Frequently Asked Questions

What are the requirements for license renewal?

Licenses Expire	CE Hours Required
Before October 1, every 3 years.	24 (All hours are allowed through home-study)

How do I complete this course and receive my certificate of completion?

On-Line Submission: Go to ***Cosmetology.EliteCME.com*** and follow the prompts.You will be able to print your certificate immediately upon completion of the course.

Fax or E-mail Submission: Fax to (386) 673-3563, be sure to include your credit card information. All completions will be processed within 2 business days of receipt and certificates e-mailed to the e-mail address provided*.

Mail Submission: Use the envelope provided or mail to Elite, PO Box 37, Ormond Beach, FL 32175. All completions will be processed and certificates issued within 10 business days from the date it is mailed*.

*Please note - providing a valid e-mail address is the quickest and most efficient way to receive your certificates when submitting via fax, phone, e-mail or mail.

Submissions without a valid e-mail address will be mailed to the address provided at registration.

How much will it cost?

Cost of Courses		
Course Title	**CE Hours**	**Price**
Art in Hair Design	**2**	**$45.00**
Chemical Makeup and Conditions of Hair	**2**	
Diseases and Disorders of the Scalp	**5**	
OSHA: Education and Salon Safety	**2**	
The Professional Colorist: It's More Than Magic	**10**	
Sanitation, Sterilization and Infection Control	**3**	

Are you a North Carolina board approved provider?

Course providers no longer need to submit course applications, packets, lesson plans, schedules or attendee information directly to the board.

Are my credit hours reported to the North Carolina board?

No, the board may conduct an audit of your continuing education at any time. Keep your certificate in a safe place.

Is my information secure?

Yes! Our website is secured by Thawte, we use SSL encryption, and we never share your information with third-parties.

What if I still have questions? What are your business hours?

No problem, we have several options for you to choose from! Online at **Cosmetology.EliteCME.com** you will see our robust FAQ section that answers many of your questions, simply click FAQ in the upper right hand corner or e-mail us at office@elitecme.com or call us toll free at 1-866-344-0970, Monday - Friday 9:00 am - 6:00 pm, EST.

Important information for licensees:

Always check your state's board website to determine the number of hours required for renewal, and the amount that may be completed through home-study. Also, make sure that you notify the board of any changes of address. It is important that your most current address is on file.

North Carolina Board of Cosmetic Art Examiners Contact Information
North Carolina Board of Cosmetic Art Examiners 1207 Front Street, Suite 110 Raleigh, NC 27609 Phone: (919) 733-4117 | Fax: (919) 733-4127 Website: https://www.nccosmeticarts.com/

Table of Contents

CE for North Carolina Salon Professionals

Chapter 1: Art in Hair Design

2 CE Hours

By: JoAnn Stills

Learning objectives

By the end of this presentation, the participant should understand:

- Training the mind, 3 points of view:
  - Adaptability.
  - Structural design.
  - Decorative design.
- 5 design decision considerations:
  - Proportion.
  - Hair.
  - Personality.
  - Clothing.
  - Lifestyle.
- 5 principles of hair design:
  - Space.
  - Form.
  - Line.
  - Color.
  - Texture.
- Design composition.

Introduction

Like an athlete conditioning the body for an athletic contest, hair artists, whether salon owners or practicing cosmetologists, must condition their mind, as well as their artistic skills to be successful.

Both psychologists and psychiatrists have found that most people, including cosmetologists, are negative by nature. The average person is reluctant to fight for something, but is quite willing to fight against anything, or everything. Unfortunately, this fact is one of the perversities of human nature. People seem to enjoy the knowledge of unhappiness, gloom, and suffering. They discuss defeat, discouragement, and despair, rather than courage, optimism and hope.

In conditioning the mind, resolve to *accentuate the positive, eliminate the negative, latch on to the affirmative, and don't mess with Mr. In-between*. These are the words of an old song; however, it is as true today as the day it was written.

The positive approach is an attitude and the artist's attitude has been the most important part of the success, or failure of the artist, according to experts in the industry. Attitude is more important than personality, appearance, and ability.

Considerations of mind training	
Right Side of Brain	**Left Side of Brain**
Flexibility	**Sensibility**
Imagination	*Verbal-Speech-Language*
Dreams	*Marks Time*
Intuition	*Details*
Creative Ability	*Counts-Numbers*
Create Ideas	*Plan Step-by-Step*
Dimensional Color	*Color Theory*
Directional Wraps	*Winding a Rod*
Adapting Style to Client	*New Release*
Applying Principles of Design	*Basics of Design*

Two areas of the brain are responsible for each of the Design Elements. ALL of these elements must come together in a harmonious way to produce the desired finished results. This section reviews face shapes and studies the positive and negative effects. It is essential to understand before proceeding: *The balance and proportion of the hair design must be complementary to the features of the client*. Often times, clients will study pictures of finished hairstyles and expect that their end results will look like the picture. Typically, this is NOT possible.

To quote Plato's great insight: "Beauty lies in the proportion of things."

Proportion is the comparative relationship of one thing to another. A well-chosen hairstyle can create the illusion of better proportion. It is essential when designing a hairstyle to take into account the client's body shape and size. Challenges in body proportion become more obvious if the hair form is too small or too large. A general guide for classic proportion is that the hair should not be wider than the center of the shoulders, regardless of the body structure.

Proportion is also defined as any portion or part in relation to the whole. No one certain feature or style produces beauty but rather the relationship or harmony created when all components come together into a total image. Why does a hairstyle, for example, look great on one client and terrible on another? Again, the answer lies in the proportions. As a hair designer, you cannot change a body or face shape, but you can use the hair to create good proportions between the hairstyle and the face and between the entire head and body.

Throughout history, artists have drawn and sculpted the human body. They found some golden rules about ideal proportions between the body and the head, including the hairstyle. Today those proportions have created a standard that is taught in art classes all over the world.

According to the standard most artists use, the head of a woman should be a 1:7 ratio of her overall body height, while the head of a man should be 1:8 ratio of his overall body height. Therefore, when creating a hairstyle for your client, it is important to keep these proportions in mind. Hairstyles that are too large or too small for your clients' statures will alter the illusion of their head-to-body proportions.

Balance is establishing equal or appropriate proportions to create symmetry. In hairstyling, it can be the proportion of height to width. Balance can be symmetrical or asymmetrical. Often when you are dissatisfied with a finished hair design, it is because the style is out of balance.

True story: I am reminded of a client that stood 5'9" tall with a very full and rounded face shape. She was well over 350 pounds and had very thin, fine, straight hair.

She chose one of the current hair designs that was 0 at the nape and cut around the ears in a brief sideburn effect. (She also had large, protruding ears.) OUCH! Not to be taken aback; I fitted a wig to her, in the style that she had requested and stood back.

Well, you have surmised her reaction. She then understood that this would not work for her. We then proceeded to create a design that gave as much volume and density as possible with extreme angles in the outer perimeter. This caused a counter-balance to her existing round lines and camouflaged her negative features. She also purchased two wigs, in similar designs, to wear for convenience.

As we study our clients, it is apparent that very few have symmetrical features. Many have a side of the face that appears heavier. Many have one eye that is slightly smaller or one flare of the nose that is slightly larger. And so, adaptability becomes the first design consideration. During your client consultation, take the time to make notations of the asymmetry to the face. If we design the hair towards the "low" side of the face, we will accentuate it. If we duplicate the head form with either fullness or the lack thereof, we emphasize it. Feel the bones of the head and take note of the growth patterns in the outer and inner perimeters. Remember that the outer perimeter creates the strongest influence to the features. Be very careful about the hair that touches the face. Will it point to an unflattering feature, such as a pointed nose? If there is a protrusion of the frontal bone, the fringe area will lift and dry shorter than anticipated. We have found that working with two mirrors is of tremendous benefit: one for the frontal view and one for the profile. Watch that you do not accentuate a poor profile with an extension in that area. The mirrors will tell you things that the eye cannot see directly. In addition, using a haircutting chair gives the best view of the back and sides of the head because you are looking directly into them. If you are looking down at the hairline, your vision is altered. (No, it is not for your feet; although that is a bonus.)

To help create *balance*, comb through and move the hair left, then right. Move the part up and down and observe what these balancing techniques will accomplish. In dealing with a part or distribution of the hair, this can give the greatest influence to counter-balance the "low" side of the face. The higher the part is placed on the head, the more length to the face is produced. The lower the part is placed on the head, the more width is realized.

BODY SHAPES

In general, three main body shapes that need to be considered. They are primarily divided by height and bone structure and are referred to as tall and lanky, average, and short and sturdy. Analyze your client's body shape at the beginning of the consultation. Have your client stand in front of the mirror to see the overall body height and proportion.

Tall and lanky body shape

Clients with tall and lanky body shape have an overall elongated and narrow bone structure. Neither their hips nor their shoulders are dominant. They have long legs and arms and an unusually long neck. Due to their height, their heads seem to be small in proportion to their bodies. Women in this category would be 5'10" or taller and men would be 6'1" or taller.

Tall and lanky clients need volume and/or longer hair. Tall women's hair should touch the shoulders, at least in the back. Men should also have longer and fuller styles.

Average body shape

Clients with average body shape have normal height, dominant shoulders, and average hips. Their bodies usually have a good proportion. Women in this category are, in general, between 5'5" and 5'9" while men are usually between 5'7" and 6'1".

These clients can wear almost anything from fuller to close hairstyles and/or from short to long hair length. However, a hairstyle that is short with volume on top will make them look taller and a hairstyle that is long (shoulder length or longer) with volume at the bottom will make them look shorter.

Short and sturdy body type

Clients with short and sturdy body type are typically shorter and have a heavy or robust bone structure. These clients often have wide shoulders and hips, and short arms, legs, and necks. Women in this category are generally 5'4" or shorter; the men are 5'7" or shorter.

These clients need hairstyles with height and volume on the top. They should not wear any style that touch the shoulders or have a lot of overall volume, since that would make them look shorter.

The neck

Besides the overall height and body proportion, there are also individual features that, if dominant, need to be considered separately. Very often, the length of the neck reflects the overall body shape. A tall and lanky client will have a long neck while a short and sturdy client will have a short neck.

Clients with short necks should avoid volume at the neck. Long, wispy lengths are a good alternative since they visually elongate. Any outlining around the neckline should be narrow and elongated. For a short neck, keep the hair close or off the face.

Long necks need mass and fullness around them. Longer, fuller hair at the perimeter is good for this characteristic. If the client likes shorter hair, choose a hairstyle that still shows hair along the neck from the front view. Leave the nape area longer and fuller. Cut a horizontal design line at the bottom to imply weight or fullness. For a long neck, frame with hair.

The shoulders

As much as the neck reflects the overall body shape, in most cases, so do the shoulders. A tall and lanky client will often have narrow shoulders, while a short and sturdy client will have wide shoulders.

Wide shoulders need a hairstyle with a narrowing design line in the back. The design lines could be any lines that imply a narrow or steep V shape. These lines give the illusion of narrowing the shoulders and stretching the body. (Wide shoulders – add elongation.)

Narrow shoulders need just the opposite. Hairstyles for narrow shoulders need design lines that imply horizontal lines or an A shape. Flat and wide, oval lines work well. All of these lines need to be cut at low angles in order to add fullness and weight. (Narrow shoulders – add width.)

Entire body shape

When considering the entire body shape, identify the widest area of the body. Visualizing the overall body silhouette, imagine the amount of volume needed the hairstyle to bring this wide area of the body in proportion with the rest of the body. If the hair is too small for a large figure, the proportion will be unbalanced and the body will look even larger. A short, small-boned body will easily become overpowered by a large hairstyle and, therefore, look even smaller.

The face

Facial structure often reflects body structure. Many tall and lanky clients have elongated faces, while short clients often have wide faces. *Any face can be beautiful if it is framed by the right hairstyle*. To determine the most appropriate style, it is important to analyze the face using criteria such as bone structure, the hairline, and the widest and most dominant areas.

When determining your client's face shape, try answering the following questions:

1. Is the face long and narrow or short and wide?
2. Is the shape of the face angular or rounded?
3. Which area of the face is most dominate?

Using these questions as a guide will easily and clearly determine which facial shape is present.

Most common facial shape

- Oval.
- Round.
- Square.
- Oblong (Rectangle).
- Pear (Trapezoid).
- Diamond.
- Heart (Triangle).

Three-sectioning

Three-sectioning is an effective way to measure the proportions of the face. It is done by measuring the three sections of the face – section one: the front hairline to the middle of the eyebrows; section two: the middle of the eyebrows to the tip of the nose; and section three: the tip of the nose to the tip of the chin. These sections are considered harmonious if they are equal. If there is more than ½" difference between any of these sections, they are not considered harmonious. Hairstyles and makeup can be used to create the illusion of balance.

To measure the face using the three-sectioning technique, do the following:

- Comb and pin all the hair out of the face.
- Remove the client's glasses and jewelry.
- Place client in front of a mirror.
- Measure the three sections with a tape measure.

Oval face shape

The oval-shaped face is rounded, long and narrow rather than wide and short. It has no dominate areas. Oval faces look very harmonious because they approximate even three-sectioning. Oval faces look good with almost any hairstyle, length, or texture. Sometimes the oval facial shape lacks a focal point and can look plain. A stronger statement with the hairstyle may be used to create interest.

Round face shape

The round-shaped face looks circular. It appears to be rather short and wide rather than long and narrow. Round faces have a low, round hairline and a short chin with a very rounded jaw line. These faces look very good with a geometric or linear hairstyle. When the face is well balanced, short and layered styles look very good. An asymmetrical hairstyle can also distract from the roundness of the face. Always add height and, when possible, cut long, wispy side areas to make the cheeks look narrow. Avoid volume at the sides since this would add even more width. Round faces should not wear fringes – a few wisps of hair are better. Avoid curls since they emphasize the roundness of the face even more. If the client has naturally curly hair, create a very angular shape. Place the volume either below the jaw line or above the temple area.

Square face shape

The square-shaped face is short and wide. It looks very angular with straight lines. The most dominant area on the square face is the jaw line. Square-shaped faces need height on top and narrowness on the sides. Shapes that elongate the face are preferable. Very short hair with height on top can look good on self-confident clients. For others, curly texture and wisps of hair around the face work well since this adds softness to the angular lines of the face. People with square faces generally should not wear fringes or styles with width at the jaw line.

Oblong face shape

The oblong-shaped (rectangle) face is long, narrow, and angular. The jaw line is wide and almost horizontal. The hairline on the oblong face is only slightly curved. The one structure allows the sides to look vertical since the cheekbones barely protrude. In many cases one area of the face is longer, whether the forehead, the chin, or the middle portion. Oblong faces need softness and width and look good with longer and curly hair. Chin length hair with volume on the sides is also very flattering. A fringe can shorten the look of an oblong face. Women with oblong faces should not wear extremely short hair, as it might look too masculine. Avoid adding any more height to the rectangular face. Also, avoid flat, long, straight hair that would make the face look even longer.

Pear face shape

The pear-shaped (trapezoid) face is often elongated, with a forehead that is narrow and a jaw that is the widest area of the face. The pear-shaped face can wear graduated forms very well since these styles can push the volume up and above the jaw line into the narrow areas. If the hair is short, the volume should be placed at the upper crest area. If the client wears the hair long, it should reach past the jaw line. Curls and wispy hair can soften the angularity of the face. Long wispy side areas make the cheeks and jaw look more slender. The hair should be neither extremely short, nor like a bob that ends at the jaw line.

Diamond face shape

The diamond-shaped face is elongated and angular. Its widest area is at the cheekbones, while the forehead and chin are narrow. The diamond facial shape resembles the oval face, but looks harsher. Diamond-shaped faces need narrow sides and fullness at the chin. Bobs work very well for the diamond facial shape. Short hair also looks good on the diamond face shape as long as the nape lengths are kept longer and wispy so the hair can visually soften the pointed chin. The diamond-shaped face should avoid wearing height on top, volume at the sides, or a short-cropped nape. Also, long, pointed side areas are not good since they emphasize the sharpness of the chin.

Heart face shape

The heart-shaped (triangle) face is long. The heart face shape is angular and the chin area is sometimes elongated and pointed, while the forehead is wide. These faces look good with volume at the chin and no or little volume on top. Curls help to soften the features. If the hair is shorter, the nape still needs to stay full. Too much volume at the top of the hairstyle will make the face look even more triangular. Diagonal-forward lines and long pointed side areas should be avoided. Short, cropped napes can make this face look too harsh.

Analysis Trick: With the client seated and looking straight into the mirror, trace the image of the face on the mirror with a dry-erase marker pen. Have the client move away and observe the shape of the face that you have drawn. This exercise gives you great insight into the areas that need fullness and the areas that do not.

When consulting with your client, it is important that you use terminology that expresses your knowledge without labeling the client. For example, instead of saying to a client that you find the client's facial shape to be pear-shaped, you should refer to fullness at the jaw and the narrow forehead area. In other words, the shape similarities are intended as a reference tool to aid in your understanding, not as a label for client consultation. The art of consultation includes finding the right words to encourage and support the client while making professional recommendations.

PROFILE

Since your clients are viewed from various angles, it important that their hairstyle complement their profile as well. The most notable features of the profile are the forehead, the nose, and the chin.

Straight profile

A straight profile has a very slight curvature from the front hairline to the tip of the nose and from the tip of the nose to the chin. Straight profiles are considered ideal and can be totally exposed.

Convex profile

A convex profile has a strong out curvature resulting from either a protruding nose or a sloping forehead or chin. For the convex profile, it is advisable to create the illusion of a straight profile. Adding volume to the fringe area and the forehead will visually shorten the length of the nose. To balance a sloping chin, keep the shape of the hair tighter in the nape so the chin does not appear too small in comparison to the hair volume. With a bob, create a diagonal-forward perimeter line that points directly to the chin to make it appear larger. A receding chin on a male client can be camouflaged by a full beard and mustache.

Concave profile

A concave profile has an inward curve, which is most often the result of a dominant, protruding forehead and chin or a small nose. To compensate for the dominant chin, build fullness in the nape and avoid short nape lengths and diagonal-forward lines, since this would cause the chin to stand out even more. To cover up a large forehead, cut fringes and style them with little volume. Moving the hair off and away from the face will compensate for the smaller nose.

SPECIAL CONSIDERATIONS

Other areas that may need special consideration when determining proper proportions include a receding hairline, protruding ears, and eyeglasses.

Receding hairline

When a client has a receding hairline, avoid a side part directly in the center of the recession corner. Try to style the hair without any direct part and let it fall slightly forward to cover the receding area.

Protruding ears

Large or protruding ears should be covered with longer hair or have more volume and fullness at the sides if the hair is short.

Eyeglasses

A client who wears eyeglasses may pose two different types of challenges. The first challenge involves the client asking you for advice on the type of frame shape to select. The other challenge is a client who needs a hairstyle adapted to the eyeglasses already being worn. In general, the factors to consider when selecting a pair of eyeglasses are similar to those for choosing a hairstyle: body shape, face shape, personality, clothing style and lifestyle.

- Select large glasses for a larger face and small glasses for a smaller face.
- Determine if the client considers glasses to be a fashion accessory or a necessity. A client who views glasses as a fashion accessory may be happy with a pair that draws attention, through shape or color. A client who is not too happy about wearing glasses and sees them as a necessity will probably be more satisfied with a delicate frame in gold or silver, or possibly unframed glasses.
- The shape of the frame can also be used to enhance or compensate for the shape of the face. A square-shaped pair of glasses can give a round face more interest while a round pair of glasses can soften a square face. A wide frame can add width to a narrow face, while a narrow frame makes a wide face look more slender.

To conclude the section on Adaptability, be aware of the 1:3 to 2:3 ratio on the image of the client. This is to say, concerning the size of the presentation. If the size of the face is small, avoid overpowering it with too much hair. This is particularly important for the short and sturdy body type. Conversely, if the face is large, enough hair must be present to balance the features and keep the presentation in proportion.

The more symmetrical faces can handle 2/3 face with 1/3 hair; whereas, the opposite would be true if the face has challenges. More hair is needed to balance the image.

STRUCTURAL DESIGN

Structural design relates to the *silhouette, form*, or *outside edges* of the hairstyle.

A structure is composed of lines and shapes and should conform to the following guidelines:

- Functional, suitable to its purpose (lifestyle).
- Simple and proportionally balanced in order to be beautiful.
- Suitable to the material of which it is made (hair texture-density-quality).

While many of the design decisions are made representing good balance and proportion, the addition of the above points is relative. A cosmetologist could never make a design decision without analyzing his/her primary working material – the hair. It is important to determine several factors about the hair before deciding on a particular style. These factors include color, texture, density, length, condition, and growth pattern.

Hair color

To be able to make the right design decision for your client's hair color, you will need to analyze his/her natural coloring. Assign a number to the depth of pigment of the skin: #1, being the darkest and #10, being the lightest. Now, assign a number to the depth of pigment in the hair: #1, being the darkest and #10, being the lightest. (Consider mostly white hair #10.) Next, look for signs of warmth in the skin. The presence of freckles and a peach or pink tone in the skin are an indication of this. This client is considered to be warm toned, even if the hair does not show it. Conversely, if the skin has a yellow or blue tone and is clear of orange granules, this person is considered to be cool-toned; again, even if the hair does not display it. Conservatively, we can take the hair color up to two (2) numbers up or down on the chart without upsetting the relationship to the pigments in the skin. We can add or subtract the tone that is complementary to the skin tone. While high fashion drives approximately 2% of the clients, 98% of the clients will accept natural-looking hair color, done in good taste. Note that neutral colors tend to be balanced. Clients who have neutral color scheme can look good in either warm or cool colors.

Hair texture

Hair texture refers to the surface appearance or feel of the hair as well as the diameter of the hair strand itself. Texture can be described as either unactivated (having a smooth and unbroken surface) or activated (having a rough surface). Hair can also be described as fine, medium or coarse.

The texture of the hair itself will determine which style will work best for the client. Hair with fine texture is usually easy to style; but the hair collapse quickly. Coarse hair is harder to style at first; but the style lasts for a longer period of time. Curly, coarse hair tends to create a wider silhouette.

Hair density

Density describes the number of hair follicles per square inch on the scalp and is usually referred to as light, medium, or heavy (or thin, medium, or thick). Hair density will determine the feasibility of certain hairstyles. For example, clients with light density generally will not have enough fullness for longer designs that go past the shoulders.

Clients with heavy density hair generally will not look good with curly perms or feel comfortable with upswept hair because of the additional weight. The amount of volume you are able to achieve in a hairstyle often depends on the density of the hair.

Hair length

A client's existing hair length might not be enough to realize a chosen style immediately. It might be necessary to let some areas of the hair grow. Clients need to be informed about this delay to avoid disappointments.

Hair condition

The condition of the hair, especially in relation to the client's history of chemical services is a very important consideration. The hair's present condition determines which additional chemical services can be performed without jeopardizing the integrity of the hair.

Growth pattern

Every client has certain growth patterns in the hair. The natural growth pattern determines the angle and direction at which the hair grows out of the scalp. This angle and direction are usually very strong and can seldom be altered. For example, if a client's growth pattern directs the hair forward onto the face, it will be frustrating to try to wear it back and away from the face.

Personality, clothing, and lifestyle

One trick that we use to determine the success of our designs on the clients is to *look at the purse/bag that your client carries* (or does not carry). Is this client fashion focused, holding a high-end purse or bag? Your client will want a design that is being worn by celebrities. Is your client a working parent (plain black or brown small bag)? Your client will go for the easy care, conservative designs. Does your client simply tuck ID and keys in a pocket? This client does not really want to bother with a hairstyle. We have used this technique in countless classes. The analysis is typically "right on" and almost instantaneous. Have fun with it!

Design composition

Design composition is the fusion of all of the individual elements of your intended design into one artistic whole. Instead of a canvas, the hair designer considers the head, with all of its limitations, as the SPACE in which to create. The hair is the medium to be molded and shaped within this space. Hair design follows the same basic artistic concepts as other art forms and applies them to this medium. Every artist works with three major design elements – form, texture and color. In creating a complete or finished design, whether in paint or with hair, not one of these elements can be ignored.

Form

Form describes the outline or silhouette of an object. Form is the three-dimensional representation of shape. An understanding of lines is critical to the understanding of form. Lines create shapes to produce different forms and can be straight or curved. Form needs to be viewed from many different perspectives to get the real impression of the design. The form and size of a hairstyle is the first element that is realized and MUST be in good proportion with his/her physical characteristics.

Moreover, the form of the design should reflect the form of the body. Curved lines are distinctly feminine, because the bone structure of a female body is curved and rounded. Conversely, the bone frame of the male body is squared with multiple angles and straight lines.

A **line** consists of a series of points that are connected with each other in a variety of directions.

Angles are formed at the point where two lines meet.

A **shape** is a two-dimensional figure consisting of points, lines, and angles.

Line

Lines produce directions that lead the eye through a hairstyle and create visual illusions. Lines can be seen along the perimeter of a hairstyle as well as within the hairstyle itself. Lines are created by cutting, styling, or chemical texturizing.

Straight lines can be horizontal, vertical, diagonal left, or diagonal right. Curved lines can be any part of a circle and can go in any direction.

Horizontal lines:
- Parallel to the horizon.
- Add width.
- Open a narrow face.
- Add weight/bulk to the image.

Vertical lines:
- Right angle to the horizon.
- Add the illusion of length.
- Make a wide face look narrower.
- Remove bulk when used in haircutting.

Diagonal lines:
- Bring the eye to a focal point.
- Allow movement if used in haircutting.
- Diagonal-forward lines move toward the face.
- Diagonal-back lines move away from the face.

Curved lines:
- Softer than straight lines.
- Soften facial angles.
- Counter-balance hard features.
- Permit blending if used in haircutting.
- Create the illusion of motion.
- Moving in opposite directions, create wave patterns.

Color

Color is the visual perception of the reflection of light. Many designers consider color to be the most powerful design element of all, because it not only has an aesthetic value in your design composition, it also has emotional value.

Color is actually a cross-over element. As a base for the overall image, color represents a strong influence on the structural design. However, when creating emphasis, it becomes part of the *Decorative Design*.

Light colors:
- Soften the features.
- Highlight the form.
- Add brightness to the skin.

Dark colors:
- Adds harshness to the features.
- Causes the form to recede.
- Adds depth.

DECORATIVE DESIGN

Decorative Design or surface enrichment is the addition of ornamentation to an existing structure.

Designs within the structural form should:

- Enhance the structure.
- Be considered secondary to the structural design.
- Be used in moderation.
- Be presented within the balance line of the structure (the predominant line of the structure).

The effects that different colors can have on a hairstyle are:

- Add depth.
- Add dimension.
- Add the illusion of sheen.
- Add the illusion of texture.
- Draw attention to a specific area.

Warm colors make you *feel* warm, attract the eye, and are cheerful. Cool colors remind you of coldness, are distant and quiet, and can seem gloomy.

Texture

Texture is the visual appearance or feel of the surface, and it is the design element that creates interest within a design. As a design element, texture identifies the surface appearance of the hair, whether it is curly or straight, smooth or layered. Texture can be natural or created through a variety of services, such as within the cut, perm, style, or relaxer. Texture speed describes the size of the actual texture pattern. Smaller patterns (tight curls or crimping) are called *fast speeds* and larger patterns (large curls or waves) are referred to as *slow speeds*.

Different textures create a different character in a hairstyle. Generally, more than three textures within a design are not recommended since it may appear too busy.

When we study the texture of the decorative design, we have additional points to observe.

- **Repetition**: A pattern in which an element is identical. (such as waves).
- **Alternation**: A pattern in which an element changes from one to another repeatedly (such as wave into curl).
- **Progression**: A pattern in which an element changes gradually in an ascending or descending scale (such as straight to wavy to curly).
- **Contrast**: A pattern in which an element has a relationship of opposites that create interest, variety, and excitement (such as a smooth finish to a highly textured curl pattern.
- **Rhythm**: The obvious flow of the given elements, whether fast or slow speed.

Balance

An important part of any design is the balance within the design. Balance is the state of equilibrium existing between contrasting, opposite or interacting elements. Without a sense of balance, or order, the eye travels aimlessly through a composition and eventually loses interest. Balance can be either symmetrical or asymmetrical.

Symmetrical balance is created when weight is positioned equally on both sides of the center, creating a mirror image. The focus remains on the silhouette of the design.

Remember also, that a symmetrical design represents a formal image. Using a center part or a straight-back or straight-forward design is representative of symmetrical distribution.

Asymmetrical balance is created when weight is positioned unequally from a center.

Visual balance can still be achieved even though the actual mass of hair is off center. Asymmetrical design represents an informal image. This is not to say that the asymmetrical distribution should or would appear lop-sided. Using a side part will produce an asymmetrical distribution automatically and this is one of the best ways to balance features.

Connecting the widest areas on either side of the head with an imaginary line creates a balance line. In a symmetrical design, this balance line is usually horizontal. With asymmetry, the balance line is diagonal. Even an asymmetrical design needs to have healthy proportions between its larger and smaller parts. For instance, asymmetry in length should not exceed more than 1/3 of the face. Asymmetry in width should not exceed the distance from the tip of the nose to the side of the face.

Trends

Have you ever wondered: From where do trend forms originate? Truth be told, it all starts with the clothing designers. At the time of Fashion Week in New York City, the clothing designers present their interpretation of what we, as consumers, will be wearing.

Based on the silhouette and fabric texture, Master Hairdressers create hair designs that balance the head to the body. For example, when the clothing presented has vertical lines and heavily textured fabric with almost military detail, the silhouette of the head is smaller, less detailed, and simpler in design. But, when the clothing designs produce more oblique and horizontal lines, the hair must follow suit and move away from the head, in a softer finish. Imagine, if you will; a chiffon dress with a flowing full skirt, balanced by a soft, fluffy finish to the hair.

With your application of these art design principles, you also will be a Master Hair Designer. I ask my returning clients: “Do you receive complements on your appearance?” If they answer, “yes,” I know that I am doing the best for my client. Most hairdressers learn haircuts; not many learn to shape and mold the hair into a total image that is balanced and proportional to the client. Trends come and go and designs become more subtle or bolder, more original or more reflective of classic designs. The most important factor of our industry is client satisfaction.

Chapter 2: Chemical Makeup and Conditions of Hair

2 CE Hours

By: JoAnn Stills

Learning objectives

- Describe the basic anatomy and chemical composition of hair.
- Describe how the pH scale pertains to hair care.
- List and compare the three main types of hair color.
- Explain the significance of material safety data sheets.
- Identify ingredients in common hair care products that may be problematic to clients.
- Associate common symptoms with conditions and diseases of the hair and scalp.

Introduction

This chapter will review the chemical composition of the hair and discuss various conditions that you are likely to encounter in your clients. Understanding the composition and nature of hair is the first step in protecting your clients from possible harm that a variety of products can cause.

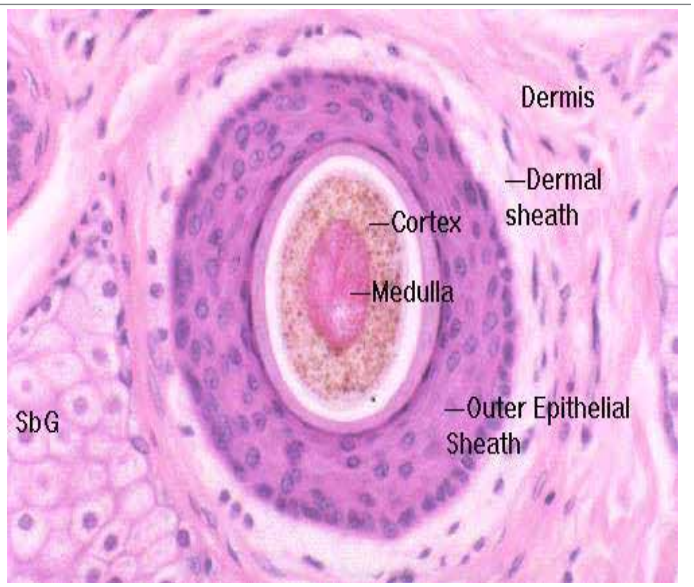
Structure of hair

Like other mammals, humans are covered by hair. Human body hair, however, is much finer than that of our nonhuman brothers and sisters, and is concentrated primarily on our heads, underarms, and genital regions. Most men, and some women, also have hair on their faces. Each hair grows from an individual follicle that is adjacent to a sebaceous gland. Sebaceous glands produce sebum, which moisturizes skin and hair and is a barrier to toxins. Sebum also manufactures the body's vitamin D, triggered by exposure to the sun.

Hair is outgrowth of skin but has no sense of feeling due to the lack of nerve endings. It is made up of the protein keratin (also found in skin and nails). Keratin protein is formed by the joining of amino acids. The fact that the acids join at some places along the protein chain makes keratin relatively resistant to change. The chemical makeup of hair also contains carbon, hydrogen, nitrogen, sulfur, and oxygen. Hair protects the body from heat loss and ultraviolet rays. Hair follicles extend down into the dermis (skin layer). A nerve ending surrounds the bulb of each hair follicle. Glands secrete an oily substance directly onto the hair follicle, lubricating the hair shaft.

Hair is composed of cells arranged in three layers: the cuticle, the cortex, and the medulla. The cuticle is the outside layer composed of transparent, scale-like cells. Chemicals raise these scales so solutions such as chemical relaxers, hair color, or permanent wave solutions can enter. The cortex is the inner layer of cells that give hair its strength. It is composed of numerous parallel fibers of hard keratin. These fibers are twisted around one another like a rope. This layer gives hair its color. The medulla is the innermost layer and is composed of round cells. **If you have very fine hair, medulla cells may be absent**.

Hair's inner cortex is composed of spindle-shaped cells and an outer sheath, called the cuticle. Within each cortical cell are the many fibrils, running parallel to the fibre axis, and between the fibrils is a softer material called the matrix. It grows from a hair follicle.



This is a cross section of a hair fairly close to the surface. You can tell where it's been cut because there's a bit of sebaceous gland (SbG) next to it. The cortex and medulla of the hair are both present. Some short, curly wool hairs lack a medulla. The outer epithelial root sheath (ORS) is a continuation of the epidermis down into the follicle.

The cuticle is responsible for much of the mechanical strength of the hair fiber. It consists of scale-shaped layers. Human hair typically has 6-8 layers of cuticle. Wool has only one, and other animal hair may have many more layers. Hair responds to its environment, and to its mechanical and chemical history. For example, hair which is wetted, styled and then dried, acquires a temporary 'set,' which can hold it in style. This style is lost when the hair gets wet again. For more permanent styling, chemical treatments (perms) break and re-form the disulphide links within the hair structure.

In people of European descent, blond hair and black hair are at the finer end of the scale, while red hair is the coarsest. The hair of people of Asian descent is typically coarser than the hair of other groups. Hair with a round cross-section will fall straight, as opposed to curly hair, which has a flat cross-section. The cross-sectional shape of human

hair is typically round in people of Asian descent, round to oval in European descent, and nearly flat in African peoples; it is that flatness which allows African hair to attain its frizzly form. In contrast, hair that has a round cross section will be straight. A strand of straight round cross-section hair that has been flattened, for example, with an edge of a coin, will curl up into a micro-afro.

The speed of growth is roughly 11 cm/yr = 0.3 mm/day = 3 nm/s. Cells at the base of the hair follicle divide and grow extremely rapidly. A single strand of human hair can hold approximately 100 g (3.5 ounce) of weight, although this will vary greatly with thickness. Wet hair, however, is very fragile.

Pathology of hair

The term "pathology" refers to the study of disease, including its nature and origins, as well as its effect on the structure and function of the body. A closely related subject is etiology, which investigates the causes or reasons for disease. This chapter reviews diseases and other common conditions of the hair and scalp, which are all part of the integumentary system. The information presented in the following section will help you develop workplace guidelines for recognizing potential health risks, to determine when and how to proceed with service – or if you should proceed at all. This information is not meant to be used for self-diagnosis or as a substitute for consultation with a health care provider. If you have any questions or concerns regarding the conditions or diseases described below, consult a health care provider.

Disorders of the hair and scalp

The condition and appearance of the hair and scalp are influenced by many factors, including physical health, nutrition, blood circulation, emotional state, function of the endocrine glands, and medications consumed. Common disorders of the hair and scalp include vegetable and animal parasitic infections, staphylococci infections, which cause furuncles (boils), and the following conditions, which may affect the hair follicle and/or sebaceous glands.

Alopecia is the formal term for any abnormal hair loss. It should not be confused with natural hair loss, which occurs when the hair has grown to its full length, falls out, and is replaced by a new hair. Alopecia senilis is hair loss associated with old age, alopecia prematura may occur any time before middle age, and is characterized by slow thinning over time. Alopecia areata is relatively sudden, patchy hair loss, including the spotty baldness that is associated with anemia and typhoid fever, among other conditions. Tension alopecia is caused by tight braiding or hair styles that pull the hair's roots.

Canities is the formal term for gray hair, which is caused by the loss of pigment. Acquired canites is usually associated with aging, while congenital canites, a condition existing at birth, includes albinism.

Dandruff (or pityriasis) is a condition in which small white flakes or scales appear on the scalp and hair. Excessive dandruff can lead to baldness, if the condition is severe and neglected. Dandruff may be due to microbial infection, poor circulation, nerve stimulation, or diet, and may be associated with specific shampoos, or insufficient rinsing of shampoos.

Pityriasis capitis simplex, or dry type dandruff is characterized by an itchy scalp and white scales scattered throughout the hair. Pityriasis steatoides, a greasy or waxy type of dandruff, is characterized by a scaly skin surface mixed with sebum, and may include bleeding or oozing of the sebum when scales tear off. Refer the client to a physician for medical attention. Dandruff is considered contagious and may spread through the common use of brushes, hair clips, or styling implements.

Fragilitas crinium is the formal term for brittle hair, which may include split ends. Conditioners may improve hair flexibility.

Hair loss occurs naturally as part of hair growth and regeneration. In women, childbirth, stress, crash dieting, emotional stress and shock can cause greater than normal hair loss, though it is usually temporary. Some older women experience female-pattern hair loss with thinning of the crown and hairline.

Drugs used in cancer chemotherapy frequently cause a temporary loss of hair, noticeable on the head and eyebrows, because they kill all rapidly dividing cells, not just the cancerous ones. Other diseases and traumas can cause temporary or permanent loss of hair, generally or in patches.

Hirsutism (or hypertrichosis) is excess hair on the body. Genetic background and age can impact how much hair a woman has on the cheeks, upper lip, arms and legs. There are a variety of methods to cope with unwanted hair, such as tweezing, waxing, shaving, bleaching, depilatories and electrolysis. Electrolysis is the only permanent hair-removal method, and is typically among the most expensive and time-consuming means of removal.

Monilethrix is the formal term for beaded hair, which breaks between the nodes or beads. Hair and scalp treatments may prove helpful.

Tinea capitis (ringworm) is a fungal infection that forms a scaly, ring-like lesion on the scalp. It is highly contagious.

Trichoptilosis is the formal term for split ends.

Trichorrhexis nodosa, or knotted hair, is characterized by dry, brittle hair with nodular swellings along the length of the hair shaft. Hair breaks easily, but the condition may be remedied somewhat by conditioners.

Changes in the hair during pregnancy

Women may experience changes in their hair during pregnancy. In most cases, these changes are temporary and will return to their original condition after the birth. Hirsutism, or excessive hair growth, can appear on the face and/or chest due to hormonal changes experienced during pregnancy. Within six months after giving birth, this condition generally dissipates. Telogen effluvium refers to excessive hair loss that occurs within five months after pregnancy. This condition does not cause permanent hair loss or baldness, typically returning to normal after six to twelve weeks.

Hair color change

Hair color change is probably one of the most obvious signs of aging. **Hair color is caused by a pigment (melanin) produced by hair follicles**. With aging, the follicle produces less melanin. Graying often begins in the 30s, although this varies widely. Graying usually begins at the temples and extends to the top of the scalp. Hair becomes progressively lighter, eventually turning white.

Many people have some gray scalp hair by the time they are in their 40s. Body and facial hair also turn gray, but usually later than scalp hair. The hair in the armpit, chest, and pubic area may gray less or not

at all. Graying is genetically determined. Gray hair tends to occur earlier in Caucasians and later in Asian races. Nutritional supplements, vitamins, and other products will not stop or decrease the rate of graying.

Chemical-induced hair color changes

There have been reports of blond hair, as well as darker hair, turning green after prolonged exposure to chlorine in swimming pools. Usually, the problem is associated with concentrations of copper dissolved in the pool water, which can chemically interact with chlorine. High levels of copper in tap water can also turn hair green.

Chronic smoking has been associated with premature gray hair because toxic substances in tobacco smoke are able to block melanocyte cell pigment producing activity. Heavy smokers with white or gray hair may develop a yellow hair color due, most likely to prolonged exposure to air laden with tar from cigarette smoke. The tar may chemically react with, and preferentially adhere to, the hair fiber.

Hair thickness changes and hair loss

Hair is a protein strand that grows through an opening (follicle) in the skin. A single hair has a normal life of about 4 or 5 years. That hair then falls out and is replaced with a new hair. Hair loss usually develops gradually and may be patchy or diffuse (all over). Roughly 100 hairs are lost from your head every day. The average scalp contains about 100,000 hairs.

Hair grows about an inch every couple of months. Each hair grows for 2 to 6 years, remains at that length for a short period, then falls out. A new hair soon begins growing in its place. At any one time, about 85 percent of the hair on your head is in the growing phase and 15 percent is not. Each individual hair survives for an average of 4 ½ years, during which time it grows about half an inch a month. Usually in its 5th year, the hair falls out and is replaced within 6 months by a new one.

Genetic baldness is caused by the body's failure to produce new hairs and not by excessive hair loss. The amount of hair you have on your body and head is determined by your genes. Almost everyone experiences some hair loss with aging, and the rate of hair growth slows. Many hair follicles stop producing new hairs altogether. The hair strands become smaller and have less pigment, with thick, coarse hair of a young adult eventually becoming thin, fine, light-colored hair.

Both men and women tend to lose hair thickness and amount as they age. Inherited or "pattern baldness" affects many more men than women. About a quarter of men begin to show signs of baldness by the time they are 30 years old, and about two-thirds of men have significant baldness by age 60. Men develop a typical pattern of baldness associated with the male hormone testosterone (male-pattern baldness). Hair may be lost at the temples or at the top of the head.

Each hair sits in a cavity in the skin called a follicle. Baldness in men occurs when the follicle shrinks over time, resulting in shorter and finer hair. The end result is a very small follicle with no hair inside. Ordinarily, hair should grow back. However, in men who are balding, the follicle fails to grow a new hair. Why this occurs is not well understood, but it is related to your genes and male sex hormones. Even though the follicles are small, they remain alive, suggesting the possibility of new growth.

Male pattern baldness is the most common type of hair loss in men. It usually follows a typical pattern of receding hairline and hair thinning on the crown, and is caused by hormones and genetic predisposition. Ultimately, one may have only a horseshoe ring of hair around the sides. In addition to genes, male-pattern baldness seems to require the presence of the male hormone testosterone. Men who do not produce testosterone (because of genetic abnormalities) do not develop this pattern of baldness.

Women may also develop a typical pattern of hair loss as they age (female-pattern baldness). In female pattern baldness, the hair becomes less dense all over and the scalp may become visible. **Female-pattern baldness is a pattern of hair loss (alopecia) caused by hormones, aging and genetics**. Unlike male-pattern baldness, female-pattern baldness is an over-all thinning which maintains the normal hairline. Body and facial hair are also lost, but the hairs that remain may become coarser. Some women may notice a loss of body hair, but may find that they have coarse facial hair, especially on the chin and around the lips.

Baldness is not usually caused by a disease, but is related to aging, heredity, and testosterone. In addition to the common male and female patterns from a combination of these factors, other possible causes of hair loss, especially if in an unusual pattern, include:

- Hormonal changes (for example, thyroid disease, childbirth, or use of the birth control pill).
- A serious illness (like a tumor of the ovary or adrenal glands) or fever.
- Medication such as cancer chemotherapy.
- Excessive shampooing and blow-drying.
- Emotional or physical stress.
- Nervous habits such as continual hair pulling or scalp rubbing.
- Burns or radiation therapy.

Alopecia areata – bald patches that develop on the scalp, beard, and, possibly, eyebrows. Eyelashes may fall out as well. This is thought to be an immune disorder.

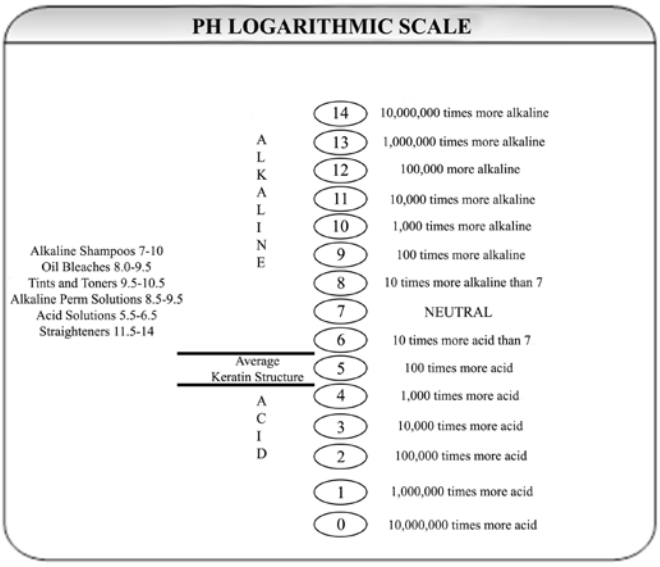
Tinea capitis (ringworm of the scalp).

What is pH?

pH is a unit of measurement; just as degrees measure temperature and inches measure distance, pH numbers measure the amount of acid or alkali in water-based solution. All solutions that contain water and products that dissolve in water have an acidic or alkaline nature. Acidic and basic are two extremes that describe chemicals, just like hot and cold are two extremes that describe temperature. Mixing acids and bases can cancel out their extreme effects, much like mixing hot and cold water can even out the water temperature. A substance that is neither acidic nor basic is neutral.

The pH scale measures how acidic or basic a substance is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic, and a pH greater than 7 is basic. The pH scale is logarithmic, which means each step or number increase by multiples of 10. Each whole pH value below 7 is ten times more acidic than the next higher value. For example, a pH of 4 is ten times more acidic than a pH of 5 and 100 times (10 times 10) more acidic than a pH of 6. The same holds true for pH values above 7, each of which is ten times more alkaline (another way to say basic) than the next lower whole value. For example, a pH of 10 is ten times more alkaline than a pH of 9. If you are using a product that is pH 6 or only one number away from acid balanced, it is actually 10 times less acidic, which is a huge difference. One number variation in pH will greatly affect the acidity or alkalinity of your cosmetic preparations.

Pure water is neutral, with a pH of 7.0. When chemicals are mixed with water, the mixture can become either acidic or basic. Vinegar and lemon juice are acidic substances, while laundry detergents and ammonia are basic. Chemicals that are very basic or very acidic are called “reactive.” These chemicals can cause severe burns. Automobile battery acid is an acidic chemical that is reactive, and household drain cleaners often contain lye, a very alkaline chemical that is reactive.



pH of hair

How does the pH scale pertain to hair? On the pH scale, hair falls on average between 4.5 and 5.5. This measurement is not the pH of the actual hair, but of the protective film of oily acidic secretions which coats and lubricates the surface of the skin, hair and nails. This combination of oils and water-soluble materials is referred to as our acid mantle, which is produced by the skin. Products with a pH of 4.5 to 5.5 are compatible with the natural biology of the hair and scalp. These products maintain a mildly acidic environment that closely resembles the environment of our acid mantle. We call these products “acid balanced.”

The scalp’s oils keep the hair lubricated and shiny. The scalp’s acidity keeps the fiber compact and strong. Part of the reason long hair tends to be weaker at the ends and dull in appearance is that less of the acid mantle reaches these ends. If, for example, the average pH on the surface of the scalp is measured at 4.8, the pH of the hair at further distances from the scalp will increase, showing that less of the acid mantle reaches the ends of longer hair.

When high pH products, such as alkaline permanent waves or tints, come in contact with the hair, the solution is absorbed through the cuticle layer into the inner layer of the hair called the cortex. The high pH causes the cortex layer to swell. This swelling forces the rigid cuticle layers to be stretched. At this point, the hair is in a very delicate condition and vulnerable to excess stretching and breaking. This condition is necessary for permanent waves to successfully curl the hair and for tints to deposit color molecules into the cortex for lasting color. Therefore, a high pH is essential for some chemical services to work properly.

pH and hair care products

Shampoos, conditioners, hair colors, and tints all require the proper combination of ingredients and appropriate pH, which plays a crucial role in the success of almost all salon services. Without the correct pH, permanent wave solutions could not create curls or waves, and color molecules from tints would not deposit themselves into the cortex. Continuous use of shampoos and reconditioners with a high pH, however, can damage and dry out the hair.

Shampoo is the most common chemical applied to the hair and therefore is especially important that it be acid-balanced. Do not confuse pH balanced and acid balanced. pH balanced means the pH is balanced at a certain number, but not necessarily at 4.5 to 5.5. Acid balanced means that it is balanced at the appropriate acidic level. Repeated use with shampoo of high pH could make the hair feel dry, dull, and less manageable. There are three basic reasons for using acid-balanced shampoos and conditioners.

The natural pH environment of a healthy hair and scalp is 4.5 to 5.5. Using acid balanced products keep the hair and scalp within this natural range. The acid mantle protects hair and skin from drying out and becoming brittle and dull. Acid-balanced products create an environment that resembles the environment of our natural acid mantle. Also, the hair is structurally compact at a mildly acidic pH value. Swelling is minimized.

How many times have you heard marketing promotions touting their product as “acid- or pH-balanced?” We have been told that a low pH is good for our hair while a high pH is less desirable. This is true when pertaining to products like shampoo and reconditioners, but there are some services, such as permanent waves and tints, that rely on high pH chemicals.

Some products do not have the pH number listed on their labels. If you want to find out the pH of any product you are using, you can use pH test paper or nitrazine paper. Just dip the paper into the solution. A product with a 4.5 pH or below will not change the paper from its original yellow shade. A higher pH will change the color to dark blue (4.6 to 7.4) and any product with a pH over 7.5 will turn the paper purple.

Permanent waves and pH

Alkaline waves have a pH of approximately 8.5 to 9.5. The high alkalinity softens and swells the hair fibers, making it easier for the chemicals of the wave to penetrate the hair structure. Because of the high alkalinity, cautious and skillful use of the perm is essential to prevent damage to the hair structure. There are pH normalizing conditioners that are made to return hair to its natural pH after chemical services. It is a good idea to use one after giving an alkaline permanent wave.

When high alkaline solutions are used, such as tints and bleaching solutions, they will change the pH of the hair and skin. In this

situation, as with alkaline permanent waves, this is desirable. The important thing is to neutralize any extra alkalinity and bring the pH back to 4.5 to 5.5. This minimizes the swelling and strengthens the hair.

pH products work together to assure successful results and beautiful hair. Acid-balanced shampoos protect the hair during cleansing. Conditioners and reconditioners that are acid balanced help return hair to its natural mildly acidic state. Some products need to be alkaline to work properly such as permanent waves and tints. To control damage that might occur from these services, finish with products that have a pH lower than 5.5.

You use chemicals and products every day. It is important to know what these products do to the hair and why. PH is more than a number. It is a measuring tool, a way for us to select and control products and services. Knowledge of pH enables you to leave the hair and skin in a natural and healthy condition.

Hair color

People have been coloring their hair for thousands of years using plants and minerals. Some of these natural agents contain pigments (e.g., henna, black walnut shells) and others contain natural bleaching agents or cause reactions that change the color of hair (e.g., vinegar). Natural pigments generally work by coating the hair shaft with color.

Some natural colorants last through several shampoos, but they aren't necessarily safer or more gentle than modern formulations. It's difficult to get consistent results using natural colorants, plus some people are allergic to the ingredients.

Health and hair care ingredients

In pursuit of cleanliness and beauty, we buy approximately $20 billion worth of personal care products every year. More than 5,000 ingredients are allowed for use in personal care products. Unfortunately, many ingredients are linked to damaging effects on human health. Many are identified by government agencies as hazardous, but many others remain untested. Unlike the pharmaceutical industry, the government does not require safety testing for these products before they go to market. Some ingredients with known health hazards are very common in personal care products, both conventional products and alternative ones.

To avoid potentially harmful ingredients, consult the list below, compiled with information from the Environmental Working Group (EWG) and the Washington Toxics Coalition. You can also visit EWG's Skin Deep report, (http://www.ewg.org/reports/skindeep2/), an online searchable database of potentially toxic chemicals in personal care products, including phthalates, which are often not listed on labels. The database also offers brand-specific information and what the group considers safer alternatives.[2]

Do not underestimate the importance of a patch test before trying any hair color products, even if they are semi-permanent or temporary hair dyes[3]. The best way is to test for allergic reaction is to apply the product to a quarter-sized spot behind the ear or neck several days prior to actually using the product on your scalp.

Predisposition test

Federal law mandated under the Pure Food, Drug and Cosmetic Act of 1938 provides that a skin test designed to determine an individual's oversensitivity to certain chemicals be performed on all clients 24 hours prior to the application of the chemicals. Hypersensitivity to chemical products can only be determined by administering a patch or predisposition test. Allergies may appear suddenly and without warning even if the client has successfully used a product for years.

NOTE: Before the application of any chemicals, a thorough analysis of hair must be done to determine the presence of metallic salts.

Client protection

Technician's hands must be washed with soap and warm water before the operation begins.

Drape the client appropriately:

- Skin of the client's neck must be protected from the re-usable drape by a neck strip.
- Drape must be snug at the neckline and extend over the back of the chair to protect the client's clothing and the chair.
- Two towels must be used to protect the client from solutions that may drip during the service. One must be under the drape and one must be on top of the drape.

NOTE: It is always important to read and follow manufacturer's directions for any chemical service. Because of the variance in products available for use, in actual practice the manufacturer's directions take precedence.

Select an area on the back of the neck below the ear lobe to apply the chemical.

NOTE: Manufacturer's directions may indicate a different area on the body for the application of the chemical; be guided by the manufacturer's directions.

Cleansing

Cleanse a quarter-size area behind client's ear or in the inner portion of the elbow. Water on a sanitary cotton ball or swab should be used for cleansing.

Area should air dry.

Application

Product for the test must be mixed in correct proportions according to manufacturer's directions.

Product must be applied to test area with a sterile cotton swab.

Sufficient amount of product must be applied to be effective for testing.

Area must be left uncovered and undisturbed for 24 hours. Do not wash off.

After 24 hours, the test area must be examined. If any sign of swelling, burning, itching, redness, or inflammation occurs, the client may be allergic to the product tested and unable to receive an aniline derivative application. (This would be a positive reaction.)

NOTE: Only if the reaction is NEGATIVE (no reaction) may the product tested be used.

NOTE: Chemical burns may occur if solution saturated cotton is left on the skin.

In case of chemical burns:

- Wash away the chemical with large amounts of water for at least 5 minutes.
- Remove the victim's clothing from the affected area to prevent further skin contact.
- Consult the product MSDS for additional first aid information.

Regardless of your current health, it's important to know the ingredients in your personal care items. Shampoo and styling products contain various combinations of parabens, phthalates, fragrance and coal tar colors, which are associated with some risk, so read ingredient labels carefully. Because labels are often difficult to decipher and not all ingredients are necessarily disclosed, finding safer personal care products can be a challenge. Remember it is also the amount, not just the presence, of an ingredient that determines risk.

Women with hair loss or other hair and scalp disorders should not assume hair products are safe. Trying a different hair color or highlights to create the illusion of thicker hair using hair dyes may actually further hair loss or aggravate existing hair and scalp disorders. This is because most professional hair color products contain loads of harsh chemicals such as peroxide, ammonia and p-phenylenediamine that can cause serious damage to the hair and scalp and increase hair loss.

Danger to eyes

Whether applying hair chemicals at home or in a hair salon, consumers and beauticians should be careful to keep them away from the eyes. FDA has received reports of injuries from hair relaxers and hair dye accidentally getting into eyes. The use of permanent eyelash and eyebrow tinting and dyeing has been known to cause serious eye injuries and even blindness. There are no color additives approved by FDA for dyeing or tinting eyelashes and eyebrows.

Hair care ingredients

The following ingredients hold some risk or are associated with negative reactions in some individuals:

Ammonia, used in hair dyes and bleaches, can irritate the eyes and skin and can be toxic when inhaled.

Bronopol may break down in products into formaldehyde and also cause the formation of carcinogenic nitrosamines, compounds shown to cause cancer in laboratory animals, under certain conditions. Bronopol is often listed as 2-bromo-2-nitropropane-1, 3-diol.

Diethanolamine (DEA), widely used in shampoos as an emulsifier or foaming agent, is a suspected carcinogen, and its compounds and derivatives include triethanolamine (TEA), and monoethanolamine (MEA), all of which can be contaminated with nitrosamines, Contamination is more likely if the product also contains bronopol (see above). DEA, TEA, and MEA are hormone disrupters that are also known to combine with nitrates to form cancer-causing nitrosamines. If a product contains nitrites, which are used as a preservative or present as a contaminant not listed on labels, chemical reactions between nitrites and these substances may occur during the manufacturing process and while products are stored in their containers. This reaction leads to the formation of nitrosamines. Most nitrosamines, including those formed from DEA or TEA, are carcinogenic. There is no way to know which products contain nitrosamines because government does not require manufacturers to disclose this information on the label.

A study by the U.S. National Toxicology Program found that these compounds themselves might also be carcinogenic. Repeated skin application of DEA was found to cause liver and kidney damage in animals. The study also discovered that when absorbed through the skin, DEA accumulated in organs. TEA may also cause contact dermatitis in some individuals.

Fragrance: Synthetic fragrances are the most common ingredients found in personal care products. In a recent study, the US National Institute of Occupational Safety and Health evaluated 2,983 fragrance chemicals for health effects. They identified 884 of them as toxic substances. The term "fragrance" on a label can indicate the presence of up to 4,000 separate ingredients. A common shampoo and conditioner ingredient, fragrance can include possible skin irritants and allergens. The FDA does not require companies to disclose the ingredients listed as "fragrance" which many include phthalates, chemicals that have been found to produce cancer of the liver and birth defects in lab animals.

Fragrance is a known trigger of asthma, and fragrances more often cause allergic contact dermatitis than any other ingredient, including watery eyes and respiratory tract irritation. Other negative symptoms reported to the FDA have included headaches, dizziness, rashes, skin discoloration, violent coughing and vomiting, and allergic skin irritation. Clinical observations by medical doctors have shown that exposure to fragrances can affect the central nervous system, causing depression, hyperactivity, irritability, and other behavioral changes. Many of the compounds in fragrance are suspected or proven carcinogens.

Hydrogen peroxide is an irritant included in oxidation dyes, which contain a combination of hydrogen peroxide, dye and ammonia.

Nonylphenols (nonoxynol or nonylphenol ethoxylate) are surfactants (substances that reduces the surface tension of liquids, making it easier for them to disperse) used for their detergent properties. This substance is found in some shampoos and hair color, resulting when certain chemicals commonly found in these products break down. These chemicals can act as hormone disrupters, potentially threatening reproductive capacity. They are of such concern that many European countries are phasing them out. Some manufacturers have voluntarily discontinued their use.

Parabens, an ingredient in many relaxers, are preservatives with antibacterial properties. Widely used in all kinds of personal care products, paraben is usually preceded by the prefixes methyl-, ethyl-, butyl-, propyl, or isobutyl-. Parabens, which are included in some conditioners, can cause allergic reactions or contact dermatitis in some people. (Preservatives are one of the leading causes of contact dermatitis.) The U.S. Food and Drug Administration (FDA) also warns consumers to use caution when using relaxers, as chemicals may accidentally enter the eyes.

Additionally, parabens, according to research published in a 2004 issue of the Journal of Applied Toxicology, have been found in breast tumors. An accompanying article suggested that adolescents and close relatives of breast-cancer patients may be at an increased risk due to continued exposure. Parabens can affect the endocrine system (the glands that produce hormones).

Appropriate recommendations on use of concentrations, restrictions and warnings for such application are critical as after active sensitization there may be extensive cross reactivity to other commonly encountered chemical substances to which the consumer

may be exposed. These include other hair coloring agents, textile dyes, drugs and rubber chemicals.

The U.S. Food and Drug Administration (FDA) proposed legislation that would have required warning labels on products, advising that this ingredient can penetrate skin and has been determined to cause cancer in lab animals. If passed, beauty salons would have had to post warnings for their customers. Cosmetic industry opposition helped defeat the proposal.

Phthalates are found in many products from plastics to shampoo. Phthalates are widely used in hair products (sprays and shampoos) to enhance fragrances, as solvents, and to denature alcohol. The oily texture of phthalates helps lotions penetrate skin. These hormone-disrupting chemicals are suspected of contaminating breast milk and causing damage to the kidneys, liver, lungs and reproductive organs. Recent product tests found the chemical in every fragrance tested in the United States.

Manufacturers are not required to list phthalates on product labels, so they are difficult to avoid. Phthalates in DEHP, DHP, and DBP5 are not identified on cosmetic labels when they are in fragrance. Since, phthalates often "hide" behind the term "fragrance," choose products labeled "fragrance-free" or that are scented exclusively with pure botanical or essential oils.

One type of phthalate, diethyl phthalate (DEP) is commonly found in fragrances and other personal care products. A study published in Environmental Health Perspectives found that DEP is damaging to the DNA of sperm in adult men at current levels of exposure. DNA damage to sperm can lead to infertility and may also be linked to miscarriages, birth defects, infertility and cancer in offspring. DEP is the phthalate found in the highest levels in humans.

Polyethylene and polyethylene glycol (PEG ingredients), which are found in hair straighteners, are safe in themselves but can be contaminated with 1,4- dioxane, which produced liver cancer in rodents in National Cancer Institute (NCI) studies.

Polysorbate compounds 60 and 80 are emulsifiers, used in lotions and creams, that can also become contaminated with the carcinogen 1,4-dioxane. Dioxane readily penetrates the skin. While dioxane can be removed from products easily and economically by vacuum stripping during the manufacturing process, there is no way to determine which products have undergone this process. Labels are not required to list this information.

Polyvinylpyrrolidone (PVP), widely used in hair-care products, especially sprays, has been found to stay in the body for months. In rats it contributed to tumor development.

Propylene glycol, a humectant, or moisture-attracting ingredient, found in personal care products, can irritate the skin in sensitive individuals.

Propylene glycol is recognized as a neurotoxin by the National Institute for Occupational Health and Safety in the U.S. It is known to cause contact dermatitis, kidney damage and liver abnormalities. It is widely used as a moisture-carrying ingredient in place of glycerine because it is cheaper and more readily absorbed through the skin. The Material Safety Data Sheet for propylene glycol warns workers handling this chemical to avoid skin contact.

Sodium hydroxide is an active ingredient in lye relaxers that can cause skin irritation, burns and necrosis as well as breathing difficulty when inhaled. Although "no lye" relaxers do not contain sodium hydroxide and result in less skin irritation than lye products, they too can burn the scalp if used incorrectly.

Sodium lauryl sulfate (sodium laureth sulfate, SLS) are used as lathering agents, and are present in 90 percent of commercial shampoos. This chemical is a known skin irritant and appears to increase allergic response to other toxins and allergens, according to the Cosmetics Ingredient Review (CIR), a panel of cosmetics-industry experts established to safety-test ingredients (cir-safety.org). After a review of over 250 existing SLS studies, the CIR concluded that SLS is not cancer-causing. However, some doctors are not convinced and recommend avoiding SLS.

The U.S. government has also warned manufacturers of unacceptable levels of dioxane formation in some products containing SLS. 1,4-Dioxane or para-dioxane is also commonly referred as simply dioxane. However, 1,4-dioxane should not be confused with dioxin (or dioxins), which are a different class of chemical compounds. While dioxane can be removed from products easily and economically by vacuum stripping during the manufacturing process, there is no way to determine which products have undergone this process. Labels are not required to list this information.

Safer straightening

The Food and Drug Administration (FDA) has received complaints about scalp irritation and hair breakage related to both lye and "no lye" relaxers. Some consumers falsely assume that compared to lye relaxers, "no lye" relaxers take all the worry out of straightening.

People may think because it says "no lye" that it's not caustic, but both types of relaxers contain ingredients that work by breaking chemical bonds of the hair, and both can burn the scalp if used incorrectly. Lye relaxers contain sodium hydroxide as the active ingredient. With no-lye relaxers, calcium hydroxide and guanidine carbonate are mixed to produce guanidine hydroxide.

Research has shown that this combination in no-lye relaxers results in less scalp irritation than lye relaxers, but the same safety rules apply for both. They should be used properly, left on no longer than the prescribed time, carefully washed out with neutralizing shampoo, and followed up with regular conditioning. For those who opt to straighten their own hair, it's wise to enlist help simply because not being able to see and reach the top and back of the head makes proper application of the chemical and thorough rinsing more of a challenge.

Some stylists recommend applying a layer of petroleum jelly on the scalp before applying a relaxer because it creates a protective barrier between the chemical and the skin. Scratching, brushing, and combing can make the scalp more susceptible to chemical damage and should be avoided right before using a relaxer. Parents should be especially cautious when applying chemicals to children's hair and should keep relaxers out of children's reach. There have been reports of small children ingesting straightening chemicals and suffering injuries that include burns to the face, tongue, and esophagus.

How often to relax hair is a personal decision. Relaxing at intervals of six to eight weeks is common, and the frequency depends on the rate of a person's hair growth. Some professionals feel that straightening every six weeks is too frequent, as relaxers can cause hair breakage in the long term, with blow drying and curling doing further damage.

Consumers should be aware that applying more than one type of chemical treatment, such as coloring hair one week and then relaxing it the next, can increase the risk of hair damage. The only color recommended for relaxed hair is semi-permanent because it has no ammonia and less peroxide, compared with permanent color.

The FDA encourages voluntary reporting of adverse reactions to hair products to the FDA, Center for Food Safety and Applied Nutrition, Office of Cosmetics and Colors.

Chapter 3: Disorders and Diseases of the Scalp

5 CE Hours

By: Staff Writer

Learning objectives

- Describe the anatomy of the skin.
- List the layers of the skin and their functions.
- Describe the glands of the skin.
- Define the classifications of bacteria.
- Describe the lesions you might encounter when serving a client.
- List disorders of the sebaceous glands.
- Describe the kinds of acne that people may have.
- Describe the kinds of dandruff you might see on a client's scalp.
- List the symptoms and signs of contact dermatitis and skin allergies.
- List common diseases of the scalp.
- Describe the steps you must take to prevent transmission of disease at your salon.
- Describe universal precautions.
- Describe the structure of hair.
- Describe the chemical composition of hair.
- Describe the growth cycles of hair.
- List the evaluations to consider when you analyze hair and scalps.
- List the types of baldness clients may experience.
- Name the products approved for treatment of hair loss.

Topics to be covered in this course

Inflammation.
Histology of the skin.
Bacteria and viruses.
Disorders of the skin.
Disorders of the scalp.
Diseases of the scalp.
Principles of prevention.
Chemical composition of the hair.
Hair loss.

Introduction

From the simplest to most complicated, the licensed, practicing cosmetologist and licensed, practicing barber must deal with scalp disorders and be able to recognize when to refer clients to a medical professional for a scalp disease. The importance is simply a matter of public health. Both of these professions must practice sanitation and disinfection in serving the clients. This is particularly important in the cases of contagious and communicable diseases.

The desire to have healthy, attractive hair can be undercut if a skin disorder produces a debilitated condition of the scalp. Diseases and disorders of the scalp can cause scalp conditions that include excessive oiliness, excessive flaking, inflammation, patchy scabbing and intense pruritus (itching).

Some of these disorders are infections; some are allergic reactions or other immune responses, and involve some degree of inflammation.

What is inflammation? Some are conditions confined to the scalp (e.g., tinea capitis, also called ringworm), and some are scalp manifestations of a more general or systemic condition (e.g., psoriasis).

Each condition has specific symptoms, but the presentation of symptoms may be confusingly similar between one condition and another (for example, seborrheic dermatitis of the scalp and psoriasis of the scalp have a number of symptoms and clinical features in common). Some conditions, or milder forms of conditions, can be managed by the professional or even home care with over-the-counter medications. More severe symptoms and systemic conditions such as psoriasis should be treated by a dermatologist or other physician with the knowledge and experience in treating skin diseases.

Inflammation is one of the body's principal defense systems against invasion by microorganisms or injury by thermal, chemical or physical trauma. The successful endpoint of inflammation is healing; a simple example is the inflammatory response to a splinter in the finger, resulting in expulsion of the splinter and healing the wound.

Inflammation is orchestrated by the body's immune system. When immune surveillance detects an event it interprets as invasion or injury, a cascade of inflammatory precursors is set into motion. When the reason for the inflammatory response is resolved, the inflammatory response is concluded under control of the immune system.

The inflammatory response can go awry, however, to the point that inflammation becomes a disease in itself. For example:

- Inflammatory response to a local bacterial infection spirals out of control, becoming a body-wide inflammation of all major organs that ends in critical illness or even death (sepsis).
- Inflammation in response to local insult proceeds to a persistent, chronic inflammatory state that may be associated with arthritis, heart disease, complications of psoriasis and a number of other chronic conditions.

How and why regulation of the inflammatory response sometimes fails is a subject of intense medical investigation.

HISTOLOGY OF THE SKIN

To bring an understanding of scalp problems, we must first cover the anatomy of the skin. The skin is the largest and one of the most important organs of the body. Healthy skin is slightly moist, soft and flexible with a texture (feel and appearance) that ideally is smooth and fine grained. Healthy skin possesses a slightly acid reaction (the acid mantle) with good immunity responses to organisms that touch or try to enter it. Appendages of the skin include hair, nails, and sweat and oil glands.

Skin varies in thickness. It is thinnest on the eyelids and thickest on the palms of the hands and the soles of the feet. Continued pressure on

any part of the skin can cause it to thicken and develop into a callus. The skin of the scalp is constructed similarly to the skin elsewhere on the human body, but the scalp has larger and deeper hair follicles to accommodate the longer hair of the head. Here, it is of value to mention that the number of follicles and their size and shape are in existence from 4 months pre-natal. The number of follicles provides the density of hair from thin to thick. The size of the follicle will determine the diameter of the hair strands (i.e., fine or coarse). The follicle shape will dictate the wave pattern.

Think of the follicle shape as the opening of a cookie press. Hair actually starts out as a semi-liquid. As the cells reproduce, the hair is formed and hardened as it is pushed through the epidermis to the outside. If the follicle shape is round, the hair will have a straight wave pattern. Because of resistance, hair that is formed through an oval or even a slit follicle will produced wavy to very curly hair. Of course, all of this has a direct link to an individual's genetic background.

The skin is composed of two main divisions: the **epidermis** (outer layer) and the **dermis** (true skin).

The **epidermis** is the outermost layer of the skin. This layer is also called the cuticle or scarf skin. It is the thinnest layer of the skin and forms a protective covering for the body. It contains no blood vessels but has many small nerve endings. The epidermis is made up of the following layers:

- The **stratum corneum**, or horny layer, is the outer layer of the epidermis. Its scalelike cells are continually being shed and replaced by cells coming to the surface from underneath. These cells are made up of **keratin**, a fiber protein that is also the principal component of hair and hails. The cells combine with a thin layer of oil to help make the stratum corneum a protective, waterproof layer.
- The **stratum lucidum** is the clear, transparent layer under the stratum corneum; it consists of small cells through which light can pass.
- The **stratum granulosum**, or granular layer, consists of cells that look like distinct granules. These cells are almost dead and are pushed to the surface to replace cells that are shed from the stratum corneum.
- The **stratum germinativum**, formerly known as the stratum mucosum and also referred to as the basal or Malpighian layer, is the deepest layer of the epidermis. It is composed of several layers of different-shaped cells. The deepest layer is responsible for the growth of the epidermis. It also contains a dark skin pigment, called melanin, which protects the sensitive cells below from the destructive effects of excessive ultraviolet rays of the sun or those from an ultraviolet lamp. These special cells are called melanocytes. They produce melanin, which determines skin color.

The **dermis** is the underlying or inner layer of the skin. It is also called the derma, corium, cutis or true skin. This highly sensitive layer of connective tissue is about 25 times thicker than the epidermis. Within its structure, there are numerous blood vessels, lymph vessels, nerves, sweat glands, oil glands and hair follicles, as well as arrector pili muscles (small muscles that work in connection with the hair follicles) and papillae (small cone-shaped projections of elastic tissue that point upward into the epidermis). The dermis is made up of two layers: the papillary or superficial layer, and the reticular or deeper layer.

- The **papillary layer** is the outer layer of the dermis, directly beneath the epidermis. Here you will find the dermal papillae, which are small, cone-shaped elevations at the bottom of the hair follicles. Some papillae contain looped capillaries and others contain small structures called **tactile corpuscles**, with nerve endings that are sensitive to touch and pressure. This layer also contains some melanin.
- The **reticular layer** is the deeper layer of the dermis that supplies the skin with oxygen and nutrients. It contains the following structures within its network:
  - Fat cells.
  - Blood vessels.
  - Lymph vessels.
  - Oil glands.
  - Sweat glands.
  - Hair follicles.
  - Arrector pili muscles.

Subcutaneous tissue is a fatty layer found below the dermis that some specialists regard as a continuation of the dermis. This is also called adipose or subcutis tissue and varies in thickness according to the age, sex, and general health of the individual. It gives smoothness and contour to the body, contains fats for use as energy, and also acts as a protective cushion for the outer skin.

How the skin is nourished

Blood and lymph, the clear fluids of the body that resemble blood plasma but contain only colorless corpuscles, supply nourishment to the skin. As they circulate through the skin, the blood and lymph contribute essential materials for growth, nourishment and repair of the skin, hair and nails. Networks of arteries and lymph vessels in the subcutaneous tissue send their smaller branches to hair papillae, hair follicles and skin glands.

Nerves of the skin

The skin contains the surface endings of the following nerve fibers:

- **Motor nerve fibers**, which are distributed to the arrector pili muscles attached to the hair follicles. These muscles can cause goose bumps when a person is frightened or cold.
- **Sensory nerve fibers**, which react to heat, cold, touch, pressure and pain. These sensory receptors send messages to the brain.
- **Secretory nerve fibers**, which are distributed to the sweat and oil glands of the skin. Secretory nerves, which are part of the autonomic nervous system, regulate the excretion of perspiration from the sweat glands and control the flow of sebum (a fatty or oily secretion of the sebaceous glands) to the surface of the skin. (Refer also to the Integumentary system.)

Glands of the skin

The skin contains two types of duct glands that extract materials from the blood to form new substances: the **sudoriferous glands** or **sweat glands**, and the **sebaceous glands** or **oil glands**.

- **Sudoriferous (sweat) glands:**
  The sudoriferous or sweat glands, which excrete sweat from the skin, consist of a coiled base, or **fundus**, and a tube-like duct that ends at the skin surface to form a sweat pore. Practically all parts of the body are supplied with sweat glands, which are more numerous on the palms, soles, forehead and in the armpits.
  The sweat glands regulate body temperature and help to eliminate waste products from the body. Their activity is greatly increased by heat, exercise, emotions, and certain drugs.

  The excretion of sweat is controlled by the nervous system. Normally, one to two pints of liquids containing salts are eliminated daily through sweat pores in the skin.

- **Sebaceous (oil) glands:**
  The sebaceous or oil glands of the skin are connected to the hair follicles. They consist of little sacs with ducts that open into the follicles. They secrete sebum, a fatty or oily secretion that lubricates the skin and preserves the softness of the hair. With the exception of the palms of the hands and the soles of the feet, these glands are found in all parts of the body, particularly in the face and scalp, where they are larger.

  Ordinarily, sebum flows through the oil ducts leading to the mouths of the hair follicles. However, when the sebum hardens and the duct becomes clogged, a blackhead is formed.

Functions of the skin

The principle functions of the skin are protection, sensation, heat regulation, excretion, secretion, and absorption.

- **Protection**. The skin protects the body from injury and bacterial invasion. The outermost layer of the epidermis is covered with a thin layer of sebum, which renders it waterproof. This outermost layer is resistant to wide variations in temperature, minor injuries, chemically active substances, and many forms of bacteria.
- **Sensation**. By stimulating sensory nerve endings, the skin responds to heat, cold, touch, pressure and pain. When the nerve endings are stimulated, a message is sent to the brain. You respond by saying "ouch" if you feel pain, by scratching an itch, or by pulling away when you touch something hot. Sensory nerve endings are located near the hair follicles.
- **Heat regulation**. This means that the skin protects the body from the environment. A healthy body maintains a constant internal temperature of about 98.6 degrees Fahrenheit (37 degrees Celsius). As changes occur in the outside temperature, the blood and sweat glands of the skin make necessary adjustments to allow the body to be cooled by the evaporation of sweat.
- **Excretion**. Perspiration from the sweat glands is excreted through the skin. Water lost through perspiration takes salt and other chemicals with it.
- **Secretion**. Sebum, or oil, is secreted by the sebaceous glands. This oil lubricates the skin, keeping it soft and pliable. Oil also keeps hair soft. Emotional stress can increase the flow of sebum.
- **Absorption**. Absorption is limited, but it does occur. When used as an ingredient of a face cream, female hormones can enter the body through the skin and influence it to a minor degree. Fatty materials, such as lanolin creams, are absorbed largely through hair follicles and sebaceous gland openings.

Control and care of the skin

Though the health of the skin is primarily under internal control, we do have direct access to its entire surface. This means we can do more to maintain it in good health than we can with most of our internal organs. But the skin is a very sensitive organ, and if exposed to harsh cleaners or strong chemicals, will soon show widespread damaging effects.

The sensible use of mild soap and warm water together with various cosmetics can do wonders in improving the skin. Cleansing and nourishing creams, lotions, skin conditioners and face powders have both a psychological and practical value in maintaining both its appearance and health.

The skin is normally protected by its character and natural oil (sebum). Dry skin is caused by a lack of this oil or by too little water being found in the skin. If your skin is dry, you should be careful not to use strong detergents or soaps, especially in the winter. Skin creams are helpful in correcting the low level of oils on the surface of the skin.

On the other hand, oily or greasy skin is often a problem in the teens. More frequent washing and avoiding oily lotions or cosmetics may improve the condition. Careful control of the diet, avoiding sweet and oily foods, may often help clear up or improve the condition. The scalp, too, needs frequent shampooing, as an oily skin usually means an oily scalp.

But persons with an oily skin have compensation. Their difficulties are over by the time they reach their late 20s. The activity of the sebaceous glands then returns to normal.

As a person gets older, still other complications of the skin may arise. Causes of wrinkling and aging of the skin are not yet wholly understood even by expert dermatologists. These effects are connected with hormone changes and a breakdown of fat cells and the elastic tissue of the skin. New hormone creams, constantly being introduced, may be helpful in improving a dry or wrinkling skin.

The rays of the sun also cause wrinkling of the skin. A heavy skin tan accelerates skin breakdown. Suntan lotion can screen out harmful rays and will help to prevent this damage. The skin around the eyes is the first to show wear. To avoid unnecessary squinting in strong glaring sunlight, it is wise to wear sunglasses.

To prevent stretching the skin unduly, it is better to maintain a constant average weight. Excessive gain and loss in weight may create flabby skin around the neck and face.

It is fairly safe to say that what is best for your general health, happiness and appearance is also best for your skin. Great care must be exercised to maintain the health and appearance of this very vital organ.

Bacteria

Bacteria are one-celled microorganisms with both plant and animal characteristics. Also known as germs or microbes, bacteria can exist almost anywhere: on the skin, in water, air, decayed matter, secretions of body openings, on clothing, and beneath the nails.

Bacteria can only be seen with the aid of a microscope; 1,500 rod-shaped bacteria will fit comfortably on the head of a pin.

Types of bacteria

There are hundreds of different kinds of bacteria. However, bacteria are classified into two main types, depending on whether they are beneficial or harmful.

- Most bacteria are **nonpathogenic** organisms (helpful or harmless; not disease-producing), which perform many useful functions, such as decomposing garbage and improving soil fertility. In the human body, nonpathogenic bacteria help metabolize food, protect against infectious microorganisms and stimulate immune response. Some bacteria cultures are used to produce penicillin, acidophilus yogurt, and a special type of milk used for gastrointestinal disorders. **Saprophites**, a type of nonpathogenic bacteria, lives on dead matter.
- **Pathogenic** bacteria are harmful and, although in the minority, cause disease when they invade plant or animal tissue. To this group belong the **parasites**, which require living matter for their growth.

Classifications of pathogenic bacteria

Bacteria have distinct shapes that help to identify them. Pathogenic bacteria are classified as follows.

- **Cocci** are round-shaped bacteria that appear singly (alone) or in the following groups:
  - **Staphlococci** – Pus-forming bacteria that grow in clusters like a bunch of grapes. They cause abscesses, pustules, and boils.
  - **Streptococci** – Pus-forming bacteria arranged in curved lines resembling a string of pearls. They cause infections such as strep throat and blood poisoning.
  - **Diplococci**—Spherical bacteria that grow in pairs and cause diseases such as pneumonia.
- **Bacilli** are short, rod-shaped bacteria. They are the most common bacteria, and produce diseases such as tetanus (lockjaw).
- **Spirilla** are spiral or corkscrew-shaped bacteria. They are subdivided into subgroups, such as *Treponema pallida*, which causes syphilis, a sexually transmitted disease (STD) or *Borrelia burgdorferi*, which causes Lyme disease.

Movement of bacteria

Different bacteria move in different ways. Cocci rarely show active **mobility** (self-movement). They are transmitted in the air, in dust, or within the substance in which they settle. Bacilli and spirilla are both mobile and use slender, hairlike extensions, known as **flagella** or **cilia**, for locomotion. A whiplike motion of these hairs moves the bacteria in liquid.

Bacterial growth and reproduction

Bacteria generally consist of an outer cell wall and internal protoplasm. They manufacture their own food from the surrounding environment, give off waste products, and grow and reproduce. The life cycle of bacteria is made up of two distinct phases: the active or vegetative stage, and the inactive or spore-forming stage.

- **Active or vegetative stage:**
  During the active stage, bacteria grow and reproduce. These microorganisms multiply best in warm, dark, damp, or dirty places where sufficient food is available. When conditions are favorable, bacteria grow and reproduce. When they reach their largest size, they divide into two new cells. This division is called **mitosis**. The cells that are formed are called daughter cells. When conditions are unfavorable, bacteria die or become inactive.
- **Inactive or spore-forming stage:**
  Certain bacteria, such as the anthrax and tetanus bacilli, form spherical spores with tough outer coverings during their inactive stage. The purpose is to be able to withstand periods of famine, dryness and unsuitable temperatures. In this stage, spores can be blown about and are not harmed by disinfectants, heat or cold.

  When favorable conditions are restored, the spores change into the active or vegetative form, then grow and reproduce.

Viruses

A **virus** is a submicroscopic structure capable of infesting almost all plants and animals, including bacteria. They are so small that they can even pass through the pores of a porcelain filter. They cause common colds and other respiratory and gastrointestinal infections. Other viruses that plague humans are measles, mumps, chicken pox, smallpox, rabies, yellow fever, hepatitis, polio, influenza and HIV, which causes AIDS.

One difference between viruses and bacteria is that a virus lives only by penetrating cells and becoming part of them, while bacteria are organisms that can live on their own. It is for this reason that bacterial infections can usually be treated with specific antibiotics while viruses are hard to kill without harming the body in the process. Generally, viruses are resistant to antibiotics. Vaccination prevents viruses from penetrating cells, but vaccinations are not available for all viruses.

DISORDERS OF THE SKIN

Like any other organ of the body, the skin is susceptible to a variety of diseases, disorders and ailments. In your work as a cosmetologist/barber, you will often see skin and scalp disorders, so you must be prepared to recognize certain common skin conditions and know what you can and cannot do with them. Some skin and scalp disorders can be treated in cooperation with and under the supervision of a physician. Medicinal preparations, available only by prescription, must be applied in accordance with the physician's directions. If a client has a skin condition that you do not recognize as a simple disorder, refer the client to a physician.

It is very important that a beauty/barber salon does not serve a client who is suffering from an inflamed skin disorder, infectious or not. The cosmetologist/barber should be able to recognize these conditions and sensitively suggest that proper measures be taken to prevent more serious consequences. Thus, the health of the cosmetologist/barber as well as the health of other clients is safeguarded.

Listed below are a number of important terms relating to skin, scalp, and hair disorders that you should be familiar with.

Lesions of the skin

A **lesion** is an injury or damage that changes the structure of tissues or organs. There are three types of lesions: primary, secondary and tertiary. The cosmetologist/barber is concerned with primary and secondary lesions only. If you are familiar with the principal skin lesions, you will be able to distinguish between conditions that may or may not be treated in a beauty/barber salon.

Primary lesions:

- **Bulla; plural: bullae** – A large blister containing a watery fluid; similar to a vesicle but larger.
- **Cyst** – A closed, abnormally developed sac, containing fluid, semifluid or morbid matter, above or below the skin.
- **Macule; plural: maculae** – A spot or discoloration on the skin, such as a freckle. Macules are neither raised nor sunken.
- **Papule**– A pimple; small, circumscribed elevation on the skin that contains no fluid but may develop pus.
- **Pustule**– An inflamed pimple containing pus.
- **Tubercle**– An abnormal rounded, solid lump above, within or under the skin; larger than a papule.
- **Tumor** – A swelling; an abnormal cell mass resulting from excessive multiplication of cells, varying in size, shape and color. Nodules are also referred to as tumors but are smaller.
- **Vesicle** – A small blister or sac containing clear fluid, lying within or just beneath the epidermis. Poison ivy and poison oak, for example, produce vesicles.

- **Wheal** – An itchy, swollen lesion that lasts only a few hours; caused by a blow, the bite of an insect, urticaria (skin allergy), or the sting of a nettle. Examples include hives and mosquito bites.

Secondary lesions
Secondary skin lesions are those that develop in the later stages of disease. These include:

- **Crust** – Dead cells that form over a wound or blemish while it is healing; an accumulation of sebum and pus, sometimes mixed with epidermal material. An example is the scab on a sore.
- **Excoriation** – A skin sore or abrasion produced by scratching or scraping.
- **Fissure** – A crack in the skin that penetrates the dermis. For example, chapped hands or lips.
- **Keloid** – A thick scar resulting from excessive growth of fibrous tissue.
- **Scale** – Any thin plate of epidermal flakes, dry or oily. An example is abnormal or excessive dandruff.
- **Scar or cicatrix** – Light-colored, slightly raised mark on the skin formed after an injury or lesion of the skin has healed.
- **Ulcer** – An open lesion on the skin or mucous membrane of the body, accompanied by pus and loss of skin depth.

Disorders of the sebaceous (oil) glands

There are several common disorders of the sebaceous (oil) glands that the cosmetologist/barber should be able to understand and identify.

A **comedone**, or blackhead, is a wormlike mass of hardened sebum in a hair follicle. Comedones appear most frequently on the face, especially on the forehead and nose, but can also migrate to the scalp, behind the ears and neck. When the hair follicle is filled with an excess of oil from the sebaceous gland, a blackhead forms and creates a blockage at the mouth of the follicle. Blackheads should be removed under sterile conditions using proper extraction procedures. Should the condition become severe, medical attention is necessary.

Milia, also called **whiteheads**, are small, whitish, pearlike masses of the epidermis, caused by retention of sebum. They can occur on any part of the face, neck, back, chest and shoulders. Milia are associated with fine-textured, dry types of skin.

Acne is a skin disorder characterized by chronic inflammation of the sebaceous glands from retained secretions. It occurs most frequently on the face, back and chest, but any area of skin can be affected. Bacteria enter the inflamed area and can spread to surrounding areas. Acne, or common pimples, is also known as acne simplex or acne vulgaris.

There are two basic types of acne: simple acne and the more serious acne vulgaris. Everyone has had the occasional pimple or blackhead, but when the inflamed area becomes infected, the more serious acne vulgaris is diagnosed.

- **Acne vulgaris** is polymorphic (able to take on other characteristics). Open and closed comedones, papules, pustules, and cysts are found.*
- **Acne vulgaris** is more common and more severe in males. It does not always clear spontaneously when maturity is reached. Twelve percent of women and 3 percent of men over the age of 25 have acne vulgaris. This rate does not decrease until after the age of 44. The skin lesions parallel sebaceous activity. Pathogenic events include plugging of the opening of the follicles, retention of sebum, overgrowth of acne bacillus with resultant release of and irritation by fatty acids, and foreign body reaction to extrafollicular sebum. The mechanism of antibiotics in controlling acne is not clearly understood, but they may work because of their antibacterial or anti-inflammatory properties.

There may be mild soreness, pain, or itching. The lesions occur mainly over the face, neck, upper chest, back and shoulders. Comedones are the hallmark of acne vulgaris. Closed comedones are tiny, flesh-colored, noninflammed bumps that give the skin a rough texture or appearance. Open comedones typically are a bit larger and have black material in them. Inflammatory papules, pustules, ecstatic pores, acne cysts and scarring are also seen.

Acne may have different presentations at different ages. Preteens often present with comedones as their first lesions. Inflammatory lesions in young teenagers are often found in the middle of the face, extending outward as the patient becomes older. Women in their third and fourth decades (often with no prior history of acne) commonly present with popular lesions on the chin and around the mouth.

Rosacea, formerly called acne rosacea, is a chronic congestion appearing primarily on the cheeks and nose, characterized by redness, dilation of blood vessels, and the formation of papules and pustules. The cause of rosacea is unknown, but certain factors are known to aggravate the condition in some individuals. These include spicy foods, caffeine, alcohol, exposure to extremes of heat and cold or sunlight, and stress. *

> **A hard and fast rule of care is the unbroken skin is the body's first line of defense against infection. The professional should be mindful of this rule and refer the client to a physician for diagnosis and treatment.*

Services that require work on inflamed skin can and will exacerbate a condition. Bacteria and viruses on the skin can and do migrate to other areas. It bears repeating that sanitation and sterilization practices are paramount in the service to the public. Beware if inflammation or broken skin is present.

Seborrhea is a skin condition caused by an abnormal increase of secretion from the sebaceous glands. An oily or shiny condition indicates the presence of seborrhea.

Asteatosis is a condition of dry, scaly skin due to a deficiency or absence of sebum, caused by old age and by exposure to cold.

A **steatoma** is a sebaceous cyst or fatty tumor. It is filled with sebum and ranges in size from a pea to an orange. It usually appears on the scalp, neck and back. A steatoma is sometimes called a wen.

Disorders of the sudoriferous (sweat) glands

Anhidrosis – Deficiency in perspiration, often a result of fever or certain skin diseases. It requires medical treatment.

Bromhidrosis – Foul-smelling perspiration, usually noticeable in the armpits or on the feet.

Hyperhidrosis – Excessive sweating, caused by heat or general body weakness. Medical treatment is required.

Miliaria ruvra – Prickly heat; acute inflammatory disorder of the sweat glands, characterized by the eruption of small red vesicles and accompanied by burning, itching skin. It is caused by exposure to excessive heat.

Inflammations of the skin

Dermatitis – Inflammatory condition of the skin. The lesions come in various forms, such as vesicles or papules.

Eczema – An inflammatory, painful itching disease of the skin; acute or chronic in nature, presenting many forms of dry or moist lesions. All cases of eczema should be referred to a physician for treatment. Its cause is unknown.

Herpes simplex – Fever blister or cold sore; recurring viral infection. It is characterized by the eruption of a single vesicle or group of vesicles on a red swollen base. The blisters usually appear on the lips, nostrils, or other part of the face, and rarely last more than a week. It is contagious.

Psoriasis – A skin disease characterized by red patches, covered with white-silver scales usually found on the scalp, elbows, knees, chest, and lower back. It rarely occurs on the face. If irritated, bleeding points occur. It is not contagious.

DISORDERS OF THE SCALP

Just as the skin on other parts of the body is continually being shed and replaced, the uppermost layer of the scalp is also being cast off and replaced. The skin is in a constant state of renewal. Skin cells in the outer layer of the scalp flake off and are replaced by new cells below. Ordinarily, these horny scales loosen and fall off freely. The natural shedding of the scalp's dead scales should not be mistaken for dandruff.

Seborrhea of the scalp

Sebum is the oily substance secreted by the sebaceous glands in the skin. This "skin oil" has a protective function of keeping skin from losing moisture and becoming excessively dry, and providing a layer of defense against potentially infectious microorganisms. Seborrhea is the medical term for excessive production of sebum, but the definition of "excessive" varies with the age and gender of the individual. Sebum production is influenced by age, sex, and hormonal status.

Because the largest sebaceous glands are on the face, scalp and groin, these areas are subject to become excessively oily due to seborrhea. All sebaceous glands distribute sebum through a connection to the hair follicles, making sebaceous glands and hair follicles the functional units for dispensing sebum to the surface of the skin. The anatomical proximity of sebaceous glands and hair follicles explains why oily skin and oily hair occur together in seborrhea.

Sebum production is largely under hormonal control, with the androgenic male hormones playing a central role in both males and females. As males begin to mature into adulthood at about age 13 to 16, androgen levels rise and sebum production increases. Sebum production reaches its highest level in males at about age 20, then slowly declines but remains higher than in healthy females throughout life. Sebum production declines markedly in females after menopause.

The defining symptom and major complaint associated with seborrhea of the scalp is excessive oiliness of the scalp and hair. A greasy-looking scalp is unsightly, and excessively oily hair is both unattractive and difficult to style. In males – young males especially – seborrhea often occurs in conjunction with acne of the face and scalp.

Acne of the scalp

Seborrhea can often be managed at home by keeping the scalp clean with shampooing as often as necessary. Some over-the-counter shampoos are labeled for use on oily hair. Seborrhea that is resistant to home treatment should be referred to a physician for examination. Medical treatment may include a medication that reduces sebum synthesis. Additional examination may be necessary if an underlying hormonal dysfunction is suspected.

While acne is most often an eruption on the faces of adolescents and young adults, severe forms that cause deep scarring can involve the scalp. Scalp involvement can occur at any age from adolescence to age 50 or older.

The cause of acne is not known with precision, but acne is commonly associated with seborrhea and excessively oily skin. The severe forms of acne that may affect the scalp should be treated by a dermatologist. Severe acne lesions on the scalp may destroy hair follicles and result in patchy hair loss.

Itchy scalp

Causes of itchy scalp are many and the condition is quite common. Finding the exact cause of the itchy scalp is essential in deciding how to treat the scalp itching. Itchy scalp can be caused by a number of diseases, which are diagnosed by the history and nature of scaling, duration of itching, severity of itching, extent of scales, and presence of skin rashes elsewhere on the body. Dry scalp is one of the overlooked causes of itchy scalp. This may be caused by harsh shampoos, hair lotions or tinctures with alcohol as a base, or following frequent shampooing. Itching of the scalp due to dryness is more common during cold, winter months.

The most common causes of itchy scalp are dry scalp, dandruff, seborrheic dermatitis, scalp psoriasis, contact dermatitis, head lice infestation, ringworm of the scalp, tinea amiantacea, lichen planus, hair follicle inflammation, neurogenic excoriation and pyogenic infection of the scalp. Dandruff that carries the yeast infection will also cause itchy scalp.

Needless to say, a definite diagnosis of the condition causing scalp itching is necessary to effectively get rid of the itchy scalp. Lotions that contain 0.5 percent each of camphor and menthol or pramoxine hydrochloride 1 percent, are effective antipruritic agents (with or without 0.5 percent menthol). Hydrocortisone 1 percent or 2.5 percent may be incorporated for its anti-inflammatory effect. Medications beyond these are prescribed by a physician.

Neurodermatitis

This is a condition that starts out as a localized area of itching on an area of the scalp that looks normal. Over a period of time, the itchy spot can enlarge as well as become more and more bothersome. For some peculiar reason it tends to occur primarily in the middle of the top of the scalp or along the back of the hairline. Repeated scratching and rubbing of the area lead to hair breakage and a characteristic

localized patch of shorter, broken-off hair. Neurodermatitis can be mild, causing occasional itching; moderate; or severe, with ongoing, continuous deep itching that never seems to go away.

The true cause of this scalp disorder is not known, but stressful events and situations definitely aggravate it and make it get worse. With repeated rubbing and scratching, the skin can become thickened and darkened so that another condition called **lichen simplex chronicus** is present. Once this condition becomes more severe, it can be very difficult to stop it. Medical treatment with localized cortisone injections, oral anti-itch medication and topical prescription products can give considerable relief and control the problem. Once the itching stops, then the hair can start to grow back in the affected areas. It can take 6 to 12 months for hair growth to return to normal, depending upon how quickly the hair grows on a normal basis.

Lichen planus

Lichen planus is an inflammatory disorder of the skin that can cause bald, scarring patches on the scalp. The cause of lichen planus is unknown, but drug reactions have been blamed. These include sulfonamides, tetracycline, quinidine, NSAIDs, and hydrochlorothiazide.

Hepatitis C infection is found with greater frequency in lichen planus patients than in controls. Allergy to mercury amalgams (dental fillings) can trigger oral lesions identical to lichen planus. This condition appears more often during stress, fatigue, exposure to medicines or chemicals.

On the scalp it starts of as a reddish or purplish patch or plaque, which may enlarge with the loss of hair. On resolution, the affected skin is scarred and bald. The skin lesions are often itchy, and involvement of the oral mucosa (around the mouth) and nails may be seen. Lichen planus usually burns itself out spontaneously after a few years.

Only physicians treat this disorder, but it poses no threat to public welfare.

Lichen planus of the scalp should be treated early to prevent scarring and permanent balding. The treatment of choice is topical steroids or intralesional injection of steroids on the affected skin.

Dandruff

Dandruff consists of small white scales that usually appear on the scalp and hair. Dandruff can leave white flakes on the head, neck and shoulders. The medical term for dandruff is pityriasis. If neglected, excessive dandruff can lead to hair loss. Although the nature of dandruff is not clearly understood, it is generally believed to involve an infection of the scalp. It may be a form of a skin condition called eczema, which causes increased shedding of normal scalp skin cells. It can also be caused by a fungal infection. Hormonal or seasonal changes can make dandruff worse.

Dandruff is characterized by the excessive production, shedding and accumulation of surface cells. Instead of growing to the surface to be shed, these horny scales accumulate on the scalp. A sluggish scalp caused by poor circulation, infection, injury, improper diet or poor personal hygiene contributes to dandruff, as does the use of strong shampoos combined with insufficient rinsing.

Treatments include frequent cleansing of the scalp and hair with a mild or medicated shampoo, followed by an antiseptic lotion. Moisturizing scalp treatments may also help soften and loosen the dead skin cells. Dandruff can leave white flakes on the head, neck and shoulders.

The two principal types of dandruff are pityriasis capitis simplex and pityriasis steatoides.

- **Pityriasis capitis simplex** is the technical term for scalp inflammation marked by dry dandruff, thin scales and an itchy scalp. The scales are usually attached to the scalp in masses or scattered loosely in the hair. Occasionally, the scales are so profuse that they fall to the shoulders. Dry dandruff is often the result of a sluggish scalp caused by poor circulation, lack of nerve stimulation, improper diet, emotional and glandular disturbances, and poor personal hygiene. Treatments include the use of mild or medicated shampoos, scalp treatments, regular scalp massage, daily use of antiseptic scalp lotions and medicated scalp ointments.
- **Pityriasis steatoides** is a scalp inflammation marked by fatty (greasy or waxy) types of dandruff. Greasy or waxy scalp scales mix with sebum and stick to the scalp in patches or crusts. Constant itching may cause the person to scratch the scalp. If greasy scales are torn off, bleeding or oozing of sebum may result. A client with this condition should be referred to a physician for medical treatment.

Pityriasis amiantacea (tinea amiantacea)

Pityriasis amiantacea is thought to be a hypersensitivity response to a number of scalp diseases, like scalp psoriasis, seborrheic dermatitis or lichen simplex chronicus.

Tinea amiantacea is a misnomer, because fungal infection is rarely a cause for P amiantacea. There is a thick, yellow, crusty flaking of the scalp along with matting of the hairs in the affected areas. Scaling is more prominent than itching in P. amiantacea.

Seborrheic dermatitis falls into this same category. However, in severe cases, this condition may affect the skin over the eyebrows, inner cheeks, back and the groin. The condition may or may not be itchy. It is not a fungal infection, although yeast infections have been reported to be associated with it. Patients with HIV infection may develop very severe seborrhoeic dermatitis.

Dry, itchy, flaky patches occur on the scalp, especially around the hair margins in front and on the sides and in the back. This condition does not usually cause hair loss, but with chronic rubbing and scratching, the hair can begin to thin around the edges. Up to 30 percent of the population is affected with seborrheic dermatitis, but most do not know the condition by name.

It can come and go, with flare-ups occurring during the winter months when it is cooler and drier. It can also flare up in association with stress and anxiety such as that caused by exams in school, deadlines at work, sales quotas to meet or financial difficulties.

While hard to explain, this scalp disorder can also be associated with scaling and flaking inside of or behind the ears, of the eyebrows, on the sides of the nose, in the beard and moustache areas as well as in the middle of the face to be affected together. This condition does not spread by transferring it from one part of the body to another or from person to person. It is genetic and frequently affects multiple family members in different generations. The earliest form of seborrheic dermatitis is **cradle cap**, which develops during infancy.

Shampoos that contain zinc pyrithione or selenium are used daily, if possible. These may be alternated with ketoconazole shampoo (1 percent or 2 percent) used twice weekly. A combination of shampoos is used in unmanageable cases. Tar shampoos are also effective for milder cases and for scalp psoriasis. Topical corticosteroid solutions or lotions are then added if necessary and are used twice daily. Refer client to a physician if condition is severe.

Both forms of dandruff are considered contagious and can be spread by the common use of brushes, combs and other personal articles. Practicing approved sanitation and disinfection procedures will prevent the spread of this condition.

Seborrheic keratoses (seborrheic warts, age spots)

Seborrheic keratoses are benign plaques, beige to brown or even black, 3-20 mm in diameter, with a velvety or warty surface. They appear to be stuck or pasted onto the skin. They are extremely common, especially in the elderly, and maybe mistaken for melanomas or other types of cutaneous neoplasms. Although they may be frozen with liquid nitrogen or curetted if they itch or are inflamed, no treatment is needed.

Naevus sebaceous

Naevus sebaceous are birthmarks originating from the oil glands of the skin They are present at birth, initially as a faint yellowish patch that becomes raised and rough and wartlike as the child grows older. It usually appears on the scalp, but can occur on the face and neck occasionally. The lesion is asymptomatic. It often enlarges at puberty, and there is a very small risk of cancer developing on the birthmark during adulthood. Surgical removal is the treatment of choice.

Atopic dermatitis (eczema)

Atopic dermatitis looks different at different ages and in people of different races. Diagnostic criteria for atopic dermatitis must include pruritus, typical morphology and distribution (flexural lichenification, hand eczema, nipple eczema, and eyelid eczema in adults), onset in childhood, and chronicity. Also helpful are:

- A personal or family history of atopic disease (asthma, allergic rhinitis, atopic dermatitis).
- Xerosis-ichthyosis.
- Facial pallor with infraorbital darkening.
- Elevated serum IgE (cholesterol).
- Repeated skin infections.

Itching may be severe and prolonged. Rough, red plaques, usually without the thick scale and discrete demarcation of psoriasis, affect the face, scalp, neck and upper trunk. The flexural surfaces of elbows and knees are often involved. In chronic cases, the skin is dry, leathery and lichenified. Pigmented persons may have poorly demarcated hypopigmented patches on the cheeks and extremities. In black patients with severe disease, pigmentation may be lost in the lichenified areas. During acute flares, widespread redness with weeping, either diffusely or in discrete plaques, is common.

Food allergy is an uncommon cause of flares of atopic dermatitis in adults. Tadioallergosorbent tests (RASTs) or skin tests may suggest dust mite allergy.

Atopic dermatitis must be distinguished from seborrheic dermatitis (less pruritic, frequent scalp and face involvement greasy and scaly lesions, and quick response to therapy). Secondary staphylococcal infections may exacerbate atopic dermatitis, and should be considered during hyperacute, weepy flares of atopic dermatitis. Fissuring where the earlobe connects to the neck is a cardinal sign of secondary infection. Because virtually all patients with atopic dermatitis have skin disease before age 5, a new diagnosis of atopic dermatitis in an adult over age 30 should be made cautiously and only after consultation.

Atopic patients have hyperirritable skin. Anything that dries or irritates the skin will potentially trigger dermatitis. Atopic individuals are sensitive to low humidity and often get worse in the winter. Adults with atopic disorders should not bathe more than once daily. Soap should be confined to the armpits, groin, scalp and feet. Washcloths and brushes should not be used. After rinsing, the skin should be patted dry (not rubbed) and then immediately – within three minutes – covered with a thin film of an emollient such as Eucerin, petrolatum or a corticosteroid as needed. Vanicream can be used if contact dermatitis resulting from additives in medication is suspected. Scratchy fabrics, including wools and acrylics, may irritate atopic patients. Cottons are preferable, but synthetic blends are also tolerated. Other triggers of eczema in some patients include sweating, ointments, hot baths, and animal danders. In adults, food allergy is a very uncommon cause of atopic dermatitis or its flares.

Once symptoms have improved, constant application of effective moisturizers is recommended to prevent flares. In patients with moderate disease, weekend only use of topical corticosteroids can prevent flares. Atopic dermatitis runs a chronic or intermittent course. Affected adults may have only hand dermatitis. Poor prognostic factors for persistence into adulthood in atopic dermatitis include onset early in childhood, early generalized disease, and asthma. Only 40-60 percent of these patients have lasting remission.

Contact dermatitis and skin allergies

Contact dermatitis is an inflammatory condition caused by an external agent. Irritant contact dermatitis of the scalp can occur from overuse of medicated shampoo, chemicals, e.g., bleaching lotion, perm lotion and excessive heat applied to the scalp. Many topical preparations for the hair and scalp can cause skin allergies. The most common cause of allergic contact dermatitis of the scalp is hair dye allergy. Other possible allergens are fragrance in hair lotion, chemical in perm lotion, and medicaments and preservatives in shampoos and hair/scalp lotions.

Dermatitis presents as itchy, scaly red patches on the scalp, hairline and ears. In the acute phase, vesicles and swelling may occur. Eyelid swelling may also be seen.

Contact dermatitis is an acute or chronic dermatitis that results from direct contact with chemicals or allergens. Eighty percent of cases are due to excessive exposure to or additive effects of primary or universal irritants (e.g., soaps, detergents, organic solvents) and are called irritant contact dermatitis. This appears red and scaly but not vesicular. The most common causes of allergic contact dermatitis are poison ivy and poison oak; topically applied antimicrobials (especially bacitracin and neomycin), anesthetics (benzocaine); hair-care products; preservatives; jewelry (nickel); rubber; vitamin E; essential oils, propolis (from bees); and adhesive tape. Occupational exposure is an important cause of allergic contact dermatitis. Seeping and crusting are typically due to allergic and not irritant dermatitis.

Symptoms and signs

In allergic contact dermatitis, the acute phase is characterized by tiny vesicles and weepy and crusted lesions; resolving or chronic contact dermatitis presents with scaling, erythema and possibly thickened skin. Itching, burning, and stinging may be severe.

The lesions, distributed on exposed parts or in bizarre asymmetric patterns, consist of erythematous macules, papules and vesicles. The affected area is often hot and swollen, with exudation and crusting, simulating – and sometimes complicated by – infection. The pattern of the eruption may be diagnostic (e.g., typical linear streaked vesicles on the extremities in poison oak or ivy dermatitis). The location will often suggest the cause: Scalp involvement suggests hair dyes or shampoos; face involvement suggests creams, cosmetics, soaps, and shaving materials.

Prevention: Prompt and thorough removal of the causative substance is necessary to stop the spread of the condition. In addition, a applying a neutralizing agent will greatly reduce the spread of the reaction. A skin sensitivity test (patch test) should be accomplished before any further services are performed. People should consult their doctor if they have symptoms of contact dermatitis for treatment and investigations to ascertain the cause of the dermatitis.

Psoriasis

Psoriasis is a common, benign and chronic inflammatory skin disease with a genetic basis. It is characterized by an increased rate of skin cell turnover. It presents as plaques with thick scales appearing on the skin and scalp. The skin lesions appear as discrete scaly plaques on the scalp and along the hairline and often extend to the skin of the forehead and sides of the scalp. The plaques are pink and covered by silvery scales. Psoriasis is usually non-itchy. The degree of involvement can range from a small area the size of a dime to near total involvement of the scalp surface. Despite extreme amounts of scaling and flaking, many individuals affected with psoriasis never have any itching and never have hair loss.

The psoriasis process is related to an ongoing overproduction of skin cells in the upper layer of the skin (epidermis). This process does not affect the hair follicles themselves either directly or indirectly. Injury or irritation of normal skin tends to induce lesions of psoriasis at the site (Koebner phenomenon). Psoriasis has several variants – the most common is the plaque type. Eruptive (guttate) psoriasis consisting of myriad lesions 3-10 mm in diameter occurs occasionally after streptococcal pharyngitis. Rarely, grave and occasionally life-threatening forms (generalized pustular and erythrodermic psoriasis with abrupt onset) may accompany HIV infection.

There are often no symptoms, but if itching does occur, it can be severe. Favored sites include the scalp, elbows, knees, palms and soles, and nails. The combination of red plaques with silvery scales on the elbows and knees with scaliness in the scalp or nail findings is diagnostic. Psoriasis lesions are well demarcated and affect extensor surfaces, in contrast to atopic dermatitis, with poorly demarcated plaques in flexural distribution. In body folds, scraping and culture for Candida and examination of scalp and nails will distinguish psoriasis from intertrigo and candidiasis.

There are many therapeutic options in psoriasis to be chosen according to the extent (body surface area affected) and the presence of other findings (for example, arthritis). In general, patients with moderate to severe psoriasis should be managed by or in conjunction with a dermatologist.

For the scalp, start with a tar shampoo, used daily if possible. For thick scales, use 6 percent salicylic acid gel (e.g. Keralyt), P & S solution (phenol, mineral oil, and glycerin) at night under a shower cap at night, and shampoo in the morning.

Psoriasis affecting 10-30 percent of the patient's BSA is frequently treated with UV phototherapy, either in a medical office or via a home light unit. If psoriasis involves greater than 30 percent of the body surface, it is difficult to treat with topical agents. The treatment of choice is outpatient narrowband UVB (NB-UVB) three times weekly. Clearing occurs in an average of seven weeks, but maintenance may be required.

We bring these treatment options to your attention only so that you can be an advisor to your clients. Many new therapies have been successful now that were not available in the past. Your client will be grateful for your expanded knowledge.

The course of psoriasis tends to be chronic and unpredictable, and the disease may be refractory to treatment. Patients should be monitored for metabolic syndrome, which occurs more commonly in psoriasis patients. Needless to say, complete sanitation regimen must be followed, and no harsh chemical processes (i.e., perms, bleaches and hair color) can be administered. This is a general rule whenever you approach broken skin. It is better to refuse these services than to exacerbate any of the present conditions.

Here, it is important to note that psoriasis of the scalp usually has a distinctive appearance of inflamed skin overlain with silvery scales. In severely progressive disease, the psoriatic lesions may merge into a solid mass of scales over the entire scalp, with temporary or permanent hair loss.

Psoriasis of the scalp and seborrheic dermatitis of the scalp have many features in common and may be confused unless properly diagnosed. Atopic dermatitis, an inflammatory, extremely pruritic skin disease, may also resemble psoriasis; scalp involvement in atopic dermatitis is more frequent in infants and children but does occur also in adults. Because treatment is different for each of these diseases, correct diagnosis is essential to appropriate treatment.

Discoid and subacute lupus erythematosus

The two most common forms of chronic cutaneous lupus erythematosus (CCLE) are chronic scarring (discoid) lesions (DLE) and erythematous non-scarring red plaques (subacute cutaneous LE) (SCLE). Both occur most frequently in areas exposed to solar irradiation. Permanent hair loss and loss of pigmentation are common sequelae of discord lesions.

Symptoms are usually mild. The lesions consist of dusky red, well-localized, single or multiple plaques, 5 mm in diameter, usually on the head in DLE and the trunk in SCLE. In DLE, the scalp, face and external ears may be involved. In discoid lesions, there is atrophy, depigmentation and follicular plugging. On the scalp, significant permanent hair loss may occur in lesions of DLE.

The diagnosis is based on the clinical appearance confirmed by skin biopsy in all cases. In DLE, the scales are dry and "thumbtack-like" and can thus be distinguished from those of seborrheic dermatitis and psoriasis. Older lesions that have left depigmented scarring (classically in the concha of the ear) or areas of hair loss will also differentiate lupus from these diseases.

While this is a condition of a systemic disease (lupus) and not in any way contagious or communicable, knowledge of its appearance is important to the professional.

Bacterial and viral infections of the scalp

Various types of bacteria, some that live normally and harmlessly on the skin, can become invasive and cause infection. Staphylococci ("staph") are frequent offenders; when they infect the scalp, the result is often folliculitis (inflammation of the hair follicles), with or without abscess formation. Skin is inflamed and painful around the infected follicles. Persistent folliculitis can lead to permanent hair loss. Treatment with antibiotics is usually necessary.

Bacterial infection of the hair follicles causes folliculitis, or inflammation of the hair follicles/pores. Folliculitis presents as pimple-like eruptions on the scalp. The small, discrete red lumps are painful and tender and are often scattered on different areas of the scalp. Pustules may also be seen.

Some individuals are more susceptible to such infection than others. If the infection becomes too frequent, tests should be carried out to ascertain whether there is any abnormality in the person's immune system.

Folliculitis can be effectively treated with appropriate oral antibiotics. Good hygiene, regular washing of the scalp and hair with mild antiseptic shampoo will help prevent recurrences. Occasionally, longterm oral antibiotics may be necessary to suppress infections.

Viral scalp infection may be due to herpes simplex (the "cold sore" virus), or herpes zoster (the "shingles" virus). Symptoms may include folliculitis. Herpes zoster infection produces inflamed and extremely painful lesions on the skin – a classic symptom of shingles. Anti-viral medication may be prescribed after appropriate diagnosis.

The virus also causes chickenpox. Patients with shingles always have a past chickenpox infection, and shingles represent a reactivation of the chickenpox virus. It is often seen in individuals with lower immunity, e.g., following a viral infection, cancer and so on. The skin eruptions appear in a linear pattern following the distribution of a branch of the nerve. There is often preceding pain and itch just before the appearance of skin eruptions.

It presents as a very painful blistering rash, followed over the next week by erosions and crusting over affected areas of the skin, e.g., on the forehead and anterior scalp, or the neck and back of the scalp. The condition is self-limiting and should clear after about two weeks. However, severe pain may persist for months after the skin lesions have cleared.

The elderly are at a higher risk of developing post herpetic neuralgia. Patients with shingles should see their doctor and may require investigation for any underlying cause of lowered immunity.

Shingles can be effectively treated if appropriate anti-viral drugs are taken very early (within 48 hours of appearance of symptoms). Oral anti-viral drugs can reduce the duration and severity of shingles. Consult your doctor immediately if you suspect that you have shingles. Updated treatment now includes vaccination to prevent the spread of this disease.

Acne keloidalis nuchae

This is a condition that is associated with the development most often at the back of the scalp along the hairline. The majority of individuals affected with this condition are males who get the condition because of localized trauma caused by sharp razors or clippers. However, this condition also occurs in females who have never used a razor or edged up the hair along the neckline.

Once the individual hair follicles become infected, keloid formation (heavy scarring) can occur, causing hard bumps of scar tissue. The process can remain localized or it can continue to spread and create larger growths of scar tissue and subsequent hair loss. It is important to eliminate the cause of the condition as well as treat it early to stop pain, itching, bleeding, and progressive damage to hair follicles.

Wherever this condition is present, it usually is a result of a primary assault to the skin. Infection entering broken skin, acne and contact dermatitis are just a few instances that are the precursors to this condition.

Vegetable parasitic infections (tinea)

Tinea is the medical term for ringworm. It is characterized by itching, scales, and sometimes, painful circular lesions. Several such patches may be present at one time. Ringworm is caused by vegetable parasites (fungi).

All forms of tinea are contagious and can be easily transmitted from one person to another. Infected skin scales or hairs that contain the fungi are known to spread the disease. Bathtubs, swimming pools and unsanitary personal articles are also sources of transmission. Practicing approved sanitation and disinfection procedures will help prevent the spread of this disease. A client with this condition should be referred to a physician for medical treatment. Above all, do not service this client if this is suspected.

Tinea capitis is commonly known as ringworm of the scalp. Tinea capitis is the medical term for ringworm or fungus infections of the scalp. The condition can cause only mild flaking that looks like dandruff, or patches of hair loss with itching and flaking or areas of infection with pus bumps or red swollen lumpy areas of the scalp. It is characterized by red papules, or spots, at the opening of the hair follicles. The patches spread, and the hair becomes brittle and lifeless. Hair often breaks off, leaving only a stump, or may be shed from the enlarged open follicle.

Tinea favosa, also known as tinea favus or honeycomb ringworm, is characterized by dry, sulfur-yellow, cup-like crusts on the scalp called **scutula**, which have a distinctive odor. Scars from favus are bald patches that may be pink or white and shiny.

While many topical antifungal medications are available over the counter, it is usually necessary for medication to be taken internally to clear most of these scalp infections. Early treatment can prevent the possibility of permanent hair loss when the disease process becomes more advanced.

Animal parasitic infections

Scabies "itch" is a highly contagious skin disease caused by the itch mite burrowing under the skin. Vesicles (blisters) and pustules (inflamed pimples with pus) usually form on the scalp from the irritation caused by this animal parasite. Excessive itching results in scratching the infected areas and makes the condition worse. Scabies is caused by infestation with Sarcoptes scabiei. The infestation usually spares the head and neck (though even these areas may be involved in infants, in the elderly, and in patients with AIDS).

Scabies is usually acquired by sleeping with or in the bedding of an infested individual or by other close contact. The entire household may be affected. Hospital-associated scabies is increasingly common,

primarily in long-term care facilities. Index patients are usually elderly and immunosuppressed. When these patients are hospitalized, hospital-based epidemics can occur. These epidemics are difficult to eradicate because many health care workers become infected and spread the infestation to other patients.

Itching is almost always present and can be quite severe. The lesions consist of more or less generalized excoriations with small pruritic vesicles, pustules and "burrows" in the web spaces and on the heels of palms, wrists, elbows around the axillae, and on the breasts of women. The diagnosis should be confirmed by microscopic demonstration of the organism. Patients with crusted/hyperkeratotic scabies must be evaluated for immunosuppression (especially HIV and HTLV-1 infections) if no genetic cause is determined.

Treatment is aimed at killing scabies mites and controlling the dermatitis, which can persist for months after effective eradication of the mites. Bedding and clothing should be laundered or cleaned or set aside for 14 days in plastic bags. High heat is required to kill the mites and ova. Unless treatment is aimed at all infected persons in a family or institutionalized group, reinfestations will probably occur.

Practicing approved sanitation and disinfection procedures will help prevent the spread of this disease. A client with this condition should be referred to a physician for medical treatment. If a client exposes your establishment to this disease, you must immediately close the business and eradicate the infestation from all surfaces.

Pediculosis capitis is the infestation of the hair and scalp with head lice. As these animal parasites feed on the scalp, itching occurs, and the scratching that usually results can cause an infection. Head lice are transmitted from one person to another by contact with infested hats, combs, brushes, and other personal articles. You can distinguish them from dandruff flakes by looking closely at the scalp with a magnifying glass.

Pediculosis capitis, the head louse, is one of humanity's constant – and unwelcome – companions. It has become adapted to a narrow environmental niche living as a parasite on the human scalp. Related forms of louse have adapted to living as parasites on the body (body louse) or on the pubic area (crab louse).

The bite of a louse is usually undetectable, but the site of the bite becomes inflamed and itchy. The most common first symptom of infestation with head lice is intense itching. Examination of the scalp will reveal red, swollen patches in the itchy areas. Examination of the hair typically reveals clusters of grayish-white louse eggs (nits) attached to the hair shafts. Further examination will usually find live adult lice.

Outbreaks of head louse infestation are most likely at sites such as schools, nursing homes and military barracks where people come into close contact. A head louse infestation does not necessarily indicate that the infested person is "dirty," although this is a common belief. An infestation simply indicates that a person came into a situation where transfer of lice or louse eggs could easily occur.

Once a head louse infestation has been discovered, all members of the household or community (nursing home, barracks) should be examined. Consideration may be given to treating the entire household or community with anti-louse medication. All clothing should be thoroughly washed in very hot water, or dry-cleaned. All combs and brushes should be cleaned and washed in anti-louse medication. Over-the-counter anti-louse medications are available and may be adequate to bring a single infestation under control when properly used. More potent oral and topical anti-louse medications are available only by prescription.

Practicing approved sanitization and disinfection will help prevent the spread of this disease. Several nonprescription medications are available. A client with this condition should be referred to a physician or pharmacist.

STAPHYLOCOCCI INFECTIONS

Bacterial folliculitis

This is a scalp disease associated with the overgrowth of harmful bacteria inside of the hair follicles. It is the more severe condition than described above. This shows up on the scalp as pus-containing bumps with a hair growing out of the middle of them. The degree of involvement can range from one single hair bump to diffuse involvement of the scalp with hundreds of infected hair follicles present.

Pain is one of key symptoms associated with bacterial infection of the scalp, so people who are affected might notice tenderness to the touch or sore spots when combing or brushing their hair. At times, the lesions can actually bleed or drain a liquid material.

The two most common types of staphylococci infections are furuncles and carbuncles.

- A **furuncle** or boil is an acute, localized bacterial infection of the hair follicle that produces constant pain. It is limited to a specific area and produces a pustule perforated by a hair.
- A **carbuncle** is an inflammation of the subcutaneous tissue caused by staphylococci. It is similar to a furuncle but is larger and affects more than one hair follicle.

Both the furuncle and the carbuncle have these essentials of diagnosis:

- Extremely painful inflammatory swelling based on a hair follicle that forms an abscess.
- Predisposing condition (diabetes mellitus, HIV disease, injection drug) sometimes present.
- Coagulase-positive Staphlococcus aures is the causative organism.

General considerations

A furuncle (boil) is a deep-seated infection (abscess) caused by S. aures and involving the entire hair follicle and adjacent subcutaneous tissue. The most common sites of occurrence are the hairy parts exposed to irritation and friction, pressure or moisture. Because the lesions are autoinoculable, they are often multiple.

Diabetes mellitus (especially if using insulin injections), injection drug use, allergy injections, and HIV disease all increase the risk of staphylococcal infections by increasing the rate of carriage. Certain other exposures, including hospitalizations, athletic teams, prisons, military service and homelessness, may also increase the risk of infection.

A carbuncle consists of several furuncles developing in adjoining hair follicles and coalescing to form a conglomerate, deeply situated mass with multiple drainage points.

Clinical findings

- **Symptoms and signs**
  Pain and tenderness nay be prominent. The abscess is either rounded or conical. It gradually enlarges, becomes fluctuant, and then softens and opens spontaneously after a few days to 1-2 weeks to discharge a core of necrotic tissue and pus. The inflammation occasionally subsides before necrosis occurs.
- **Laboratory findings**
  There may be slight leukocytosis, but a white blood cell count is rarely required. Pus should be cultured to rule out MRSA or other bacteria.
- **Differential diagnosis**
  The most common entity in the differential is an inflamed epidermal inclusion cyst that suddenly becomes red, tender, and expands greatly in size over one to a few days. The history of a prior cyst in the same location, the presence of a clearly visible cyst orifice, and the extrusion of malodorous cheesy rather than purulent material helps in the diagnosis.
- **Complications**
  Serious and sometimes fatal complications of Staphylococcal infection such as septicemia (blood poisoning) can occur.
- **Prevention**
  Identifying and eliminating the source of infection is critical to prevent recurrences after treatment. The source individual may have chronic dermatitis or be an asymptomatic carrier. Local measures such as meticulous hand washing; no sharing of towels and clothing; aggressive scrubbing of bathrooms and surfaces with bleach; and cleaning all surfaces with bleaching cleaners are recommended. This should be referred to a physician.

Impetigo

Impetigo is a contagious and autoinoculable infection of the skin caused by staphylococci or streptococci. The lesions consist of macules, vesicles, bullae, pustules and honey-colored, gummy crusts that when removed leave denuded red areas. The face and other exposed parts are most often involved. **Ecthyma** is a deeper form of impetigo caused by staphylococci or streptococci, with ulceration and scarring. It occurs frequently on the extremities.

While this disease should be treated only by a physician, it is relevant to advise that great care within a family and public places must be taken. Linens and clothing should be washed in hot water with detergent and bleach. The addition of bleach to the bath water (1/2 to 1 cup per 20 liters) and cleaners containing bleach on all surfaces is recommended.

Solar keratoses

Solar keratoses are pre-cancerous skin lesions on sun-exposed skin of the face and scalp. On the scalp, they occur on balding individuals where chronic sun exposure occurs. They are often seen in fair-skinned individuals who have had exposure to sunlight for many years. They often occur in middle-aged and older individuals.

Solar keratoses present as ill-defined red scaly patches on the skin. The surface of the lesion looks and feels rough (akin to sandpaper). The lesion is painless and not itchy. If left untreated, solar keratosis may develop into skin cancer.

Solar keratoses must be destroyed to stop cancerous transformation. It is usually destroyed with liquid nitrogen applications or topical anti-cancer cream, e.g., 5-fluorouracil. Patients with solar keratoses must avoid further sun exposure. Patients should avoid midday sun exposure and use sunscreen daily. They should consult their doctor regularly to get treatment whenever new lesions occur. A skin biopsy may be necessary to ascertain whether a cancer has developed.

Angiosarcoma

This is a rare blood vessel cancer of the skin. It tends to appear on the scalp, face and ears. It usually occurs in elderly patients, and it commonly presents as single or grouped bluish-red nodules or plaques on the scalp, face or ears. The lesions may occasionally be mildly tender but are often painless. Early diagnosis is essential to improve the prognosis of such patients. A skin biopsy is essential to confirm the diagnosis.

Patients with angiosarcoma are referred to the oncologist for treatment. Localized lesions can be removed by surgery, but large lesions need radiotherapy. The prognosis of angiosarcoma is poor generally.

PRINCIPLES OF PREVENTION

There is no better way for a salon to make a good first impression than to maintain the highest level of cleanliness. This makes a positive statement that fills clients with confidence.

There is more to a clean salon, however, than a well-swept floor or vacuumed rugs. Proper care must be taken to meet rigorous health standards. Otherwise, the salon could be contributing to the spread of disease.

Controlling infection and disease is a vitally important aspect of the salon industry. Clients depend on us to ensure their safety. One careless action could cause injury or serious illness. Being a salon professional can be fun and rewarding, but it is also a great responsibility. Fortunately, preventing the spread of dangerous diseases is not hard to do if you know how to do it and, more important yet, if you practice what you know.

Decontamination

Almost everything in the salon presents a surface of some kind. These surfaces may seem clean; but no matter how clean they appear to the naked eye, chances are they are contaminated.

Surfaces of tools or other objects that are not free from dirt, oils and microbes are covered with **contaminants**, which are any substances that can cause contamination. Many things can be contaminants, such as hair left in a comb, make-up on a towel or brush, or nail dust on the floor.

Tools and other surfaces in the salon can also be contaminated with bacteria, viruses, and fungi. Even tools that appear to be clean are usually covered with these microorganisms.

Of course, a salon can never be completely free from all contamination, and it would not make sense to attempt such a goal. However, it is your responsibility as a salon professional to be on constant alert for disease-causing contaminants.

The removal of pathogens and other substances from tools and surfaces is called **decontamination**. Decontamination involves the use of physical or chemical means to remove, inactivate or destroy pathogens so that the object is rendered safe for handling, use or disposal. There are three main levels of decontamination: sterilization, disinfection and sanitation. Only disinfection and sanitation are required in the salon.

Disinfection

Disinfection is a higher level of decontamination than sanitation. It is second only to sterilization. Disinfection controls microorganisms on hard, nonporous surfaces such as cuticle nippers and other salon implements.

Disinfection provides the level of protection required by the salon to kill most organisms, with one exception. Disinfection does not kill bacterial spores, but this is not necessary in the salon environment. It is important only in hospitals and other health-care facilities where instruments are used to penetrate or cut the skin.

Disinfectants are chemical agents used to destroy most bacteria and some viruses and to disinfect implements and surfaces. **Disinfectants are not for use on human skin, hair or nails**. Never use disinfectants as hand cleaners. Any substance powerful enough to quickly and efficiently destroy pathogens can also damage skin.

There are a variety of disinfectants that the salon can choose to use:

- Quaternary ammonium compounds.
- Phenols.
- 70 percent alcohol.
- Bleach.
- Approved ultraviolet light appliance.

No matter what the choice or application, follow the manufacturer's directions for dilution and use.

Sanitation

The third, or lowest, level of decontamination is called **sanitation** or **sanitizing**. These words are often frequently misused and misunderstood. To sanitize means "to significantly reduce the number of pathogens or disease-producing organisms found on a surface." Cleaning with soaps and detergents will sanitize salon tools, capes, towels and other surfaces.

Sanitized surfaces may still harbor pathogens or other organisms. Removing hair from a brush and washing the brush with detergent is considered sanitation. Placing the brush in Barbicide solution for the required time is considered disinfection.

Putting antiseptics designed for hands or feet on your skin or washing your hands is another example of sanitation. Your hands may appear very clean when you are finished, but will still harbor pathogens found in tap water and on the towel.

Universal precautions

Many infectious diseases do not present visible symptoms on the infected person. Because you will not necessarily be able to identify clients with infectious diseases, the same infection control practices should be used with all clients.

OSHA sets the standard that must be used in the industry for dealing with blood-borne pathogens. The standard prescribes the use of universal precautions as the approach to infection control. **Universal precautions** are a set of guidelines and controls, published by the Centers for Disease Control and Prevention (CDC), that require the employer and the employee to assume that all human blood and specified human body fluids are infectious for HIV, HBV and other blood-borne pathogens. Precautions include hand washing; gloving; use of personal protective equipment such as goggles; injury prevention; and proper handling and disposal of needles. Other sharp instruments and products that have been contaminated by blood or other body fluids must be disposed of correctly.

You have many responsibilities as a salon professional. None is more important than your responsibility to protect your clients' health and safety as well as your own. Never take shortcuts when it comes to sanitation and disinfection. Remember, this is a hands-on profession. The beauty of it is that you come into close contact with all sorts of people. This is why a "people" person like you has chosen this field.

But you must be wise and careful about this contact. If you are to be an effective practitioner, you must learn the rules – every one of them – and you must always follow them to the letter of the law. This is how you, your colleagues and your clients can maintain a sense of trust and respect for each other.

STRUCTURE OF THE HAIR

The integument is the outer covering that encloses the entire body. It includes the hair, skin and nails and is the largest and fastest-growing organ of the human body. Full-grown human hair is divided into two parts: The hair root and the hair shaft. The hair root is the part of the hair located below the surface of the scalp. The hair shaft is the portion of the hair that projects above the skin.

Structures of the hair root

The main structures of the hair root are the follicle, bulb, papilla, arrector pili muscle, and sebaceous glands.

The **follicle** is the tube-like depression or pocket in the skin or scalp that contains the hair root. Hair follicles are distributed all over the body, with the exception of the palms of the hands and the soles of the feet. The follicle extends downward from the epidermis (the outer layer of the skin) into the dermis (the inner layer of the skin), where it surrounds the dermal papilla. It is not uncommon for more than one hair to grow from a single follicle.

The **hair bulb** is the lowest area or part of a hair strand. It is the thickened, club-shaped structure that forms the lower part of the hair root. The lower part of the hair bulb fits over and covers the dermal papilla.

The **dermal papilla** (plural: papillae) is a small, cone-shaped elevation located at the base of the hair follicle that fits into the hair bulb. The dermal papilla contains the blood and nerve supply that provides the nutrients needed for hair growth.

The **arrector pili** is a minute, involuntary muscle fiber in the skin inserted in the base of the hair follicle. Fear or cold causes it to contract, which makes the hair stand up straight, resulting in "goose bumps."

Sebaceous glands are the oil glands of the skin, connected to the hair follicles. The sebaceous glands secrete an oily substance called **sebum**, which lubricates the hair and skin.

Structures of the hair shaft

As a reminder, let's review the structures of the hair shaft. The three main layers of the hair shaft are the cuticle, cortex, and the medulla (if present).

The **cuticle** is the outermost layer of the hair. It consists of a single, overlapping layer of transparent, scale-like cells that overlap like shingles on a roof. A healthy, compact cuticle layer is the hair's primary defense against damage. Swelling the hair raises the cuticle layer and opens the space between the scales, which allows liquid to penetrate. Many times the cuticle layer will contain an abundance of cells. This is seen in white hair and very coarse hair and makes the hair difficult to approach with chemicals.

A healthy cuticle layer protects the hair from penetration and prevents damage to hair fibers. Oxidation hair colors, bleaches, permanent waving solutions, and chemical hair relaxers must have an alkaline pH in order to penetrate the cuticle layer and reach their target within the cortex.

The **cortex** is the middle layer of the hair. It is a fibrous protein core formed by elongated cells containing melanin pigment. About 90 percent of the total weight of hair comes from the cortex. The elasticity of the hair and its natural color are the result of the unique protein structures located within the cortex. The changes involved in oxidation hair coloring, wet setting, thermal styling, permanent waving, and chemical hair relaxing all take place within the cortex.

The **medulla** is the innermost layer, sometimes referred to as the pith of the hair. It is composed of round cells. It is quite common for very fine and naturally blonde hair to entirely lack a medulla. The same is true of children's hair, before puberty. Generally, only thick, coarse hair contains a medulla. All male beard hair contains a medulla. Beard hair is generally much coarser than and not as uniform as hair from the head of the same individual.

The chemical composition of hair

Hair is composed of protein that grows from cells originating within the hair follicle. This is where the hair shaft begins. As soon as these living cells form, they begin their journey upward through the hair follicle. They mature in a process called keratinization. As these newly formed cells mature, they fill up with a fibrous protein called keratin, then move upward, lose their nucleus, and die. By the time the hair shaft emerges from the scalp, the cells of the hair are completely keratinized and no longer living. The hair shaft that emerges from the scalp is a nonliving fiber composed of keratinized protein.

Hair is approximately 91 percent protein. The protein is made up of long chains of amino acids, which, in turn, are made up of elements.

The elements that make up human hair are carbon (51 percent), oxygen (21 percent), hydrogen (6 percent), nitrogen (17 percent), and sulphur (5 percent). These five elements are also the major elements found in skin and nails and are often referred to as the **COHNS elements**.

The **amino acids**, the units of structure in protein, are linked together end to end like pop beads. The chemical bond that joins amino acids to each other is called a **peptide bond** or end bond. A long chain of amino acids linked by peptide bonds is called a **polypeptide chain**. Polypeptide chains intertwine around each other in a spiral shape called a helix.

The side bonds of the cortex

The cortex, middle layer of the hair, is made up of millions of polypeptide chains. These polypeptide chains are cross-linked together, like a ladder, by three different types of side bonds: hydrogen bonds, salt bonds and disulphide bonds. These side bonds hold the hair fibers in place and account for the incredible strength and elasticity of human hair. These side bonds are essential to wet sets, thermal styling, permanent waving and chemical hair relaxing.

- A **hydrogen bond** is a physical side bond that is easily broken by water or heat. Although individual hydrogen bonds are very weak, there are so many of them that they account for about one-third of the hair's overall strength.
- A **salt bond** is also a physical bond, but it is broken by changes in pH. Salt bonds are easily broken by strong alkaline or acidic solutions and account for about one-third of the hair's overall strength.
- A **disulfide bond** is a chemical side bond that differs greatly from the kind of physical bonding seen in a hydrogen or salt bond. A disulfide bond joins the sulfur atoms of two neighboring cysteine amino acids to create cysteine. Although there are far fewer disulfide bonds than hydrogen or salt bonds, disulfide bonds are much stronger and account for about one-third of the hair's overall strength. Disulfide bonds are not broken by heat or water. Permanent waves and chemical hair relaxers change the shape of hair by chemically changing the hair's disulfidd bonds.

Thio permanent waves break disulfide bonds, which are re-formed by thio neutralizers. Hydroxide chemical hair relaxers break disulfide bonds, which are converted to lanthionine bonds when the relaxer is rinsed from the hair. The disulfide bonds that are broken by hydroxide relaxers are broken permanently and can never be re-formed.

Hair growth

The two main types of hair found on the body are vellus (lanugo) and terminal hair.

- **Vellus** or **lanugo** hair is short, fine and downy. Vellus hair is not pigmented and almost never has a medulla. It is commonly found on infants and can be present on children until puberty. On adults, vellus hair is usually found in places that are normally considered hairless (forehead, eyelids and bald scalp), as well as nearly all other areas of the body except the palms of the hands and the soles of the feet. Women retain 55 percent more vellus hair than men.
- **Terminal hair** is the long, soft hair found on the scalp, legs, arms and bodies of males and females. Terminal hair is coarser than vellus hair, and with the exception of gray hair, it is pigmented. It usually has a medulla and is easily distinguished from vellus by its dark color and coarse texture. Hormonal changes during puberty cause some areas of fine vellus hair to be replaced with thicker terminal hair, depending on genetics, age and hormonal changes.

THE GROWTH CYCLES OF HAIR

Hair growth occurs in cycles. Each complete cycle has three phases that are repeated over and over again throughout life. The hair of the scalp is programmed to produce approximately 25 cycles, each lasting about four years. The three phases of a cycle are anagen, catagen and telogen.

Anagen: The growth phase

During the **anagen**, or growth, phase, new hair is produced. The hair actively manufacturers new keratinized cells in the hair follicle. During this phase, hair cells are produced faster than any other normal cell in the human body.

The average growth of healthy scalp hair is about one-half inch per month. The rate of growth varies on different parts of the body, between sexes and with age. Scalp hair grows faster on women than on men. Scalp hair grows rapidly between the ages of 15 and 30, but slows down sharply after the age of 50.

About 90 percent of scalp hair is growing in the anagen phase at any one time. For each specific hair, the anagen phase generally lasts from three to five years, but in some cases, it can last as long as 10 years.

Catagen: The transition phase

The **catagen** phase is the brief transition period between the growth and resting phase of a hair follicle. It signals the end of the growth phase. During the catagen phase, the follicle canal shrinks and detaches from the dermal papilla. The hair bulb disappears and the shrunken root end forms a rounded club.

Less than 1 percent of scalp hair is in the catagen phase at any one time. The catagen phase is very short and lasts from one to two weeks.

Telogen: The resting phase

The **telogen**, or resting, phase is the final phase in the hair cycle and lasts until the fully grown hair is shed. The hair is either shed during the telogen phase or remains in place until the next anagen phase, when the new hair growing in pushes it out.

About 10 percent of scalp hair is in the telogen phase at any one time. The telogen phase lasts for approximately three to six months. As soon as the telogen phase ends, the hair returns to the anagen phase and begins the entire cycle again. On average, the entire growth cycle repeats itself once every four or five years.

HAIR AND SCALP ANALYSIS

All successful salon services must begin with a thorough analysis of the client's hair type and the present condition of the hair and scalp in order to determine beforehand the results that can be expected from the service. Because different types of hair react differently to the same service, it is essential that a thorough analysis be performed prior to all salon services. Hair and scalp analysis is performed by observation, using the senses of sight, touch, hearing and smell. The four most important factors to consider in hair analysis are texture, porosity, elasticity and density. The factors for scalp analysis should include dryness, oiliness, flaking, tightness, sights of broken skin and hair, lack of hair, and presence of disorders and diseases.

Hair texture

Hair texture is the thickness or diameter of the individual hair strands. Hair texture can be classified as coarse, medium or fine and differs from individual to individual. Hair texture can also vary from strand to strand on the same person's head. It is not uncommon for hair from different areas of the head to have different textures. Hair from the nape (back of the neck), crown, temples and front hairline of the same person may all have different textures.

Coarse hair texture has the largest diameter. It is stronger than fine hair, for the same reason that thick rope is stronger than thin rope. Coarse hair also has a stronger structure. It usually requires more processing than medium or fine hair and may also be more resistant to that processing. It is usually more difficult for hair lighteners, hair colors, permanent waving solutions, and chemical hair relaxers to penetrate coarse hair.

Medium hair texture is the most common and is the standard to which other hair is compared. Medium hair is considered normal and does not pose any special problems or concerns.

Fine hair has the smallest diameter and is more fragile, easier to process, and more susceptible to damage from chemical services than coarse or medium hair.

Hair texture can be determined by feeling a single dry strand between the fingers. Take an individual strand from four different areas of the head – the front hairline, the temple, the crown, and the nape – and hold the strand securely with one hand while feeling it with the thumb and forefinger of the other hand. With a little practice, you will be able to feel the difference between coarse, medium, and fine hair diameters.

Hair density

Hair density measures the number of individual hair strands on one square inch of scalp. It indicates how many hairs there are on a person's head. Hair density can be classified as low, medium or high (or thin, medium or thick-dense). Hair density is different from hair texture in that different individuals with the same hair texture can have different densities. Some individuals may have coarse hair texture (each hair has a large diameter), but low hair density (a low number of hairs on the head). Others may have fine hair texture (each hair has a small diameter), but high hair density (a number of hairs on the head).

The average hair density is about 2,200 hairs per square inch. Hair with high density (thick or dense hair) has more hairs per square inch. Hair with low density (thin hair) has fewer hairs per square inch. The average head of hair contains about 100,000 individual hair strands. The number of hairs on the head generally varies with the color of the hair. Blondes usually have the highest density, and redheads tend to have the lowest.

Hair porosity

Hair porosity is the ability of the hair to absorb moisture. The degree of porosity is directly related to the condition of the cuticle layer. Healthy hair with a compact cuticle layer is naturally resistant to penetration. Porous hair has a raised cuticle layer that easily absorbs water.

Hair with **low porosity** is considered normal. Chemical services performed on this type of hair will usually process as expected, according to the texture.

Hair with **high porosity** is considered overly porous and is the result of previous overprocessing. Overly porous hair is damaged, dry, fragile and brittle. Chemical services performed on overly porous hair require less alkaline solutions with a lower Ph. This will help prevent additional overprocessing.

The texture of the hair is not an indication of its porosity. Different degrees of porosity can be found in all hair textures. Although course hair normally has a low porosity and is resistant to chemical services, coarse hair can also have high porosity as the result of previous chemical services.

You can check porosity on dry hair by taking a strand of several hairs from four different areas of the head (the front hairline, the temple, the crown and the nape). Hold the strand securely with one hand from the end to the scalp. If the hair feels smooth and the cuticle is compact, dense and hard, it is considered resistant. If you feel a slight roughness, it is considered overly porous.

Hair elasticity

Hair elasticity is the ability of the hair to stretch and return to its original length without breaking. Hair elasticity is an indication of the strength of the side bonds that hold the hair's individual fibers in place. Wet hair with normal elasticity will stretch up to 50 percent of its original length and return to that same length without breaking. Hair with normal elasticity holds the curl from wet sets and permanent waves without excessive relaxing.

Hair with low elasticity is brittle and breaks easily. Hair with low elasticity may not be able to hold curl from wet setting, thermal styling or permanent waving. Hair with low elasticity is the result of weak side bonds that usually result from previous overprocessing. Chemical services performed on hair with low elasticity require a milder solution with a lower pH. Such a solution minimizes damage and helps prevent additional overprocessing.

Check elasticity on wet hair by taking an individual strand from four different areas of the head (the front hairline, the temple, the crown and the nape). Hold a single strand of wet hair securely and try to pull it apart. If the hair stretches and returns to its original length without breaking, it has normal elasticity. If the hair breaks easily or fails to return to its original length, it has low elasticity.

HAIR LOSS

Under normal circumstances, we all lose some hair every day. Normal daily hair loss is the natural result of the three phases of the hair's growth cycle. The growth cycle provides for the continuous growth, fall, and replacement of individual hair strands. Hair that is shed in the telogen phase is replaced by a new hair in the same follicle in the next anagen phase. This natural shedding of hair accounts for normal daily hair loss. Although estimates of the rate of hair loss have long been quoted at 100 to 150 hairs per day, recent measurements indicate that the average rate of hair loss is closer to 35 to 40 hairs per day.

More than 63 million people in the United States suffer from abnormal hair loss (alopecia). As a professional, it is likely that you will be the first person that many of these people come to with questions about their hair loss. It is important that you have a basic understanding of the different types of hair loss and the products and services that are available.

The emotional impact of hair loss

Although the medical community does not recognize hair loss as a medical condition, the anguish felt by many of those who suffer from abnormal hair loss is very real, and all too often overlooked. Results from a study that investigated perceptions of bald and balding men showed that compared to men who had hair, bald men were perceived as:

- Less physically attractive (by both sexes).
- Less assertive.
- Less successful.
- Less personally likable.
- Appearing older (by five years).

Results of a study investigating how bald men perceive themselves showed that greater hair loss had a more significant impact than moderate hair loss. Men with more severe hair loss:

- Experience significantly more negative social and emotional effects.
- Are more preoccupied with their baldness.
- Make some effort to conceal or compensate for their hair loss.

For women, abnormal hair loss is particularly devastating. Women who experience hair loss try to disguise it from everyone, even their doctor. Women also tend to worry that their hair loss is a symptom of a serious illness. Studies indicate that women have a greater emotional investment in their appearance, and although abnormal hair loss is not as common in women as it is in men, it can be very traumatic. The vast majority of women with abnormal hair loss feel anxious, helpless and less attractive. Many think they are the only ones who have the problem.

Types of abnormal hair loss

Abnormal hair loss is called **alopecia**. The most common types of abnormal hair loss are:

- Cicatricial alopecia.
- Androgenitic baldness.
- Telogen effluvium.
- Alopecia areata.
- Trichotillomania.

Cicatricial alopecia (baldness due to scarring)

Cicatricial baldness may occur following chemical or physical trauma, lichen, planopilaris, bacterial or fungal infections, severe herpes zoster, chronic DLE, scleroderma, and excessive ionizing radiation. The specific cause is often suggested by the history, the distribution of hair loss, and the appearance of the skin, as in lupus erythematosus. Biopsy

is useful in the diagnosis of scarring alopecia, but specimens must be taken from the active border and not from the central zone.

Scarring alopecias are irreversible and permanent. It is important to diagnose and treat the scarring process as early in its course as possible.

Dissecting cellulitis

This is a rare scalp condition that is associated with the development of large areas of thickening of the scalp in association with pockets of pus trapped under the skin. While pus is usually associated with the presence of bacteria and infection, in dissecting cellulitis, some of these areas are bacteria-free.

This condition can be very aggressive, leading to large areas of hair loss and a high possibility of causing scarring and permanent baldness because this condition affects the deeper portions of the scalp.

Baldness not associated with scarring

Nonscarring alopecia may occur in association with various systemic diseases, such as SLE, secondary syphilis, hyperthyroidism or hypothyroidism, iron deficiency anemia, and pituitary insufficiency. The only treatment necessary is prompt and adequate control of the underlying disorder, which usually leads to regrowth of the hair.

Androgenetic (pattern) baldness, the most common form of alopecia is of genetic predetermination. The earliest changes occur at the anterior portions of the calvarium on either side of the "widow's peak" and on the crown (vertex). The extent of hair loss is variable and unpredictable. Minoxidil 5 percent solution is available over-the-counter and can be specifically recommended for persons with recent onset (less than five years) and smaller areas of alopecia. Approximately 40 percent of patients treated twice daily for a year will have moderate to dense growth. Finasteride (Propecia), 1mg orally daily, has similar efficacy and may be additive to minoxidil. As opposed to minoxidil, finasteride is used only in males.

Hair loss or thinning of the hair in women results from the same cause as common baldness in men (androgenetic alopecia) and may be treated with topical minoxidil. A workup consisting of determination of serum testosterone, DHEAS, iron, total iron binding capacity, thyroid function tests, and a complete blood count will identify most other causes of hair thinning in premenopausal women. Women who complain of thin hair but show little evidence of alopecia need follow-up, because more than 50 percent of the scalp hair can be lost before the clinician can perceive it.

Telogen effluvium is transitory increase in the number of hairs in the telogen (resting) phase of the hair growth cycle. This may occur spontaneously, may appear at the termination of pregnancy, may be precipitated by "crash dieting," high fever, stress from surgery or shock, malnutrition, or may be provoked by hormonal contraceptives. Whatever the cause, telogen effluvium usually has a latent period of 2-4 months. The prognosis is generally good.

The condition is diagnosed by the presence of large numbers of hairs with white bulbs coming out upon gentle tugging of the hair. The scalp looks perfectly normal with this condition, and there are no symptoms except the hair shedding. Hair may be noticed on the pillowcase upon awakening, on the floor, or easily come out while shampooing. Counts of hairs lost by the patient on combing or shampooing often exceed 150 hairs per day, compared to an average of 70-100. In one study, a major cause of telogen effluvium was found to be iron deficiency, and the hair counts bore a clear relationship to serum iron levels.

Alopecia areata is of unknown cause but is believed to be an immunologic process. Typically, there are patches that are perfectly smooth and without scarring. Tiny hairs 2-3mm in length, called "exclamation hairs," may be seen. Telogen hairs are easily dislodged from the periphery of active lesions. The beard, brows, and lashes may be involved. Involvement may extend to all of the scalp hair (alopecia totalis) or to all scalp and body hair (alopecia universalis).

Severe forms may be treated by systemic corticosteroid therapy, although recurrences follow discontinuation of therapy. Alopecia areata is occasionally associated with Hashimoto thyroiditis, pernicious anemia, Addison disease, and vitiligo (lack of pigmentation).

Intralesional corticosteroids are frequently effective for alopecia areata. Trimicinolone in a concentration of 2.5-10mg/mL is injected in aliquots of 0.1 mL, at approximately 1-2cm intervals, not exceeding a total dose of 30 mg per month for adults. Alternatively, anthralin 0.5 percent ointment, used daily, may help some patients.

Alopecia areata is usually self-limiting, with complete regrowth of hair in 80 percent of patients with focal disease. But some mild cases are resistant to treatment, as are the extensive totalis and universalis types. Both topical diphency-prone and squaric acid dibutylester have been used to treat persistent alopecia areata. The principle is to sensitize the skin, then intermittently apply weaker concentrations to produce and maintain a slight dermatitis. Hair regrowth in 3-6 months in some patients has been reported to be remarkable. Long-term safety and efficacy have not been established. Support groups for patients with extensive alopecia areata are very beneficial.

In **trichotillomania** (the pulling out of one's own hair), the patches of hair loss are irregular, and short growing hairs are always present, since they cannot be pulled out until they are long enough. The patches are often unilateral, occurring on the same side as the patient's dominant hand. Sometimes this extends to the eyebrows and eyelashes. The patient may be unaware of the habit and is considered to have a mental problem.

Traction folliculitis: Prolonged tension and violent pulling of the hair can lead to injury in susceptible individuals.

The earliest sign of injury is localized scaling, flaking, and pus bumps that develop around the base of the hairs that are affected. Amazingly, these areas don't usually itch or hurt despite significant inflammation being present.

If the source of the tension is not eliminated and the condition continues on a chronic basis, then scarring can occur, which is called **traction alopecia**. An example of **acute traction alopecia** comes as a result of a street fight where the hair is yanked out. Sadly, many times the hair follicle is so traumatized that the hair does not grow back.

Other possible causes for excessive hair loss, thinning or breakage include:

- Damage to the hair from hair care products, such as dyes and permanents, and from hot rollers, curling irons and hair dryers.
- Side effects of medicines or medical treatments, such as chemotherapy or radiation therapy.
- Recent surgery, high fever, or emotional stress. You may have a lot of hair loss four weeks to three months after severe physical or emotional stress. This type of hair loss usually stops within a few months.
- Diseases, such as lupus and hyperthyroidism (overactive thyroid).
- Heavy metal poisoning, such as thallium or arsenic poisoning.
- Poor nutrition, especially lack of protein or iron in the diet. (Remember that the hair and the nails are the last to receive the body's nutrition, so these are the first to suffer when the body is not being cared for correctly.)
- Damage to the hair and scalp from burns or other injuries.

Hair loss treatments

Of all the treatments that are said to counter hair loss, there are only two products – minoxidil and finasteride – that have been proven to stimulate hair growth and are approved by the FDA for that purpose.

Minoxidil is a topical (applied to the surface of the skin) medication that is applied to the scalp twice a day, and has been proven to stimulate hair growth. It is sold over-the-counter as a non-prescription drug. Minoxidil is available for both men and women and comes in two strengths: 2 percent regular and 5 percent extra strength. It is not known to have any negative side effects.

Finasteride is an oral prescription medication for men only. Although finasteride is more effective and convenient than minoxidil, possible side effects include weight gain and loss of sexual function. Women may not use this treatment, and pregnant women or those who might become pregnant are cautioned not to even touch the drug because of the strong potential for birth defects.

In addition to the treatments described above, there are also several surgical options available. Transplants, or hair plugs, are probably the most common permanent hair replacement technique. The process consists of removing small sections of hair, including the follicle, papilla and bulb, transplanting them into the bald areas. These sections, or bulbs, grow normally in the new location. Only licensed surgeons may perform this procedure, and several surgeries are usually necessary to achieve the desired results. The cost of each surgery ranges from $8,000 to more than $20,000.

Hairstylists can offer a number of nonmedical options to counter hair loss. Some salons specialize in nonsurgical hair replacement systems, such as wigs, toupees, hair weaving and hair extensions. With proper training, you can learn to fit, color, cut, and style wigs and toupees. Hair weaving and hair extensions allow you to enhance the client's natural hair and create a look that boosts self-esteem.

Chapter 4: OSHA: Education and Salon Safety

2 CE Hours

By: Staff Writer

Learning objectives

- Understand OSHA's Blood-borne Pathogen Standard.
- Describe a material safety data sheet (MSDS).
- Know the purpose of an MSDS.
- Know how to safely work with chemicals.
- Be aware of how workplace injuries can occur.
- Be aware of the protective measures you can take to minimize chemical exposure.
- Identify the potential risks associated with the use of ultraviolet (UV) nail lights.

Summary of OSHA's blood-borne pathogen standard

In March 1992, OSHA's Blood-borne Pathogen Standard, 29 CFR 1910.1030, took effect. This standard was designed to prevent more than 200 deaths and 9,000 blood-borne infections every year. While the standard was primarily aimed at hospitals, funeral homes, nursing homes, clinics, law enforcement agencies, emergency responders, and HIV/HBV research laboratories, anyone who can "reasonably expect to come in contact with blood or potentially infectious materials" as part of his or her job is covered by the standard. OSHA's summary of the standard is below.

PURPOSE: Limits occupational exposure to blood and other potentially infectious materials because any exposure could result in transmission of blood-borne pathogens which could lead to disease or death.

SCOPE: Covers all employees who could be "reasonably anticipated" as the result of performing their job duties to face contact with blood and other potentially infectious materials. OSHA has not attempted to list all occupations where exposures could occur. "Good Samaritan" acts, such as assisting a co-worker with a nosebleed, would not be considered occupational exposure.

Infectious materials include semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids. They also include any unfixed tissue or organ other than intact skin from a human (living or dead), human immunodeficiency virus (HIV)-containing cell or tissue cultures, organ cultures and HIV or hepatitis B (HBV)-containing culture medium or other solutions as well as blood, organs or other tissues from experimental animals infected with HIV or HBV.

EXPOSURE CONTROL PLAN: Requires employers to identify, in writing, tasks and procedures as well as job classifications where occupational exposure to blood occurs – without regard to personal protective clothing and equipment. It must also set forth the schedule for implementing other provisions of the standard and specify the procedure for evaluating circumstances surrounding exposure incidents. The plan must be accessible to employees and available to OSHA. Employers must review and update it at least annually – more often if necessary to accommodate workplace changes.

METHODS OF COMPLIANCE: Mandates universal precautions, (treating body fluids/materials as if infectious) emphasizing engineering and work practice controls. The standard stresses hand washing and requires employers to provide facilities and ensure that employees use them following exposure to blood. It sets forth procedures to minimize needlesticks, minimize splashing and spraying of blood, ensure appropriate packaging of specimens and regulated wastes, and decontaminate equipment or label it as contaminated before shipping to servicing facilities.

Employers must provide, at no cost, and require employees to use appropriate personal protective equipment such as gloves, gowns, masks, mouthpieces and resuscitation bags and must clean, repair and replace these when necessary. Gloves are not necessarily required for routine phlebotomies in volunteer blood donation centers but must be made available to employees who want them.

The standard requires a written schedule for cleaning, identifying the method of decontamination to be used, in addition to cleaning following contact with blood or other potentially infectious materials. It specifies methods for disposing of contaminated sharps and sets forth standards for containers for these items and other regulated waste. Further, the standard includes provisions for handling contaminated laundry to minimize exposures.

HIV AND HBV RESEARCH LABORATORIES AND PRODUCTION FACILITIES: Calls for these facilities to follow standard microbiological practices and specifies additional practices intended to minimize exposures of employees working with concentrated viruses and reduce the risk of accidental exposure for other employees at the facility. These facilities must include required containment equipment and an autoclave for decontamination of regulated waste and must be constructed to limit risks and enable easy cleanup. Additional training and experience requirements apply to workers in these facilities.

HEPATITIS B VACCINATION: Requires vaccinations to be made available to all employees who have occupational exposure to blood within 10 working days of assignment, at no cost, at a reasonable time and place, under the supervision of licensed physician/licensed health care professional and according to the latest recommendations of the U.S. Public Health Service (USPHS). Prescreening may not be required as a condition of receiving the vaccine. Employees must sign a declination form if they choose not to be vaccinated, but may later opt to receive the vaccine at no cost to the employee. Should booster doses later be recommended by the USPHS, employees must be offered them.

POST-EXPOSURE EVALUATION AND FOLLOW-UP: Specifies procedures to be made available to all employees who have had an exposure incident plus any laboratory tests must be conducted by an accredited laboratory at no cost to the employee. Follow-up must include a confidential medical evaluation documenting the circumstances of exposure, identifying and testing the source

individual if feasible, testing the exposed employee's blood if he/she consents, post-exposure prophylaxis, counseling and evaluation of reported illnesses. Health care professionals must be provided specified information to facilitate the evaluation and their written opinion on the need for hepatitis B vaccination following the exposure. Information such as the employee's ability to receive the hepatitis B vaccine must be supplied to the employer. All diagnoses must remain confidential.

HAZARD COMMUNICATION: Requires warning labels, including the orange or orange-red biohazard symbol, affixed to containers of regulated waste, refrigerators and freezers and other containers that are used to store or transport blood or other potentially infectious materials. Red bags or containers may be used instead of labeling. When a facility uses universal precautions in its handling of all specimens, labeling is not required within the facility. Likewise, when all laundry is handled with universal precautions, the laundry need not be labeled. Blood that has been tested and found free of HIV or HBV and released for clinical use and regulated waste that has been decontaminated need not be labeled. Signs must be used to identify restricted areas in HIV and HBV research laboratories and production facilities.

INFORMATION AND TRAINING: Mandates training within 90 days of effective date, initially upon assignment and annually; employees who have received appropriate training within the past year need only receive additional training in items not previously covered. Training must include making accessible a copy of the regulatory text of the standard and explanation of its contents, general discussion on blood-borne diseases and their transmission, exposure control plan, engineering and work practice controls, personal protective equipment, hepatitis B vaccine, response to emergencies involving blood, how to handle exposure incidents, the post-exposure evaluation and follow-up program, and signs, labels, and color-coding. There must be opportunity for questions and answers, and the trainer must be knowledgeable in the subject matter. Laboratory and production facility workers must receive additional specialized initial training.

RECORDKEEPING: Calls for medical records to be kept for each employee with occupational exposure for the duration of employment plus 30 years, must be confidential and must include name and Social Security number; hepatitis B vaccination status (including dates); results of any examinations, medical testing and follow-up procedures; a copy of the health care professional's written opinion; and a copy of information provided to the health care professional. Training records must be maintained for three years and must include dates, contents of the training program or a summary, trainer's name and qualifications, names and job titles of all persons attending the sessions. Medical records must be made available to the subject employee, anyone with written consent of the employee, OSHA and NIOSH – but they are not available to the employer. Disposal of records must be in accord with OSHA's standard covering access to records.

Safety and health add value

OSHA is committed to assuring – so far as possible – that every working man and woman in the nation has safe and healthful working conditions. OSHA believes that providing workers with a safe workplace is central to their ability to enjoy health, security and the opportunity to achieve the American dream. Addressing safety and health issues in the workplace also saves the employer money and adds value to the business. Recent estimates place the business costs associated with occupational injuries at close to $170 billion – expenditures that come straight out of company profits.

When workers stay whole and healthy, the direct-cost savings to businesses include:

- Lower workers' compensation insurance costs.
- Reduced medical expenditures.
- Smaller expenditures for return-to-work programs.
- Fewer faulty products.
- Lower costs for job accommodations for injured workers.
- Less money spent for overtime benefits.

Safety and health also make big reductions in indirect costs, due to:

- Increased productivity.
- Higher quality products.
- Increased morale.
- Better labor/management relations.
- Reduced turnover.
- Better use of human resources.

Employees and their families benefit from safety and health because:

- Their incomes are protected.
- Their family lives are not hindered by injury.
- Their stress is not increased.

Implementing an accident prevention program will allow a small business to learn firsthand that the cost of accident prevention is far lower then the cost of accidents. Consultation offers free help in identifying workplace hazards and establishing or improving safety and health management systems corporate-wide.

OSHA and you

OSHA has not formulated any rules and regulations that deal specifically with the cosmetology industry. While no specific rules exist, individuals engaged in the practice of cosmetology are expected to abide by basic rules contained within the Code of Federal Regulations (29 CFR) that deal with workplace safety and health. These rules describe the responsibilities of employers and employees in dealing with hazardous chemicals, personal protective devices, proper ventilation, prevention from overexposure to dusts, and overall health and safety plans.

One regulation that indirectly impacts the cosmetology profession is placed on the manufacturers of many of the products that you may use in your business. The federal government requires that product manufacturers make available to customers material safety data sheets (MSDS). Each MSDS must contain basic information on the each product manufactured. There is no standard format for an MSDS, but each one must contain the following:

- Identity of chemicals that may present physical or chemical hazards.
- Physical hazards, i.e., volatility, evaporation rate and interaction with other chemicals.
- Health hazards, i.e., possible physical side effects of product usage.
- Primary routes of entry into the body.
- Permissible exposure limits.
- Carcinogen (cancer-causing) hazard of the chemical.
- Precautions and handling procedures.
- Control and protection measures.
- Emergency and first aid procedures.
- Storage and disposal information.

Your local product suppliers are required by federal law to provide you with an MSDS for each product you purchase from them. It is the legal responsibility of salon owners to collect MSDS for each product that you use in your business and to make them available for reference. The following page is a sample of OSHA form 174 (MSDS) Sheet.

MATERIAL SAFETY DATA SHEETS (MSDS)

SECTION I: MANUFACTURER'S NAME AND CONTACT INFORMATION

Manufacturer's name and address
Emergency phone number

Call this number in case of an emergency

SECTION II: HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

List hazardous components and safe exposure limits

Ingredient name can be found here

SECTION III: PHYSICAL/CHEMICAL CHARACTERISTICS

Physical state (gas, liquid, or solid), boiling point, freezing point, vapor pressure, specific gravity

SECTION IV: FIRE AND EXPLOSION HAZARD DATA

Flash point, extinguishing media, special fire fighting procedures, unusual fire and explosion hazards, if any

This section explains what may cause the product to catch fire and how to put out the fire

SECTION V: REACTIVITY DATA

Stability, incompatibility, hazardous decomposition or by-products, if any

SECTION VI: HEALTH HAZARD DATA

Routes of entry/exposure
Health hazards
Carcinogenicity
Signs and symptoms of exposure
Medical conditions generally aggravated by exposure

This section indicates if this product contains an ingredient that is listed as a potential cancer-causing agent

This section explains the hazards and symptoms workers may have if they are exposed to a harmful ingredient

This section describes physical effects that may be experienced if overexposure occurs, as well as if certain illnesses can be made worse by exposure to this ingredient

SECTION VII: PRECAUTIONS FOR SAFE HANDLING AND USE

Emergency and First Aid procedures
Steps to be taken in case material is released or spilled
Precautions to be taken in handling and storing
Waste disposal methods

This section explains what to do in an emergency

This section explains how to clean up spills

This section describes how to dispose of this product properly

SECTION VIII: CONTROL MEASURES

Respiratory protection
Ventilation requirements
Personal Protective Equipment

This section describes the proper personal protective equipment (e.g. gloves) to wear and ventilation requirements when using this product

Labels

Each container of a hazardous substance must have a label attached to it. The label must be in English and state the product name, risk and safety phrases. The label may also state the ingredient's chemical name.

If a hazardous substance is transferred from one container into a second container, and the substance is not entirely used immediately, you must ensure that the second container is properly labeled. Chemicals must not be decanted into a food or beverage container.

If the contents of a container are unknown, it should be labeled:
CAUTION – DO NOT USE – UNKNOWN SUBSTANCE

Store all unknown substances in isolation until the contents can be identified and properly labeled. If the substance cannot be identified, dispose of it. You should contact the Environmental Protection Agency for advice on disposal requirements.

Working with hazardous chemicals

The issue of most concern to cosmetologists is chemical exposure in the workplace. According to National Institute for Occupational Safety and Health (NIOSH), the chemicals used in a hair salon can cause a range of allergies and lung problems, from hairspray-induced coughs to rashes caused by certain chemicals in hair dye. Dyes and bleaches can cause dermatitis, or skin rashes, among some salon professionals.

Dermatitis (a general term meaning inflammation of the skin). There are two types of dermatitis. **Irritant contact** dermatitis results from contact with irritant substances, such as water and detergents in shampoo. **Allergic contact** dermatitis occurs when a person develops an allergic response to a chemical.

Asthma (a respiratory disease, which narrows the air passages and results in breathing difficulties). Chemicals used in the hairdressing, nail and beauty industry may aggravate pre-existing asthma or cause occupational asthma.

Cancer. Workers in the hairdressing, nail and beauty industry may be exposed to chemicals that are suspected of causing cancer. There is limited and inconsistent data to support this.

Hazardous substances can enter the body through the skin, by inhalation or by swallowing. Acute health effects, such as eye and throat irritation, may occur almost immediately. Chronic health effects, such as allergic contact dermatitis, take some time to develop.

The likelihood of a hazardous substance causing health effects depends on a number of factors, including:

- The toxicity of the substance.
- The amount of substance that workers are exposed to.
- The length of exposure.
- The frequency of exposure.
- The route of entry into the body, e.g., skin absorption, inhalation or ingestion.

Here are a few tips to avoid exposure to hazardous chemicals:

- **Substitution**
  - Replace a substance with an alternative product that contains a less hazardous substance. Health information found in an MSDS may assist in the selection of a less hazardous substance.
  - Replace pressurized aerosol containers, with pump sprays, e.g., pressurized wrap catalyst, hairsprays.
- **Redesign**
  - Make sure there is good ventilation so that exposure to airborne contaminants can be prevented or minimized, e.g., local exhaust ventilation.
  - Protect against eye splash by installing splash shields in areas where chemicals are mixed.
- **Administrative controls**
  - Make sure MSDSs are available for all chemicals used in the salon.
  - Make sure workers are provided with suitable information, training and supervision on the safe use of chemicals and PPE (personal protective equipment).
  - Store chemicals away from energy sources, such as fuse boxes, naked flames, heat and intense light sources.
  - Store flammable chemicals in a cool place in a securely locked fireproof cabinet.
  - Make sure chemicals are out of reach of children.
  - Make sure procedures are in place for the cleanup of spills using a suitable absorbent material. Refer to the MSDS.
  - Clean up chemical spills promptly.
  - Make sure that spilled chemicals and equipment used for chemical clean up are disposed of appropriately. Contact the Environmental Protection Agency for further advice.
  - Purchase chemicals in ready-to-use packages rather than transferring from large containers.
  - Do not eat, drink or smoke in areas that contain chemicals.
  - Wash hands with a pH neutral soap or barrier cream before eating, drinking or smoking.
- **Personal protective equipment**
  - Provide gloves, glasses, aprons and respiratory protection as required by your hazardous substances risk assessment. Guidance can be found in the MSDS.
  - Provide workers with training on the fit, maintenance and use of personal protective equipment.
  - Make sure workers apply barrier creams on exposed skin areas if bothered by skin irritation.
  - Make sure workers cover broken skin with a waterproof dressing.
  - Make sure workers wear eye protection and covered shoes to protect against chemical splashes.
  - Other control measures apply specifically to each industry.

Salon industry

Many products used in salons are classed as hazardous substances. Some products, such as shampoos, are not classified as "hazardous" but may still cause adverse health effects such as dermatitis.

Specific control measures

- Do not use products that are known to contribute to dermatitis or cause sensitization, such as:
  - **Formaldehyde/formalin** (present in low concentration in some shampoos as a preservative).
  - **P-phenylene diamine and paratoluene diamine** (present in some hair colors and tints – also known as PPD and PTD).
  - **Glycerol monothioglycolate** (present in some "acid" permanent wave solutions – also known as GMTG).
  - **Thioglycolic acid** (present in some hair straighteners).
  - Do not use **nickel-plated equipment with permanent wave solutions containing ammonium thioglycolate**. Use high quality stainless steel or plastic equipment.

Manual tasks

The manual tasks performed in the hairdressing, nail and beauty industry can be physically demanding and are responsible for the majority of musculoskeletal disorders. Disorders can include lower back pain, neck and shoulder pain, tendonitis of the shoulder or wrist, leg discomfort and carpal tunnel syndrome.

How do manual task injuries occur?

Injuries from manual tasks result from ongoing wear and tear to the joints, ligaments, tendons, muscles and discs. Although uncommon, injuries can be caused by a one-off overload situation.

Over a period of time, damage can gradually build up through:

- Holding fixed positions for a prolonged time.
- Performing repetitive movements that are fast and/or involve a lot of muscular effort.

If insufficient breaks are taken, muscle fatigue can lead to inflammation and tissue damage. Injury is more likely to occur when this happens repeatedly.

What are the risk factors?

Risk factors are part of the demands of a job that affect the worker and can contribute to injury. These are set out in the table below.

Common manual task risk factors in the beauty industry		
Risk factor	**Contribution to injury**	**Examples of work problems**
Working postures.	Awkward postures require greater muscular effort and lead to greater fatigue, particularly when holding a position for a long time. Awkward postures occur when joints are working away from the normal position.	• Back bent or twisted, e.g., washing hair. • Neck bent forward or twisted, e.g., applying color. • Shoulders raised. • Upper arms held out to the sides and away from the body, e.g., massage, cutting hair. • Wrist bent or twisted, e.g., setting rollers, stabilizing hand when filing nails.
Repetition and duration.	Continually repeating a movement, particularly with a forceful exertion, increases the risk of injury. Long durations of awkward postures or repetitive work are also a risk.	• Rolling hair. • Applying color. • Filing nails. • Prolonged sitting or standing. • Prolonged bending or leaning, e.g., electrolysis.
Work area design.	The work area design and layout may require workers to bend or reach to perform tasks.	• Equipment and materials not located close to the worker, causing workers to bend, reach or twist. • Non-adjustable chairs and benches. • Work surfaces too high or too low. • Poor lighting. • Hard, slippery floors. • Work surfaces too wide or narrow. • Leaning or supporting elbows or arms on work surfaces.
Use of tools.	Poor design and excessive use of hand tools contributes to disorders of the wrist, elbow and shoulder.	• Working with heavy tools. • Difficult or awkward hand grips.
Load handling.	Supporting a weight while holding arms away from the body increases stress to the back and shoulders.	• Working with heavy tools, e.g., holding a blow dryer away from the body. • Holding a body part while waxing. • Carrying heavy boxes of product to storage.
Individual factors.	For new, young, older, pregnant and inexperienced workers, the risk of injury is increased. The type of clothes people wear can also have an impact.	• Lack of training in specific tasks. • No period of physical adjustment provided. • Wearing shoes with an elevated heel.
Work organization.	Continuous work of a similar nature, poor equipment maintenance and inadequate rest breaks can result in fatigue and lead to injury.	• Too little task variation. • Inadequate rest breaks. • Insufficient staff to cope with peak periods.

Control measures /design controls

- **Redesign the work area**
  - Provide adequate lighting for the task to decrease bending of the back or neck.
  - Make sure there is enough room for easy movement around furniture and work areas.
  - Provide nonslip surfaces that are comfortable for standing, e.g., cork.
  - Provide adjustable styling chairs and stools to avoid working with arms above shoulder height or constantly bending head forward.
  - Provide adjustable tables/benches/massage couches.
  - Place required work items within reach and close to waist height.
  - Provide trolleys with castors to reduce carrying.
  - Provide padding on table for nail work to protect elbows and underside of arms from nerve damage, e.g., a towel.
  - Make sure the work surface for nail work is wide enough so that you do not bump knees with your client or have to stretch to reach client's hands.
  - Provide access to chairs in lunchroom or office so workers can rest from prolonged standing.
- **Select well-designed tools**
  - Discuss the selection and purchase of new tools and equipment with staff prior to purchase.
  - Make sure that tools such as blow dryers are as light as possible.
  - Provide scissors with bent-shaped handles that keep your wrists straight and do not dig into the hand.
- **Redesign work methods**
  - Work as close as possible to the client to reduce bending and reaching.
- **Administrative controls**
  - Make sure workers alternate tasks so that different muscles are used, e.g., recover from cutting hair by folding towels, sweeping floors or reception duties, variation in artificial nail filing techniques.
  - Manage the number of bookings per worker, particularly those involving demanding tasks, e.g. highlighting hair.
  - Make sure workers take short breaks frequently to give wrists, shoulders or back a rest.
  - Make sure workers alternate between sitting and standing when performing tasks such as cutting or drying hair, waxing, facials.
  - Make sure all tools are maintained so they do not need extra effort to use.
  - Train workers to do tasks so that problem working postures are avoided or kept to a minimum.
- **Personal protective equipment**
  - Wear footwear with low heels and shock-absorbing soles or inserts.

Noise and vibration

The main risk to health from noise exposure, other than permanent loss of hearing, is stress and fatigue. Noise levels of most equipment, such as hair dryers and radios, in the health and beauty industry are generally not high enough to cause hearing loss. However, some workers and clients may find the noise levels annoying.

If a worker has used a personal security alarm in an emergency situation, he or she should be tested by an audiologist or ear, nose or throat specialist to establish whether hearing damage has occurred.

Equipment such as hand-held hair dryers, body massagers and electric nail files and drills emit vibration. Workers who use this equipment are at risk of developing Raynaud's disease and carpal tunnel syndrome; the onset of these conditions depends on:

- Type of equipment used.
- Length of use.
- Postures when using the equipment.

Employers should consult with workers and take steps to minimize risk from exposure to noise and vibration at work.

Control measures

- **Substitution**
  - Replace existing equipment with equipment that emits a lower level of noise and vibration.
- **Redesign**
  - Rearrange the layout of the workplace to separate noisy work activities from less noisy activities.
  - Install sound absorbing material on ceiling and walls to reduce the sound level.
- **Administrative controls**
  - Adopt a "buy quiet" policy for all new equipment.
  - Make sure all equipment is maintained and in a good condition.
  - Make sure workers vary working postures regularly to minimize exposure to vibration, e.g., alternate the equipment between hands.
  - Provide workers with training and information about noise and vibration.

COSMETICS SAFETY

What is FDA's legal authority over cosmetic safety?

FDA regulates cosmetic safety under the authority of the Federal Food, Drug, and Cosmetic Act (FD&C Act). The FD&C Act requires that cosmetics marketed in interstate commerce be safe when used as directed in the labeling or under customary conditions of use.

Cosmetics are not subject to pre-market approval by FDA. However, pre-market approval is required for the color additives used in cosmetics (including those in lipsticks) and other FDA-regulated products (with the exception of coal-tar hair dyes).

Eye cosmetic safety

Eye cosmetics are intended to make eyes more attractive, or in some cases to cleanse the eye area. One thing they shouldn't do is cause harm. Most are safe when used properly. However, there are some things to be careful about when using these products, such as the risk of infection, the risk of injury from the applicator, and the use of unapproved color additives. The following information provides an introduction to some safety concerns and legal issues related to eye cosmetics.

Keep it clean!

Eye cosmetics are usually safe when you buy them, but misusing them can allow dangerous bacteria or fungi to grow in them. Then, when applied to the eye area, a cosmetic can cause an infection. In rare cases, women have been temporarily or permanently blinded by an infection from an eye cosmetic. See the safety checklist below for tips on keeping your eye cosmetics clean and protecting against infections.

Occasionally, contamination can be a problem for some eye cosmetics even when they are new. FDA has an Import Alert in effect for cosmetics – including eye cosmetics – contaminated with harmful microorganisms.

Don't share! Don't swap!

Don't share or swap eye cosmetics -- not even with your best friend. Another person's germs may be hazardous to you. The risk of contamination may be even greater with "testers" at retail stores, where a number of people are using the same sample product. If you feel you must sample cosmetics at a store, make sure they are applied with single-use applicators, such as clean cotton swabs.

Hold still!

It may seem like efficient use of your time to apply makeup in the car or on the bus, but resist that temptation, even if you're not in the driver's seat. If you hit a bump, come to a sudden stop, or are hit by another vehicle, you risk injuring your eye (scratching your cornea, for example) with a mascara wand or other applicator. Even a slight scratch can result in a serious infection.

What's in it?

As with any cosmetic product sold on a retail basis to consumers, eye cosmetics are required to have an ingredient declaration on the label, according to regulations implemented under the Fair Packaging and Labeling Act, or FPLA – an important consumer protection law. If you wish to avoid certain ingredients or compare the ingredients in different brands, you can check the ingredient declaration.

If a cosmetic sold on a retail basis to consumers does not have an ingredient declaration, it is considered misbranded and is illegal in interstate commerce. Very small packages in tightly compartmented display racks may have copies of the ingredient declaration available on tear-off sheets accompanying the display. If neither the package nor the display rack provides the ingredient declaration, you aren't getting the information you're entitled to. Don't hesitate to ask the store manager or the manufacturer why not.

What's that shade you're wearing?

In the United States, the use of color additives is strictly regulated. A number of color additives approved for cosmetic use in general are not approved for use in the area of the eye. An import alert for cosmetics containing illegal colors lists several eye cosmetics.

Keep away from kohl -- and keep kohl away from kids!

One color additive of particular concern is kohl. Also known as al-kahl, kajal, or surma, kohl is used in some parts of the world to enhance the appearance of the eyes, but is unapproved for cosmetic use in the United States. Kohl consists of salts of heavy metals, such as antimony and lead. It may be tempting to think that because kohl has been used traditionally as an eye cosmetic in some parts of the world, it must be safe. However, there have been reports linking the use of kohl to lead poisoning in children.*

An FDA import alert cites three main reasons for detaining imports of kohl:

- For containing an unsafe color additive, which makes the product adulterated.
- For labeling that describes the product falsely as "FDA-approved."
- For lack of an ingredient declaration.

Some eye cosmetics may be labeled with the word "kohl" only to indicate the shade, not because they contain true kohl. If the product is properly labeled, you can check to see whether the color additives declared on the label are in FDA's list of color additives approved for use in cosmetics, then make sure they are listed as approved for use in the area of the eye.

Dying to dye your eyelashes?

Permanent eyelash and eyebrow tints and dyes have been known to cause serious eye injuries, including blindness. There are no color additives approved by FDA for permanent dyeing or tinting of eyelashes and eyebrows. FDA has an import alert in effect for eyelash and eyebrow dyes containing coal tar colors.

Thinking of false eyelashes or extensions?

FDA considers false eyelashes, eyelash extensions, and their adhesives to be cosmetic products, and as such, they must adhere to the safety and labeling requirements for cosmetics. False eyelashes and eyelash extensions require adhesives to hold them in place. Remember that the eyelids are delicate, and an allergic reaction, irritation or other injury in the eye area can be particularly troublesome. Check the ingredients before using these adhesives.

Bad reaction?

If you have a bad reaction to eye cosmetics, first contact your health care provider. FDA also encourages consumers to report any adverse reactions to cosmetics.

Safety checklist

If you use eye cosmetics, FDA urges you to follow these safety tips:

- If any eye cosmetic causes irritation, stop using it immediately. If irritation persists, see a doctor.
- Avoid using eye cosmetics if you have an eye infection or the skin around the eye is inflamed. Wait until the area is healed. Discard any eye cosmetics you were using when you got the infection.
- Be aware that there are bacteria on your hands that, if placed in the eye, could cause infections. Wash your hands before applying eye cosmetics.
- Make sure that any instrument you place in the eye area is clean.
- Don't share your cosmetics. Another person's bacteria may be hazardous to you.
- Don't allow cosmetics to become covered with dust or contaminated with dirt or soil. Keep containers clean.
- Don't use old containers of eye cosmetics. Manufacturers usually recommend discarding mascara two to four months after purchase.
- Discard dried-up mascara. Don't add saliva or water to moisten it. The bacteria from your mouth may grow in the mascara and cause infection. Adding water may introduce bacteria and will dilute the preservative that is intended to protect against microbial growth.
- Don't store cosmetics at temperatures above 85 degrees F. Cosmetics held for long periods in hot cars, for example, are more susceptible to deterioration of the preservative.
- When applying or removing eye cosmetics, be careful not to scratch the eyeball or other sensitive area. Never apply or remove eye cosmetics in a moving vehicle.
- Don't use any cosmetics near your eyes unless they are intended specifically for that use. For instance, don't use a lip liner as an eye liner. You may be exposing your eyes to contamination from your mouth, or to color additives that are not approved for use in the area of the eye.
- Avoid color additives that are not approved for use in the area of the eye, such as "permanent" eyelash tints and kohl. Be especially careful to keep kohl away from children, because reports have linked it to lead poisoning.

Lipstick and lead: Questions and answers

The Food and Drug Administration (FDA) has received a number of inquiries regarding reports of lead contamination in lipstick. The following information is drawn from responses to those inquiries, along with information on their latest findings.

Has FDA set limits for lead in cosmetics?

No, FDA has not set limits for contaminants, such as lead, in cosmetics. However, FDA does set specifications for impurities, such as lead, for color additives used in cosmetics. FDA approval of color additives is based on safety evaluations that consider the color additive's intended use(s) and estimated consumer exposure resulting from those uses. FDA-approved color additives are listed in Title 21 of the U.S. Code of Federal Regulations (CFR). To learn more about FDA-approved color additives, please refer to Color Additives.

What are FDA's limits for lead in color additives?

FDA limits lead in color additives to maximum specified levels, typically no more than 20 parts per million (ppm) for color additives approved for use in cosmetics. Some color additives listed under regulations in 21 CFR Parts 74 and 82, such as D&C Red No. 6 and D&C Red No. 7, are required to be batch-certified by FDA before they may be used in cosmetics. Part of the FDA certification process for such color additives includes testing each batch of the color additive for lead. Other color additives listed under regulations in 21 CFR Part 73, such as mica, titanium dioxide, and iron oxides, are not required to be batch-certified by FDA, although cosmetic manufacturers are still responsible for ensuring that the color additives used in their products meet FDA's specifications.

Has FDA been aware of concerns about lead in lipstick?

Yes, reports about lead in lipstick are not new. In the 1990s, reports of analytical results from a commercial testing laboratory suggested that traces of lead in lipstick might be of concern. Subsequent evaluation by FDA of that laboratory's test results determined that the method used had not been validated for the analysis of lipsticks. More recently, in October 2007, the Campaign for Safe Cosmetics (CSC) reported finding lead in a selection of 25 lipsticks on the market. FDA was not able to determine whether a method validated for the analysis of lipstick was used to generate the data in the CSC report. Because reports regarding lead in lipstick have surfaced periodically and because of the amount of time that had elapsed since FDA last examined data and other information on lipsticks in the marketplace, FDA decided that further follow-up was needed.

Is there a safety concern about the lead found by FDA in lipsticks?

No. FDA has assessed the potential for harm to consumers from use of lipstick containing lead at the levels found in its testing. Lipstick, as a product intended for topical use, is only ingested incidentally and in very small quantities. FDA does not consider the lead levels that it found in the lipsticks to be a safety concern. FDA also notes that the lead levels that it found are lower than limits recommended by other public health authorities for lead in cosmetics, including lipstick.

Does FDA intend to continue investigating lead in lipstick?

Yes. FDA does not believe that the lead content found in its recent lipstick analyses is a safety concern. However, the agency is planning to investigate a wider range of lipsticks than has been tested so far, including lipsticks similar to those recently assessed for lead content by another laboratory.4 If FDA determines that a safety concern for lead in lipstick exists, the agency will advise the industry and the public and will take appropriate action under the authority of the FD&C Act in protecting the health and welfare of consumers.

FDA analyses of lead in lipsticks

The following results for lead content in a selection of lipsticks were obtained by scientists at the U.S. Food and Drug Administration (FDA) and reported in the Journal of Cosmetic Science. FDA purchased lipsticks from retail stores between October and December 2007.

Brand name	Parent company	Lipstick line and shade[a]	Lot numbers[b]	Lead (Pb)[c] (ppm)[d]
Cover Girl	Procter & Gamble	Incrediful Lipcolor 964 Maximum Red	7241S1	3.06
			5188S1	3.05
Revlon	Revlon, Inc.	ColorStay Lipcolor 345 Red Velvet	Composite[e]	2.91[f]
			07298	2.38
Cover Girl	Procter & Gamble	Queen Collection Q580 Ruby Remix	7136	2.24
Body Shop	L'Oreal	Lip Colour 22 Garnet	C274EA	1.79
Cover Girl	Procter & Gamble	Continuous Color 435 Cherry Brandy	7228	1.76
L'Oreal	L'Oreal	Colour Riche 315 True Red	FD261	1.47
Revlon	Revlon, Inc.	Super Lustrous 660 Bed of Roses	07208 1508 53	1.37
Maybelline	L'Oreal	Moisture Extreme F315 Cocoa Plum	WD2891	1.21
Revlon	Revlon, Inc.	Super Lustrous 725 Love That Red	07284 1508 59	1.04
L'Oreal	L'Oreal	Colour Riche 752 Classic Wine	FD064	0.79
			FD234	0.67
Clinique	Estee Lauder Companies Inc.	Long Last FJ Merlot	AA7	0.55
Clinique	Estee Lauder Companies Inc.	Long Last F9 Paprika	A87	0.48
Estee Lauder	Estee Lauder Companies Inc.	Pure Color 1A3 Maraschino	B55	B55
Burt's Bees	Clorox Company	Lip Shimmer Merlot[g]	1840701	0.33
Maybelline	L'Oreal	Moisture Extreme E215 Midnight Red	WD3041	0.23
PeaceKeeper	PeaceKeeper	Paint Me Compassionate[g]	h	0.17
Dior	LVMH	Replenishing Lipcolor 752 Red Premiere	7A01	0.15
Dior	LVMH	Addict Ultra-Shine 750 Shiniest Sexiness	7D01	0.12
MAC	Estee Lauder Companies Inc.	Matte Lipstick Viva Glam I	A67	0.10
Avon	Avon	Ultra Color Rich U250 Cherry Jubilee	h	0.09
			Average	1.07

a. Lipsticks selected are the same brands and shades analyzed by the Campaign for Safe Cosmetics (*http://www.safecosmetics.org/your_health/poisonkiss.cfm*).
b. Lot numbers embossed or printed on lipstick cases or end labels.
c. Results are for total lead content determined by FDA's validated method [Reference 1].
d. Reported in units of µg Pb/g in Reference 1.
e. Combination of several lots.
f. Result not used for determining average value of lead content by FDA's validated method.
g. No shade number on lipstick.
h. No lot number on lipstick.

Useful links:

- Color additives – *http://www.fda.gov/ForIndustry/ColorAdditives/default.htm*
- Import alerts – *http://www.accessdata.fda.gov/cms_ia/industry_53.html*

CHEMICAL EXPOSURE

Introduction

Nail technicians and to some extent customers are exposed to high concentrations of several compounds that are included in the various chemical products used in their work/treatments. A wide diversity of chemical products are used in the different therapies performed in salons including natural and artificial nails and reflexology. Each of these products has a large number of components, including several volatile organic compounds (VOCs), methacrylates, phthalates, and formaldehyde.

Occupational skin and respiratory disorders, and disputable reproductive and genotoxic effects have been linked to chemical exposures of salon workers. Toluene and xylenes are derived from many sources, such as vehicles (incomplete combustion), and solvents used in various products including cosmetic products. The presence of high concentrations of these compounds shows that they are emitted from the products used in salons everyday.

Ethyl acetate and acetone are used as solvents in many products, including nail polish removers. Terpenes such as pinene and limonene give characteristic odor in beauty products. Chemical vapors can even escape the salon and affect neighboring businesses.

However, nail work can be done safely if the proper steps are taken. This chapter suggests the measures that employers and employees can take.

What is the problem?

The chemicals in artificial nail products can enter the body from breathing them, from accidentally swallowing them, or from absorbing them through the skin. Whether they affect a person's health depends on several factors:

- How often and how long one is exposed to the chemicals.
- How the chemicals enter the body.
- The amount of the chemicals in the air or on the skin.
- The kinds of harm a specific chemical can cause.

Artificial nail products can irritate the skin and cause a rash. They can also cause dryness, flaking and cracking of the skin.

An allergy to some chemicals may also develop, resulting in redness, itching, hives and sometimes blisters. Once an allergy to a chemical develops, exposure to even a tiny amount can cause an allergic reaction – which in extreme cases can be life-threatening. Nail products that can produce an allergic skin reaction include methacrylates, formaldehyde and benzoyl peroxide.

Eyes

Contact with vapors and airborne dusts can cause irritation and redness, burning, itching or discomfort. The eyes may water and vision may briefly become distorted. Chemicals that can cause these effects include acrylates and many solvents, such as methyl ethyl ketone (MEK) and acetone.

Nose, throat and lungs

These same chemicals can also irritate the nose, throat and lungs. Symptoms include irritation or soreness of the nose and throat, hoarseness, coughing, lung congestion, chest tightness and shortness of breath. Cigarette smoking can worsen these symptoms. Chronic bronchitis can develop from repeated exposure to chemicals that irritate the lungs.

Repeated exposure to some of artificial nail products, such as ethyl methacrylate, can cause asthma. Symptoms of asthma include difficulty breathing, wheezing, coughing, shortness of breath and tightness in the chest. Once a person becomes sensitized to a chemical, extremely small amounts of that chemical (or even similar ones) can cause asthmatic attacks. Occupational exposure limits established by recognized reference organizations (such as OSHA and the American Conference of Governmental Industrial Hygienists [ACGIH]) do not typically protect against sensitization. Therefore, exposure to chemicals that cause asthma or other allergies should be kept as low as possible.

Nervous system

Breathing in the vapors of certain chemicals can affect the brain the same way as drinking too much alcohol does. Overexposure to these vapors can cause headaches, nausea and dizziness, as well as make one feel irritable, confused or drunk. Long-term exposure can affect the brain (including the ability to learn and to concentrate). Some of these chemicals are MEK, acetone, toluene, xylene, ethyl ether and methacrylates.

Cancer

Most of the substances used in artificial nails have not been adequately tested to see whether they can cause cancer. Formaldehyde and methylene chloride are suspected of causing cancer. Avoid products that contain these chemicals.

Reproductive system

Most of the chemicals used in artificial nails have not been adequately tested to see whether they can harm a developing baby or affect the fertility of men or women. Organic solvents are used in artificial nail products and can be absorbed into the body by inhalation or by skin contact. This type of chemical can cause birth defects when a pregnant woman is exposed to them. They can also harm the nursing infant. Avoid the use of acetonitrile and the glycol ethers if at all possible.

How can I identify dangerous chemicals?

The products that a manicurist or nail technician uses are made up of many different chemicals. It is important to know the ingredients and hazards of the chemicals being used.

The right to know

The Hazard Communication Standard is a regulation of the federal Occupational Safety and Health Administration (OSHA) that gives employees the right to know the health and safety hazards of the products that they use on the job. This standard requires chemical manufacturers and importers to provide hazard information to employers by means of a fact sheet, called a Material Safety Data Sheet (MSDS). It is the employer's responsibility to obtain the MSDSs from the manufacturer or distributor for all hazardous products used in the salon and to make them easily available to employees.

Material safety data sheets

An MSDS must list the hazardous ingredients of a product, discuss any health and safety hazards and suggest ways to use the product safely. The MSDS must also describe any fire and explosion hazards, first aid and procedures for cleaning up leaks and spills.

Employees who believe that they are exposed to a chemical that might affect their health should ask their supervisor for the MSDS for that product. Employers should ask their suppliers for the MSDS.

Worker education

In addition to an MSDS, employers should have an education program to tell employees about the hazards of the chemicals with which they work, as well as how to work safely with them.

What protective measures can I take?

In the nail salon, to get rid of the chemical vapors in the air, nail technicians should apply artificial fingernails at a ventilated work table. It is also helpful to keep all bottles of fingernail liquid tightly capped. In addition, it may be helpful to look at work habits to see whether they can be improved. Finally, proper general room ventilation is important to keep toxic chemicals from drifting into near-by businesses.

Use a ventilated table

A ventilated table is a table that has a fan that pulls the chemical vapors into a duct and away from both the nail technician and the customer. A ventilated table protects the technician and customer best against breathing toxic chemicals. The ventilation system should be designed to vent contaminated air to the outside, not inside the shop. Researchers from the National Institute for Occupational Safety and Health (NIOSH) have found that a ventilation table protects the nail technician best against breathing EMA. The ventilated table is the most important engineering control for getting rid of EMA in the fingernail salon because the vented table places local exhaust ventilation close to the work area.

Place local exhaust ventilation as close to the EMA source as possible. Exhaust this air outdoors. Charcoal filters that allow the air to be used over again are not recommended because it is hard to know when the charcoal is full.

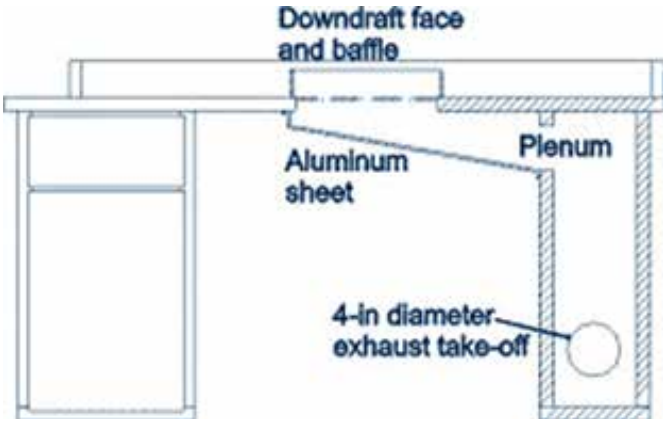
Build a ventilated table, or change a table you already own into a ventilated one (Figure 1). Ventilated table sizes will vary from nail salon to nail salon. Choose a wood for your ventilated table that will not soak up the chemicals. If the table acts like a sponge, it may actually expose you to the chemicals you want to avoid. A veneer-coated particle board works well for the table material.

Make a hole in the tabletop for an air intake (called the downdraft face). This downdraft face should be placed on the technician's side of the table. Cover the hole with a screen-like cover (or perforated plate) to prevent things from falling in.

The client's side of the table should be a little higher than the technician's side. This will allow the client's hands to hang over the downdraft face and be as close as possible to the local exhaust ventilation (Figure 2).

Figure 1

Figure 2



Make sure enough air blows through the table downdraft to get rid of the EMA. The amount of air exhausted depends on its speed as it moves through the downdraft face and on the size of the table opening. However, too much air rushing past the fingernails may cause the artificial nail product to crystalize.

An air speed of 620 feet per minute, directly above the 13- by 4-inch downdraft face works well. A 22-inch baffle should surround the downdraft face to pull the moving air closer to the client's hands.

Different drying times are needed for different fingernail products and different application techniques. Although a stronger and larger airflow will collect more dust during filing and dry the color coat faster, a slower and lower airflow gives better results for the artificial fingernail product.

Choose an exhaust fan that can exhaust at least 250 cubic feet per minute of air and has ¼-inch static pressure. A 1/8 horsepower centrifugal fan should work well. To prevent fan noise from getting in the way of talk or client comfort, you can do one of three things: (1) buy a quiet fan, (2) put a cover over a noisier fan, or (3) buy an outdoor fan to be placed on an outside wall. The fan should have control settings. Use either a multispeed or high-volume exhaust fan with a damper. You can find a fan supplier by looking in a directory called "Thomas Register of American Manufacturers." Look under the headings of "fans" or "fans, centrifugal." Your public library should have this directory. The fan supplier may be able to install your fan as well as supply the duct work and other needed materials.

Provide enough make-up air to replace the exhausted air. If the make-up air is too weak, there will be negative pressure areas and perhaps drafts. The air intake, which pulls outdoor air inside, should not be placed near the building exhaust. If the exhaust and intake vents are too close, dirty air will be pulled back into the room.

Comfort fans should not blow directly on the downdraft face because the strong air movement can interfere with the exhaust airflow.

Keep dispenser bottles closed

Use dispenser bottles that have small openings, only large enough for an application brush to enter. The bottle stoppers should be pressure-sensitive. A dispenser bottle with a pressure-sensitive stopper and small opening will result in less evaporation of the fingernail liquid and, thus, will cut down on possible exposures to methacrylates and waste less product. (Figure 3).

Figure 3

Improve your work habits

Nail technicians can also lower their exposures to these airborne chemicals by changing some of their work habits:

- Place chemical-soaked gauze pads in a sealed bag before throwing them in the trash can.
- Change trash can liners daily.
- Pour only the amount of fingernail liquid needed into the closed dispenser bottle.
- Nail technicians should wear personal protective clothing and glasses. When technicians remove artificial nails, chips of acrylic often fly off, creating a need for eye protection. In addition to safety glasses, technicians also should wear long sleeves and gloves to protect their skin from acrylic dust. To protect against breathing the dust, a dust mask should be worn.
- Technicians should wash their hands, arms and face with mild soap and water several times throughout the day to remove potentially irritating dust.
- Do not eat or drink where artificial fingernails are applied or in other working areas. Methacrylates in nail dust can be carried accidentally to the mouth or face on a cup or other food item, and this contact may cause a skin rash. Also, many other chemicals are used in a salon that could cause health problems if swallowed.
- Prohibit smoking in the entire salon because many of the chemicals in a beauty shop, including nail products, catch fire easily.

Provide adequate room ventilation

As with any indoor environment, artificial nail salons should provide general dilution ventilation with an adequate supply of outside air. The minimum recommended amount is 25 cubic feet per minute of fresh air per occupant for beauty salons. To avoid spreading chemical vapors to neighboring businesses, nail salons should not share the same ventilation system with another business and should have negative air pressure in relation to adjacent spaces. To maintain negative pressure, the salon should exhaust slightly more air than is supplied so that any leakage of vapors will not enter adjacent businesses. A ventilation contractor can measure the amount of fresh air and air pressure in the salon.

In addition, walls separating the salon from other businesses should have no holes, gaps or cracks. Check with your local board of health to find out about any local regulations that may apply to nail salons.

The dangers of ultraviolet (UV) nail lights

A recent study published in the American Medical Association's Archives of Dermatology authored by Drs. Deborah MacFarlane and Carol Alonso discussed another potential dermatologic hazard associated with nail cosmetics: the development of skin cancer after exposure to UV nail light.

Case 1

A 55-year-old white woman in good health who was not taking immunosuppressive medications, who had an indoor occupation, little recreational UV exposure, and no personal or family history of skin cancer had an erythematous plaque on her right index finger (Figure 4). The patient had no sign of solar damage to her face or the rest of her body. There was no preceding human papillomavirus infection at this site or elsewhere. Biopsy revealed a squamous cell carcinoma, and three surgeries were required to clear the tumor. The affected area healed. The patient had a 15-year history of twice-monthly UV nail light exposure to dry her nail polish and set her acrylic nails.

Figure 4. Squamous cell carcinoma on the right index finger.

Case 2

A 48-year-old white woman, similarly in good health, not taking immunosuppressive medications, with an indoor occupation, moderate recreational UV exposure, and no personal or family history of skin cancer, had a scaly papule on her right hand. There was no preceding human papillomavirus infection at this site or elsewhere. Biopsy revealed a squamous cell cancer that was later removed during surgery. A previous squamous cell cancer had been removed from her left finger three years earlier (Figure 5). During the next four years, the patient had two further squamous cell cancers on both hands that had been treated with surgery. Questioning revealed previous exposure to UV nail lights approximately eight times in one year several years before her first skin cancer.

Figure 5. Squamous cell carcinoma on the right hand. Note the full-thickness skin graft on the base of the left index finger from a previous squamous cell carcinoma.

UV lamp usage

A common piece of equipment found in almost all nail salons is the UV nail lamp. This device is also widely available for purchase on the Internet for use at home. The UV emitted from the nail lights is predominantly UV-A, similar to tanning beds, which are, on average, 95 percent UV-A and 5 percent UV-B. Most nail lamps produce from 4 W to 54 W of power, depending on the model. Most home tanning beds have 12 to 28 bulbs producing 100 W per bulb, and salon beds have 24 to 60 bulbs producing 100 to 200 W per bulb.16 Most tanning beds can produce 1,200 W of power or more, depending on the model.

When correcting for body surface area (100 percent body surface area while using a tanning bed and 2 percent body surface area with a nail lamp), the amount of UV radiation per meter squared is approximately comparable, unless one is using a super tanning bed with 60 lamps putting out 200 W per bulb.

Marketing materials claim that the lamp will clean nails, kill residual bacteria, and make nails healthier. The UV nail lamp is most commonly used to cure UV gel nails, but it is also used for UV-cured acrylic nails and nail fill-ins, and to dry traditional nail polish and, more recently, for “UV top sealers,” or topcoats formulated to protect the nail. It may also be used to dry nail polish in pedicures.

Because exposure to the UV light from tanning beds may cause nails to yellow and nail polish to fade, more tanners are now using UV-protective topcoats to safeguard their nails before tanning. Such topcoats may, in turn, entail the use of UV nail lamps, and some tanning salons offer this service. There are, therefore, a variety of uses for the UV nail lamp.

The traditional acrylic nail is “glued on” via a two-part system consisting of a liquid (the monomer) and a powder (the polymer), which are mixed together. The nail can dry with or without UV light exposure.

The UV gel system is a popular choice owing to its natural appearance, flexibility, and added high-gloss shine. In addition, the virtual lack of odor makes UV gel systems popular in beauty salons. The UV gel system is popular in Europe and is becoming increasingly popular in the United States.

The process involves applying a premixed gel acrylic to the nails, followed by curing the nails under UV light. The acrylic polymer is cross-linked by the action of the UV light. This technique has been around for more than 20 years and consists of applying approximately three separate coats of gel, followed by curing each nail under UV light for three minutes after each coat. Nail fill-ins are often required every two to three weeks as the natural nail grows out, and the nails are typically replaced every three to four months. Other technologies in the gel market involve curing of a gel with visible light or with a brushed-on, dropper-applied, or spray catalyst.

Exposure to UV light is a major risk factor for the development of melanoma and nonmelanoma skin cancers. Sunlight and the UV-A light in tanning beds have been shown to damage DNA and to cause mutations that lead to skin cancer. Perhaps of relevance to the described cases, studies performed with mice confirm a relationship between squamous cell carcinoma and artificial tanning, and meta-analytic estimates suggest a significant effect of exposure to indoor tanning appliances for squamous cell cancer but not for basal cell cancer.

In this article, Drs. MacFarlane and Alonso discuss another common source of artificial UV light, the UV nail lamp, as a possible carcinogen. Although no strong conclusions can be made from this limited case series, we suggest that exposure to UV nail light might also be considered when assessing potential skin cancer risks and that special attention be given to inspecting the dorsum of the fingers and hands and perhaps the feet in the exposed patient population. As we learn more about this increasingly popular technology, this may become another important point for patient education.

Extrapolating from this observation, one might also question the safety of in-home and in-salon UV light use to activate teeth whiteners or the current use of a plastic mouthpiece that is inserted by tanners into their mouths so that the UV tanning lights may activate teeth whitener while they tan. It may be prudent to further explore the potential health hazards of other UV light applications in the beauty industry.

Chapter 5: The Professional Colorist: It's More Than Magic

10 CE Hours

By: JoAnn Stills

Learning objectives

- Explain the significance of primary, secondary and tertiary colors on a color wheel and in the process of coloring.
- Define what is meant by "warm" and "cool" colors, "complementary" colors, and "neutralizing" colors.
- Describe the structure of hair and explain how it is affected by semi-temporary, semi-permanent and permanent hair coloring.
- Explain the importance of light in a hair salon that provides color services.
- Explain the difference between hair levels and tones.
- Explain what the pH scale measures and how this is important to hair color.
- Describe the process of oxidation and its function in permanent hair coloring.
- Describe what is meant by "working volume" of hydrogen peroxide and its relevance to permanent hair coloring.
- Explain the objectives of the consultation/assessment.
- List the main points and relevance of assessing hair texture and porosity.
- Define natural base level; explain how to find it and its significance in hair coloring.
- Explain how percentage and distribution of gray affect hair coloring.
- Describe how the target color is formulated.
- Distinguish between predisposition (patch) testing and strand testing.
- Define dominant remaining pigment (DRP) and explain its significance in lifting color.
- Identify the major categories of hair color services and describe the complications associated with each.

Introduction

Hair coloring can be the most lucrative, rewarding service offered at a salon, yet many stylists remain apprehensive about color long after they leave cosmetology school. This is probably because hair coloring is about chemistry. It can be fraught with problems, with mistakes that drastically affect real people. This course will remind you about the basics of the process, and discuss the products and techniques to help you boost your confidence as you boost your knowledge. For those who have been using hair-coloring products comfortably for years, this course will refresh and reinforce the important points, and perhaps introduce a few new concepts or products.

Hair care services are constantly evolving, and there continues to be an increasing demand for color services. From covering gray, restoring or "tweaking" the original color, "highlighting" or truly transformative color services, color can improve hair texture and strength, and increase confidence as much as good makeup. Clients receiving color services tend to visit more frequently than other types of clients and spend more money each time, using both services and products. Because application time is typically brief, there is a potential for substantial profits. Additionally, to maintain their look and address new growth, clients have a strong incentive to stay timely about services.

While the demand for skilled colorists grows, most come out of school rank amateurs in the art of science and color, and many are rightfully fearful of making mistakes. Above all, hair coloring requires technical precision, and the only way to become an expert is by doing it many times. Stylists should find a good resource for hair samples and testing materials and practice, practice, practice. The best hair colorists have done it a million times and have learned from failures as well as successes. Running your own experiments will increase your skills as well as your confidence in the results.

The function and ingredients in home hair color products and those found in the salon are essentially the same. The major difference in home hair color versus salon color is the expertise of a professional colorist who is able to custom blend a specific color and control the amount of hydrogen peroxide or other products used. Through experience, the stylist learns how the process will affect hair color and quality, and how long or short a time to process the color.

Careful reading is essential to successful hair coloring, starting with the critical information in product directions and manufacturer's information. One can also "read up" on new hair color developments and the latest technologies in magazines and on the Internet. Artful hair coloring is enhanced by reading and doing. Not only can you find information about getting the best results with specific products, such as details on how to mix and apply hair color, you also can see photos of the results. The more you learn about hair color, the more valuable your services and the more your clients will appreciate you. Let your clients know that the magic is not just in the materials, but also in the expert choice of product and application. Clients know little about their options in hair color products and services. You provide that knowledge. And as an experienced professional, you are able to maximize a good product.

New do-it-yourself products are both a boon and a burden. Many clients may try to color their own hair with varying results. You may have to correct a client's mistake. Your knowledge and abilities will ensure that the client's money is well-spent, and you'll find your confidence stretched with each success. Coloring accidents can be a nightmare – but great color correction can make you invaluable to that client. Remember, the product is only one part of the equation (and not the most important part).

This course will help you increase your value in the color equation. Instead of living in fear of hair coloring disasters, you might even get a reputation for correcting them. To really understand how color works, you need to have a basic understanding of a number of topics, which will be covered in this chapter:

- The laws of color (color wheel), including primary, secondary and tertiary colors.
- Color levels and tones.
- The chemistry of artificial hair color.
- How to formulate a target color.
- Hair coloring products and how they differ.

We start, however, with a solid understanding of hair structure and natural color.

Glossary

Acid: Having a pH level below 7.0. A substance with molecules that release hydrogen ions into water and combine with bases to form salts. Turns red litmus paper blue.

Alkaline: Having a pH level over 7.0. A type of compound that reacts with acids to form salts and with fats to form soap. Turns blue litmus paper red.

Amino acids: Organic compounds that make up proteins.

Ammonia: A strong-smelling gas. Ammonia is mixed with hydrogen peroxide to activate the oxidation process, which opens the hair cuticle.

Ash: A hair color with tonal qualities of green, blue or violet, lacking in warm tones.

Bleach: The product or action of removing color or stains; alkaline compound that removes color.

Cap method: A disposable rubber cap used to highlight or lowlight; hair is pulled through and selectively colored or bleached.

Ceramide II: A lipid compound that provides saturated and unsaturated fats to the hair and bulb.

Cool: A color lacking warm tones, ash.

Corrective base: A color and its opposite, used to neutralize a tone that is too warm or cool.

Deposit: Positioning hair color at a specific point in the hair shaft.

Developer: A type of peroxide used in hair products to open the cuticle, allowing new pigment to enter.

Enzyme: An organic protein catalyst that accelerates specific chemical reactions.

Filler: Hair color solution that equalizes porosity differences along the hair shaft to allow color to deposit more evenly. Often used to correct or neutralize poor tonal quality in the hair.

Foiling: A method using aluminum foil to selectively color strands of hair; used to multicolor hair.

Highlights: Selectively lightening strands of hair two or more levels above the rest of the hair. Highlights can be any tone or level.

Keratin: A water-soluble, resistant protein found in nails and hair.

Level: How light or dark a color is; ranging from level 1, black, to level 10, pale blonde.

Lift: The amount of lightening or bleaching occurring with a product; to lighten.

Lighten: Removing tone or color from the hair with bleach.

Lowlight: Adding darker sections of hair to give hair dimension and break up highlights.

Melanin: Natural color pigment in the hair.

Natural: The original color of the hair, without the use of any hair products.

Neutralize: To balance an action or color.

Oxidize: To transfer oxygen to another substance.

pH: The percent of a solution that is acid or alkaline; a measurement of potential hydrogen.

Porosity: Hair's ability to absorb liquid.

Pre-lighten: To remove color in the hair before applying a different color or tone.

Resistant: Hair that is nonporous with a very compact cuticle that prohibits moisture from entering it.

Saturation: The level of color in a hair color product.

Strand test: A test to assess processing time for hair.

Tone: The base of a hair color, or degree of warm or cool colors in hair.

Toner: A hair color applied to damp hair for a matter of minutes that neutralizes yellow tones.

Tri-color: To apply three colors to the hair; typically used with foil.

Volume: In regard to developers, the level of oxygen in a hydrogen peroxide solution. Higher volumes correspond with greater strength.

Warm: A hair color with tonal qualities of red, yellow or orange.

Hair structure

A single hair has many layers and sublayers, but three main parts: the medulla, cortex and cuticle. The medulla is at the center of the hair shaft, but does not exist in every type of hair. Thick or course hair is more likely to have a medulla, while fine or lighter colored hair will not. Around the medulla is the cortex, the inner layer which gives the hair its color and strength. The cortex is surrounded by a cuticle (much like the cuticle on your finger that holds the nail in place), which expands and contracts as the hair absorbs and releases water.

Hair is composed of keratin (a protein), melanin (a pigment), carbohydrates, lipids and trace quantities of metallic elements.

Cortex

Most of the hair's mass (80-90 percent) comes from the cortex, the inner layer of cells that give hair its strength, flexibility and color. The cortex is made up of hard keratin, a protein composed of 19 amino acids, which link to create polypeptide chains ("poly" means many) that run the length of the hair. Polypeptide chains are connected to one another transversally (cross-linked, like a big chain link fence) by three different kinds of peptide bonds (disulphide, hydrogen, and ionic). Peptide bonds are extremely significant to hair styling, as breaking and reforming these bonds are what allows hair to be "sculpted" or shaped a specific way.

Each of the three types of peptide bonds is associated with different qualities. Hydrogen and ionic bonds, for example, are easily broken, then reformed through the use of water and shaping tools such as curlers and dryers. Disulphide bonds, in contrast, are very strong, and cannot be broken with water. Instead, specific chemicals must be introduced to break and reshape these bonds.

Cuticle

A human hair typically has six to eight layers of cuticle. The overlapping cells appear like shingles on a roof [see Figure 1], with each individual cuticle attached to the cortex. The cuticle is clear, showing the color of the cortex beneath it. Without the hard cuticle to protect it, the cortex might easily be damaged.

Figure 1: Cuticles on a hair strand

Natural hair color

Melanin is produced at the root of the hair, within granules called melanosomes that release and deposit color into the hair's cortex but leave the cuticle transparent. The color of pigment in the melanosomes, as well as their quantity, density, and shape, determine the appearance of hair color.

The color of each strand of hair is a function of how much melanin it contains, what kind of melanin it is, and how it is distributed throughout the hair shaft. The darkest hair contains larger melanosomes and more melanin. Black hair has the greatest concentration of melanin granules, with brown hair having somewhat less; red hair, even less; and blonde hair, the least of all. Hair color may also change during the teen years, naturally darkening blonde, red or light brown hair because of increased melanin production during those years and the resulting higher pigment density. Gray hair has very little melanin, while albino hair, which is pure white, has no melanin.

There are two primary types of melanin: eumelanins (coming from eumelanosomes), which are black and brown; and pheomelanins (coming from pheomelanosomes), which range from reddish brown and reddish yellow to yellow. A third type of melanin, called tricochromes, occurs rarely in hair but produces the yellow/red pigment found in carrot-colored hair. Americans of Asian or African descent are more likely to contain eumelanin in their hair than other individuals. Most hair contains both eumelenin and pheomelanin in varying amounts and patterns of distribution.

Graying hair

As a person ages, the number of melanosomes decrease, and they produce less melanin, resulting in graying of the hair. Graying usually begins at the temples and extends to the top of the scalp. Hair becomes progressively lighter, eventually turning white. When an individual gets gray hair is genetically determined.

All about color

How we perceive color is an integral part of understanding how color works. Physiologist Ewald Hering (1834-1918) was the first to theorize how the eye and brain perceive color. Expanding on ideas proposed by Goethe and Schoepenauer before him, he conceptualized the oppositional nature of red/green and blue/yellow perception. Figure 2, below, is a two dimensional representation of this opposition.

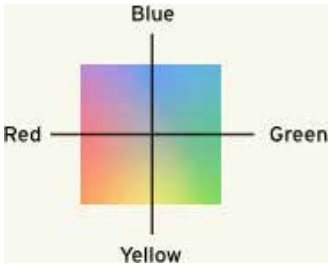


Figure 2: Opposition in color perception

The opposition of these colors is the foundation of color vision. When we look at something, our visual nerves register color in terms of three main attributes:

- The amount of green versus red.
- The amount of blue versus yellow.
- The amount of light or brightness (reflected light).

Three signals, corresponding to the three color attributes, are sent to the brain. Color nerves sense green or red, and blue or yellow, but not both at the same time. Because these color attributes are opposites, like hot and cold, more red means less green; more yellow, less blue.

Color and light

Brightness" or "luminosity" refers to the intensity of the color. This is the third attribute of color the eye and brain are designed to perceive. Brightness is reflection, a feature of light. Light reveals color, which cannot exist without light. You may notice objects appear subdued or lack color when viewed in a dark room, compared to when the light is on.

Our eyes see the reflection or absorption of a certain amount of light as color. Black is the absence of all light or the absorption of all light waves, while white is the combined reflection of all light waves. An object looks blue to us because it reflects light with a blue wavelength and absorbs all other wavelengths in the spectrum: red, orange, yellow, green, blue and violet. The color of hair we perceive is actually the reflection of light off the color pigments in the hair's cortex. That is one reason hair looks very different in different types of light.

Spectrum

When white light is viewed through a prism, it is split into its component wavelengths, separating into a rainbow of colors. When sunlight is bent as it moves through raindrops, a similar effect occurs, producing a rainbow. The group of colors viewed with a prism or in a rainbow is called the color spectrum. These colors always appear in

the same order: red, orange, yellow, green, blue, indigo and violet [see Figure 3].

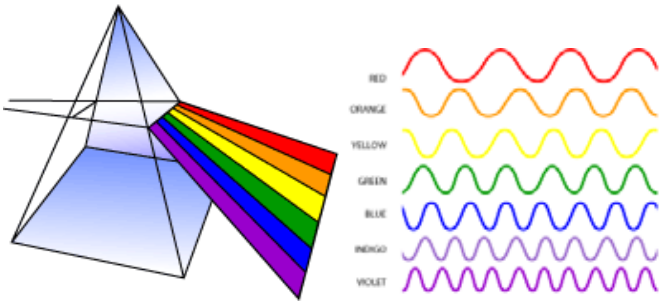


Figure 3: Light passing through a prism

Each color corresponds to a different wavelength of the electromagnetic spectrum. When all the waves are seen together, they make white light. Within the visible spectrum, red has the longest wavelength and violet has the shortest wavelength. There are also colors at each end of this spectrum of white light that our eyes are unable to see. Ultraviolet light, for example, is the spectral wavelength next to violet, which we are unable to see with the naked eye. Infrared light is also invisible to us [see Figure 4].

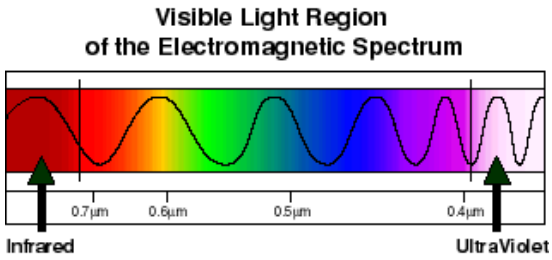


Figure 4: Visible and invisible light spectrum

The color wheel

The color wheel is a circular representational chart of how we see color that can be a useful tool in understanding the way color works. Many different versions of color wheels are used for different purposes. The color wheel presented here was developed in the 1700s, using a theory of primary colors. You can easily experiment with watercolor paints or food coloring (or clay – Play-Doh works!) to demonstrate these principles for yourself. Remember, however, hair color is not paint. It does not go on a white canvas, but a head of hair, with pre-existing pigmentation that must be taken into account.

Primary colors

Three colors make up all the colors in the world: red, yellow and blue. These are the primary points of a color wheel, often portrayed in a triangle, like this [see Figure 5]:

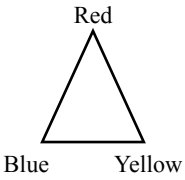


Figure 5: Primary colors

Secondary colors

Combining two of these primary pigments or colors in equal measure creates a secondary color. Three combinations make up the three secondary colors: equal parts of red and yellow make orange; equal parts of yellow and blue make green; and equal parts of blue and red make purple (also called violet) [see Figure 6].

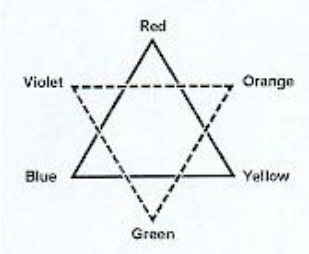


Figure 6: Secondary colors

Tertiary colors

Tertiary colors are formed by mixing equal parts of one primary color and the secondary color next to it. The six tertiary colors are blue-violet, blue-green, yellow-green, yellow-orange, red-orange and red-violet (although they may be called by different names). These tertiary colors form six new complementary color pairs – each tertiary is directly opposite from another tertiary color. They also divide the color wheel into twelve equal color points around the color circle.

Warm and cool colors

If you divide the color wheel into two halves, separating purple (violet), blue (indigo) and green on one side, from red, orange and yellow on the other, you distinguish the cool colors from the warm [see Figure 7]. Warm colors, which show red and yellow, get their name from the "heat" they seem to radiate; cool colors (also called ash or drab) show no red or yellow. Mixtures of cool and warm colors can produce both cool and warm outcomes. Red violet is a cool red, while red orange is a warm red. Note that warm and cool colors meet at some point, so while yellow is warm and green is cool, a yellow or greenish tertiary may be either warm or cool. The more warm a tone is, the less cool it can be, and vice-versa.

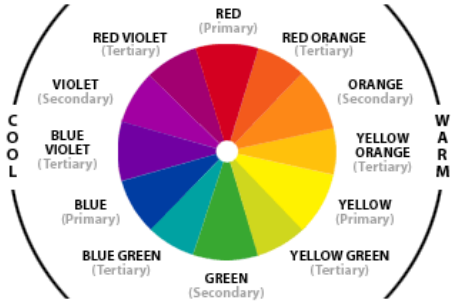


Figure 7: Warm and Cool Colors

In hair coloring:

- Blue, black, drab and ash refer to cool tones.
- Gold, red, orange and yellow refer to warm tones.

Complementary/contrasting colors

Complementary or contrasting colors are those colors that sit opposite one another on the color wheel: Red ←→green; violet←→yellow; and blue←→orange [see Figure 8, which indicates the complementary pair of red versus green]. When one of these colors is mixed with the other, the result is a neutral tone. Note, in each pair, one color is warm and one is cool. This is another way complementary tones "cancel out" one another. In each pair of complementary colors, one of the colors is a secondary color and the other is a primary. When two complements combine, all three primary colors are mixed.

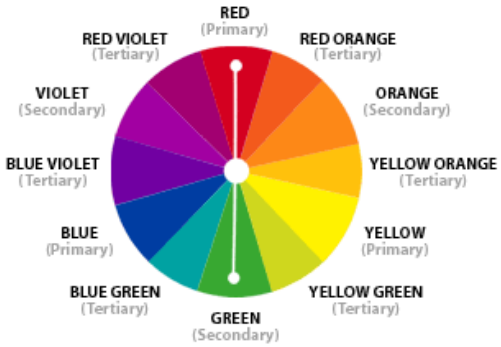


Figure 8: Complementary colors

Complementary colors neutralize or even one another out when combined. Looking at the color wheel, it makes sense that a mixture of complements creates a neutral tone, as primaries combine to neutralize. Green, for example (a combination of yellow and blue), is reduced or eliminated by red (the missing primary). Orange, a combination of yellow and red, is reduced or eliminated by blue. This neutralizing effect is critical in hair color science. One might use blue to neutralize a brassy orange tone in hair. This kind of corrective color is referred to as balancing, toning or neutralizing an undesirable hue.

The perception of warm and cool tones is important when it comes to hair and skin tones. Some people look much better in warm tones, others in cool. Some of these effects are cultural, some a function of optics (for example, warm colors appear closer, while cool colors seem further away). Neutral colors may look softer than bright colors. Remember that color is very subjective. Not only is our perception of it influenced by personal meanings and social significance, it appears very different in different kinds of lighting.

Good lighting in a salon is essential for good hair coloring. You need to see the client's current hair color as clearly as possible in order to produce the desired result. The best light for analyzing hair color is indirect natural daylight. Direct light tends to emphasize yellow and orange tones, while low light makes colors muted. The walls in your salon also absorb and reflect light. Certain colors are much more flattering to skin and hair tones – something to consider when you redecorate.

HOW HAIR COLORING WORKS

Level and tone

What we perceive as hair color is really a subtle mixture of many colors that can be categorized by level and tone. Level refers to the degree of lightness or darkness of the hair and is a function of the degree of reflectivity of the hair. Each level is one degree lighter or darker than the one next to it. Level measures are typically 1 through 10, with 10 being the lightest and one the darkest. Each brand or company uses a slightly different system to indicate each level. In other words, Company A's level 3 may be slightly different than Company B's level 3, but both companies use a 1-10 measuring system that progresses from lowest (1, the darkest) to highest (10, the lightest). [See Figure 9 for an example of one company's system.]

Color Level	Degree of Darkness/Lightness	Field
1 2	Black Brown Black/Darkest Brown	Dark
3 4 5 6	Very Dark Brown/Dark Brown Dark Brown/Light Brown Medium Brown/Light Brown Light Brown/Dark Blonde	Medium
7 8 9 10	Dark Blonde/Medium Blond Medium Blonde/Light Blond Light Blonde/Very Light Blonde Very Light Blonde/Lightest Blond	Light

Figure 9: Color levels and degree of lightness or darkness

A level is determined by its darkness or lightness. It may also be referred to as saturation, density or concentration of color. All colors at the same level have the same lightness or depth, without the richness of tones (discussed below). When you consider how a color film or picture looks in black and white, you are seeing levels of color, not tones. The missing reflected colors are tones.

While the level system is universal (in that it is used worldwide), there are two main variations to it. Some companies have one or two more levels than the 10 shown here. In those cases, the highest value (typically 11 or 12) will be the lightest that they make (one is still the darkest). Remember, color levels do not match across different manufacturers.

The first hair colors used the shade system, which measures the tonal value of the hair. Those familiar with the shade system should know that about three or four shades are equivalent to one level of the level system. If you are using a product and the level is not apparent, you may have a product that uses the shade system. Most technicians prefer the level system, once they get used to it, for its consistency, and ease of use. The level system formulation is much more cut and dried, with fewer steps and unknowns. Its increased predictability of results will make you more confident about the process.

Tones

There are a number of different ways to conceptualize or describe tonal value, or tones. The level system usually uses letters to refer to tonal value. In some cases, tone is the main pigment in a series of color products that vary by manufacturer. Hair tones are primarily natural or neutral, red, gold, or ash. These are usually abbreviated "A," for ash, "N" for natural or neutral, "G" for gold, "R" for red, and "S" for silver. Every color can be categorized as both a level and a tone.

While each manufacturer develops its own tonal systems, many conceptualize all hair color as a variation on brown, with warm tones like gold, yellow or auburn, and cool tones like ash [see Figure 10 for a chart of tones and levels]. Hair with red and golden highlights is warm in tone, while ash highlights produce a cooler tone. Learning to see the level and tones making up hair color takes time, but is critical to successful coloring.

Coolest ⟵ Neutral/Natural ⟶ Warmest

Black/Blue/Ash Pigment --------Yellow (Golden)/Orange/Red Pigment

Lightest Ash Blonde	Lightest Natural Blonde	Level 10	Lightest Golden Blonde	Lightest Reddish Blonde
Very Light Ash Blonde	Very Light Natural Blonde	9	Very Light Golden Brown	Very Light Reddish Blonde
Light Ash Blonde	Light Natural Blonde	8	Light Golden Blonde	Light Reddish Blonde
Medium Ash Blonde	Medium Natural Blonde	7	Medium Golden Blonde	Medium Reddish Blonde
Dark Ash Blonde	Light Natural Blonde	6	Dark Golden Blonde	Dark Reddish Blonde
Lightest Ash Brown	Lightest Natural Brown	5	Lightest Golden Blonde	Lightest Reddish Blonde
Light Ash Brown	Light Natural Brown	4	Light Golden Brown	Light Reddish Brown
Medium Ash Brown	Medium Natural Brown	3	Medium Golden Brown	Medium Reddish Brown
Dark Ash Brown	Dark Natural Brown	2	Dark Golden Brown	Dark Reddish Brown
Black/Blue/ Ash	(Absence of blue/black/ ash)	1	(Absence of blue/black/ ash)	(Absence of blue/black/ ash)

Figure 10: Chart of tones and levels

Each manufacturer develops its own system for defining colors in each level (color lines). Ashes, gold, red and natural or neutral are the most common. But be aware that one company's "auburn" is not another company's "auburn."

Some systems divide natural hair colors into four or five categories, such as:

- B (black and dark brown): Usually encompasses levels 1 and 2; in some cases, 3 may have reddish highlights; hair typically darkens throughout life then turns gray.
- W (warm brown): People born with blonde hair that darkens through childhood and young adulthood. Tends to lose some of its warmth and dimension before graying; Undertones are still there, even with graying hair; a good candidate for highlights; usually encompasses levels 5-10.
- L (Light brown): Those born with blonde hair that stays blond until the person is about 10, when it gradually darkens to a light brown. Light or soft brown category usually encompasses level 5 or 6.
- R (Red): Those born with red hair that stays that color until young adulthood. Hair usually begins darkening noticeable in the teens. Hair tends to lose warm tones with age. Red usually encompasses 5-7.
- Blond: Blond hair usually encompasses levels 8-10. This group of people often highlights their hair or start to lighten when their hair begins to darken naturally.

It is important to remember that all tones are the result of a combination of the three primary colors: red, yellow and blue. Mixed in unequal portions, these colors create a neutral or brown tone; more red or yellow makes the brown warmer; more blue makes it cooler. The mixture of two complementary colors also creates a color with all the primary colors in unequal amounts, making brown (browning or neutralizing a color). The terms natural and neutral are sometimes used interchangeably in discussions about color.

Tonal intensity refers to the degree of warmth or coolness in the tone. Warm colors reflect more light than cool colors, appearing brighter and more luminous. Much of how we perceive hair color is a function of that reflectivity. As noted earlier, cool tones have an absence of red and yellow; warm tones contain the presence of red and yellow. Intensity is important in relation to coloring gray – the more intense colors are inappropriate for white or gray coverage. Products vary in intensity, with the richest colors (concentrates) at one end of the spectrum; they are typically not meant to be used alone at full strength.

Much of what we do in selecting desired or target hair tones is express what we don't want in our hair color – how to neutralize the things we don't like. In choosing to enhance a color, you can use a color whose base is on the same side of the color wheel (adding to that color), or choose to neutralize it by adding a color across the color wheel. Remember, colors are not uniform to everyone; what's red to you may look orange to someone else. Because the way we see color and light varies by individual, it is best to use all resources at your disposal to identify current color and desired (target) color.

Hair color products

Hair color products are primarily defined by how long the color change lasts.

- **Temporary**: Uses surface-acting direct dyes that coat the hair and wash out; does not use a developer (no oxidation process).
- **Semi-permanent**: Uses direct dyes that stain the cuticle and outer cortex: no developer (no oxidation process).
- **Demi-permanent**: Uses indirect dyes; uses developer (oxidation process); deposit only; no lightening or lift.
- **Henna**: Uses semi-permanent vegetable-based dye that can coat hair (no oxidation process).
- **Deposit only**: Indirect dyes; used to make hair darker or brighter and cover gray; uses developer (oxidation process) to deposit pigment in the cortex; can be used as color filler.
- **Permanent hair color**: Indirect dyes; uses developer (oxidation process) to lift natural pigment and deposit color.
- **Bleach**: This term is used loosely to refer to any product that lightens hair, but usually refers to color removers that are mixed with hydrogen peroxide. Bleaches use oxidation and are capable of lifting natural melanin as well as artificial pigment.

Temporary

These products are surface-acting; they coat the surface of the hair, changing its appearance, but do not alter pigment or enter the hair's cortex. These products are typically water-based and wash out in a single shampoo or two (depending on the formula). Temporary products include color rinses and shampoos as well as colored styling and finishing products Temporary products applied to damp hair tend

to be absorbed unevenly by the hair, settling into the cuticle scales where the hair is most porous, and rinsing away from resistant patches. Eventually, this adhering color can build up in hair, with the potential to interfere with or affect other types of hair color treatments.

Temporary colors are most often used to enhance the more enduring color products (like semi-, demi- and permanent colors). Temporary products are a great way to try out color for the first time, a gentle introduction for people who are a little timid about changing their color. They are also great for fun effects with styling and finishing products – similar to makeup – providing a little accent of color.

Temporary colors are often used in corrective coloring, either as a stopgap measure if there is no time for permanent color, or to address tonal issues. Temporary color can also be used to maintain tone in highlighted, lifted or bleached clients and eliminate unpleasant tones. Clients prone to fading may benefit from a pigmented shampoo or conditioner, rather than filling and toning. Custom shampoo color can also be developed especially for color clients.

Perhaps the most common functions of temporary color are to tone or neutralize the yellow tinge of some white or gray hair, or to apply to overlightened hair. In cases where there is bleaching or extensive corrective color and the scalp is sensitive, a temporary color may be used where the scalp or hair is too sensitive for oxidative processes. Because temporary products can cause permanent staining, they should be used with the same care and precision as permanent dyes.

Temporary dyes may be labeled acid, basic, D&C, and FD&C dyes. They are made of pigment (certified color) in a base (liquid, gel and so on). Because temporary colors work without causing any chemical changes to the keratin or other parts of the hair, they are less harsh. The hair looks healthier because it is coated with a color that absorbs and reflects light differently than the original color. Eventually water or other ingredients wash off the hair, returning it to its natural color. Although they coat the hair temporarily, they do not damage hair and can improve the look and feel of hair as well as provide color, especially when used with conditioning agents.

Too much temporary product, however, coats the hair, reducing its natural shine and making the color look dull or fake. In some cases, temporary products become unevenly permanent, tending to sink into hair more if heat (hair dryer, iron or others products) is applied. Extremely porous (damaged) hair will remain colored by the material longer than healthy hair. Overporous ends, in particular, are the most likely to show the excess color. Because these dyes are water soluble, they can be affected by the amount of moisture in the air, or even perspiration. Also be aware that hair near the scalp (if it is oilier) may not coat as easily with the product.

Temporary colors do not require a patch test for potential allergic reaction – although some people may react to these dyes with allergic symptoms. Read manufacturers' directions regarding temporary product removal. Oil-based removers, clarifying treatments/shampoo, or other treatments may not all be equally effective. Some temporary dyes require peroxide or bleach to decolorize effectively.

Semi-temporary color is included as an ingredient in some color shampoos, mousses and styling products. It is not exactly temporary but not exactly semi-permanent (and may last longer than one expects!). Semi-temporary products are sometimes referred to as color and shine products (including glazes) and vary enormously by manufacture in degree of penetration. While heat makes the color more enduring, the quality of the hair and maintenance routine also influences the result and length of endurance significantly, especially in multiporous hair. The manufacturer can give you some idea of the product's degree of endurance, but it will vary by individual.

Semi-permanent

These products work by staining the cuticle of the hair. The critical factor defining these products is that they utilize direct or "preformed" dyes, which do not require a developer to deposit color. With no developer or oxidation to drive the process, the color typically stains the cuticle, and less commonly, some of the cortex. Semi-permanent products are often alkaline, causing the hair to swell and increase absorption of the product. Like temporary dyes, they tend to stain the hair where it is more porous, leaving the hair unevenly colored, but less so than earlier versions of the products. Evening out hair porosity is critical to producing even color intensity and staying power. Greater porosity means more color. Semi-permanents do wash out over time, but may leave some color residue behind. Semi-permanent products are unable to lift or lighten color.

Initially developed to cover small amounts of evenly distributed gray (no more than 25 percent, typically), semi-permanent products work well for that purpose, and can create a warm highlighted look with the right tone. Ash tones can be used to attractively whiten gray hair that has a poor tonal quality. Very light semi-permanent color can produce a blonde tone for individuals who are mostly gray. Because these products fade, they are more often used to introduce color than more permanent dyes. Semi-permanent products do, however, produce a demarcation line (the point where new growth meets old color). The more color that is left in the hair, the more it will contrast with new growth, and the more noticeable it will be. Similarly, the more gray in the hair, the more obvious the demarcation.

Dyes are typically categorized as semi-permanent if they do not lighten the natural color of hair (deposit only). Semi-permanent colors are also called direct colors because, like temporary colors, the color does not occur through a chemical change. Semi-permanent color (direct dyes) lasts through about four shampoos. While it penetrates the hair more than temporary coloring, it does not leave as obvious a regrowth line as it fades with repeated shampooing. Semi-permanent products include traditional semi-permanent (aniline derivatives that both coat and penetrate the hair) and polymers (certified dyes that coat, but do not penetrate). Semi-permanent color is deposit only and does not lighten, but it can be used to brighten an existing color or tone.

Semi-permanent or direct dyes may be labeled as HC dyes, nitro dyes, acid dyes or disperse dyes. Traditional dyes usually use neither developer (hydrogen peroxide) nor ammonia, and require no mixing. Clients allergic to permanent hair coloring can often wear traditional semi-permanent coloring, although a patch test is necessary. Direct dyes, used alone, penetrate only the outer layers of the cortex, with a first application that lasts from four to six shampoos. They last longer than temporary color, but not as long as permanent colors. In some cases, semi-permanent colors may take longer than four to six shampoos to fade, especially in the case of repeat applications, which penetrate further than the first application, and over time may even cause a regrowth or demarcation line.

Porosity influences the degree of deposit (intensity) and the endurance of the color, so great variation in porosity of the hair can be a problem. Semi-permanent colors may produce uneven results, selectively coloring different parts of the hair different colors. It is common, for example, that a chestnut brown has porous ends that absorb larger amounts of green than a colorist bargained for. Using a mix of different dyes selectively on one head of hair can often produce a more even, natural coloring effect.

Semi-permanent color can give the effect of highlighting on individuals with about 25 percent evenly distributed gray hair. Semi-permanent color can also be used on higher percentages of gray to make it appear blonde. While some semi-permanent colors are excellent for covering gray, others are less effective. Traditional semi-permanent color is a good way to try out the coloring process as the color appears brighter, fades gradually and leaves no color line. The

easiest traditional semi-permanent colors require no mixing before use. If you want all the hair to be one color, choose the color at the level of the darkest natural color on the head.

To increase permanence, color must be able to penetrate the cortex. Referred to as "increasing color affinity," it means increased binding of the color to keratin in the cortex. There are a number of ways to encourage this process. Characteristics such as smaller size color molecules and the use of alkaline agents allow the dye to penetrate further. Raising the pH level lifts and swells the cuticle, allowing deeper color penetration. When these other tools are used, the semi-permanent is typically called a long-lasting, semi-permanent dye.

Long-lasting semi-permanent

Color endurance (how long it lasts) depends on hair texture, porosity (more porosity equals more deposit), and the amount of heat applied, as well hair maintenance routine, including the choice and frequency of shampooing. Slightly porous hair typically produces somewhat better coloring. Long-lasting, semi-permanent color was initially developed to blend gray, which is probably its most common use. It works effectively to deposit color for clients who want to conceal a small amount of gray, but are not ready for the commitment of permanent hair color.

Long-lasting, semi-permanent colors tend to be gentler to the hair than permanent oxidation colors, which are able to lift color. Hair decolorization requires a higher pH and higher concentration of hydrogen peroxide. Long-lasting, semi-permanents are usually less alkaline than permanent colors and are combined with a low volume developer. Always follow any application of alkaline products with a mild acid shampoo and conditioner or rinse, to neutralize alkaline residue and restore normal pH.

Demi-permanent

Some semi-permanents are actually oxidizing hair colors, a new category called demi-permanents, which contain indirect dyes. The development of demi-permanent colors was an attempt to address deficiencies of semi-permanent colors, to make them less sensitive to porosity, and deposit more evenly: a semi-permanent dye with a developer. Demi-permanent colors do perform better than traditional semi-permanent colors, with an enhanced degree of penetration, more even deposit and coverage, more natural looking color and longer endurance, and they are less subject to varying porosity. Demi-permanent colors produce more color on unevenly porous hair, are great at covering gray and can even look like highlighting on evenly distributed gray hair (25 percent). They can also be used in many of the same ways semi-permanent colors are used, but last longer.

Both long-lasting, semi- and demi-permanent dyes can be used for corrective coloring, to improve tone, darken lighter ends, tweak highlights, correct excessive highlighting or even out patchy color. Many long lasting, semi-and demi-permanent dyes can be used as fillers, to condition and plump hair, increase its shine and body, and make it appear full and healthy. Traditional semi-permanents are usually best for a little gray, while demi-permanent colors should be used for coverage of more gray.

Long lasting semi-permanent and demi-permanent colors use a variety of different alkalizing agents, including ammonia, to swell the cuticle, soften hair and increase absorption. They also use oxidizing agents, such as hydrogen peroxide, among others. While these non-ammonia products claim to be milder than other alkalizing agents or oxidizers, the active ingredients in these products are still capable of damaging hair.

Nonoxidizing permanent color (henna)

Nonoxidizing permanent colors include natural products like henna, botanical dyes that are heat-activated and produce no lift. Henna and products like it can be used to coat as well as penetrate hair. Some of these natural vegetable dyes have been used to color hair for thousands of years. Generally, the dried plant is combined with water to make a paste that's applied to the hair, which turns dark hair an auburn color.

Henna contains tannic acid, which increases hair stiffness. This may act to improve the texture of fine hair, but can make hair dry if used repeatedly. Henna fades slowly with shampooing. It is best used on dark hair and can turn bleached hair greenish. Henna also can interact with other chemicals in the hair. It bonds well with salt bonds in the cortex of the hair, so builds up on the hair's surface and the cortex, which act as a barrier to permanent wave applications. Nonoxidizing permanent colors are not recommended for gray coverage because the colors tend to look too bright on gray hair.

Oxidizing permanent hair color

The best identifying characteristic of permanent oxidation colors is the capability to lift melanin as well as deposit permanent color. These products vary significantly by manufacturer and type. The main components of permanent color are pigment, base, alkaline substance and hydrogen peroxide. The old name for permanent dyes was "penetrating tints" because they penetrate the cortex. Permanent hair coloring will always show a demarcation line growing out. Oxidation colors are the only ones able to lighten or lift natural pigment (melanin). Oxidation colors may be creams, gels, shampoos, oils or waxes. The kind of base typically determines the final form of the product (liquid, gel, cream, etc.). Cream developers are emulsions of hydrogen peroxide, water and other agents that thicken the developer or act as conditioners.

Permanent hair color requires a patch test. Many consider PPD (short for p-Phenylenediamine, a common ingredient in permanent hair color) the leading cause of hair color allergic reactions. This compound is used in almost every permanent hair color brand and may be labeled as paraphenylenediamine, paratoulenediamine, phenylenediame, dihydrochloride, benzenediamine dihydrochloride, metaphenylenediamine, paraaminophenol, and aminoaniline dihydrochloride, among others. Darker colors usually mean higher concentrations of PPD.

All of the various PPD derivatives may cause allergic reactions in chemically sensitive individuals. When PPD makes contact with the skin, it may cause rashes and contact dermatitis. Eye contact may cause irritation, redness and pain. Chronic exposures to PPD may affect kidney or liver function and can cause bluish discoloration of the lips or tongue. See patch testing, below, for more information.

Bleaches/lighteners

The terms “bleaching” and “lightening” are used interchangeably, but mean different things to different people. “Bleach” typically refers to color removers mixed with hydrogen peroxide, but hair lighteners (bleaching products) come in many different forms. They may be found in shampoos and pastes, creams, gels. All bleaches use oxidizers, but affect hair in different ways.

Stylists use three main kinds:

- Cream bleaches for on-the-scalp lightening (cream bleaches are slower and milder bleaches; they are used in areas where body heat tends to dry the product more quickly).
- Off-the-scalp bleaches, which use buffers that boost bleaching power but produce fewer negative effects on the hair’s condition.
- Off-the-scalp products, like foils, weaves, and frosts, which utilize powdered bleaches. Powder bleach lifts color more quickly than cream bleach.

A number of terms are commonly used to refer to blonde color processing. “High-lift blonde” is used to refer to significant lift or lightening, up to four or five levels. In general, use caution when moving more than two levels lighter as it is increasingly difficult to maintain healthy hair. To get a consistent all-over blonde, you must start with even porosity and no color residues from previous hair coloring to throw things off. High-lift colors can leave the hair brassy; to increase the platinum and decrease the brass, you’ll need to “bleach and tone.” That means lightening the pigment (levels), and toning the resulting color, sometimes in a single process. Level-on-level toning is a process where the target level of artificial pigment corresponds to the level of natural warmth in the hair.

The chemistry of hair color

Some hairstyles are the result of physical changes, such as those where hair is softened (with water or other ingredients) and physically shaped to a wave or curl. In a physical change, no new substance is formed and the process is reversible. Examples of temporary physical changes to hair are shampooing, setting or styling hair. Temporary hair color is also the result of a physical change in which temporary hair color molecules stain the surface of the hair. The chemical structure of the hair stays the same. No new chemicals are formed. In oxidation hair color, a chemical reaction changes the structure of the dye molecules, as well as the hair, forming new chemicals and locking them into the hair structure. Chemical reactions cause permanent changes in hair that form new substances and are not reversible.

Many of the services performed in a salon, and all hair-coloring services, wouldn’t be possible without chemistry, so a basic understanding of certain chemical processes is essential to hair coloring. Both bleaching and tinting are examples of processes that are the result of chemical reactions that create new chemicals. Permanent hair color is an example of a chemical reaction in which dye is formed and driven into the internal structure of the hair.

The process for permanent hair coloring

Permanent hair coloring requires the following materials:

- The color product (pigment or dye).
- A developer (like hydrogen peroxide).
- An alkaline agent (like ammonia).
- Understanding the following concepts:
  - pH value.
  - Oxidation process.
  - Working volume (WV).

PH values

PH is a unit of measurement. Just as degrees measure temperature and inches measure distance, pH numbers measure the amount of acid or alkali in water-based solution. All solutions that contain water and products that dissolve in water have an acidic or alkaline (also called “basic”) nature.

The pH scale measures how acidic or alkaline a substance is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic, and a pH greater than 7 is alkaline or basic [see Figure 11]. Acidic and alkaline are two extremes that describe chemicals, just like hot and cold are two extremes that describe temperature. Mixing acids and bases can cancel out their extreme effects, much like mixing hot and cold water can even out the water temperature.

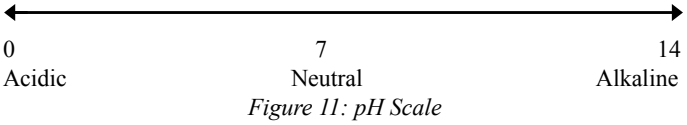


Figure 11: pH Scale

The “pH” of the scale refers to “potential hydrogen” or “parts hydrogen,” the strategy used to measure acidity and alkalinity. What is actually being measured is the concentration of hydrogen ions: Small “p” (quantity) of capital “H” (hydrogen ion).

Pure water is neutral, with a pH of 7. When chemicals are mixed with water, the mixture can be either acidic or alkaline. Vinegar and lemon juice are acidic substances, while laundry detergents and ammonia are alkaline. Chemicals that are very alkaline or very acidic are called “reactive.” These chemicals can cause severe burns. Automobile battery acid is an acidic chemical that is reactive, and household drain cleaners often contain lye, a very alkaline chemical that is reactive. [See Figure 12 for a table of common acidic and alkaline products.]

Product	**Approximate pH**
	Acid
Hydrochloric Acid	0-1
Lemon Juice	2
Hydroxide Neutralizers	3
Hydrogen Peroxide	4
Conditioners	3-6
	Neutral
Distilled Water (Neutral)	7
	Alkaline
Semi-Permanent Color	8
Soap	9
Lighteners	10
Tints	9-11
Ammonia	12

Figure 12: Table of product pHs

Each number on the pH scale is 10 times more alkaline or acid than the one next to it. A very small change on the pH scale is a big change in the concentration of hydrogen and hydroxide ions. A pH of 9, for example, is 10 times more alkaline than a pH of 8. A pH of 10 is 100

times more alkaline than a pH of 8. If you are using a product that is pH 6 or only one number away from acid balanced, it is actually 10 times less acidic, which is a huge difference. One number variation in pH will greatly affect the acidity or alkalinity of your cosmetic preparations.

When high pH products, such as alkaline permanent colors, come in contact with the hair, the solution is absorbed through the cuticle layer into the inner layer of the hair called the cortex. The high pH causes the cortex layer to swell. This swelling forces the rigid cuticle layers to be stretched. At this point, the hair is in a very delicate condition and vulnerable to excess stretching and breaking. This condition is necessary for permanent color to successfully deposit color molecules into the cortex of the hair for lasting color. A high pH is necessary for some chemical services to work properly.

Hydrogen peroxide

Often known as "developer," hydrogen peroxide is typically used in combination, diluted, with water. Different volumes of hydrogen peroxide refer to different concentrations, with higher volumes signifying more concentrated (stronger) solutions, and lower volumes signifying less concentrated (weaker) solutions. Hydrogen peroxide usually ranges from 10 to 40 volume, increasing or decreasing by increments of 10. Each individual volume or strength of hydrogen peroxide provides a different degree of lightening and has a specific use. The higher the volume (strength) of the hydrogen peroxide, the more oxygen is provided, and the more lightening (and less deposit) result. Always follow the manufacturer's recommendations to determine the right selection.

Hydrogen peroxide provides the necessary oxygen for oxidation in hair coloring. It is also a cause of much of the damage of oxidation colors. Use only the strength of developer necessary for the hair coloring effect you need. Using a higher strength of hydrogen peroxide risks unnecessary damage to the hair. The strength of a developer is expressed as either a percent or a volume. The volume is associated with the amount of hydrogen peroxide in the solution and its resulting strength in water. Three percent hydrogen peroxide is equal to 10 volume; 6 percent is equal to 20 volume; 9 percent is equal to 30 volume; and 12 percent is equal to 40 volume. (Twenty-volume hydrogen peroxide, for example, is a solution of 6 percent hydrogen peroxide diluted with 94 percent water [See Figure 13]).

% Hydrogen Peroxide	% Water	Peroxide Volume
3%	97%	10 Volume
6 %	94%	20 Volume
9%	91%	30 Volume
12%	88%	40 Volume

Figure 13: Strength of hydrogen peroxide solutions in water

Hydrogen peroxide is unstable, meaning that light, dirt, metals, oils and other contaminants cause the oxygen and water in it to break down prematurely. For its use in hair coloring, hydrogen peroxide is acid-stabilized to ensure that it doesn't decompose before you want it to. Metal utensils and containers will accelerate hydrogen peroxide's decomposition. Hydrogen peroxide should never be stored in sealed metal containers as rapid decomposition can cause rupturing of the container. Always store hydrogen peroxide according to manufacturers' instructions, in its original container, in a cool location.

By itself, hydrogen peroxide is a relatively slow way to lighten hair a little bit. Mixing hydrogen peroxide with a hair lightener that's alkaline will increase the pH of the hydrogen peroxide, releasing extra oxygen (just because it's oxygen being released doesn't mean it's not very dangerous; take special care to avoid contact with the eyes or breathing in the dust).

Alkalinity

Typically, ammonia (NH3), or a similar substance in permanent hair coloring, is used to increase alkalinity, making the cuticle swell, which allows color pigment molecules to penetrate the cortex and accelerate lightening. Both ammonia and alkanolamines can be used to increase alkalinity, but ammonia is losing its popularity as an alkalizing agent, mostly disliked for its strong, unpleasant smell.

Alkaline products are catalysts in the chemical reaction that occurs in hair coloring. A catalyst causes a chemical reaction, in this case, oxidation. Alkalinity accelerates the rapid decomposition of hydrogen peroxide, which speeds up the decolorization process. Its purpose in hair coloring is to cause lightening in the hair by releasing oxygen (which comes from the developer) to oxidize natural pigment.

The alkalinity, however, also serves another function, as it is instrumental in the formation of permanent hair color dyes. Alkaline products are usually housed in the same container as the dyes, with more ammonia associated with more lightening capability and less depositing of dye. The higher the hair color level, the more ammonia (creating lift) and the less deposit of pigment; The lower the hair color level, the less lift (and less ammonia) and the greater deposit of pigment. High-lift colors contain the greatest amount of ammonia, which work harder and for a longer duration than those in lower lift formulas.

Alkanolamines are a low-odor way to lighten that is replacing ammonia in some salons. They are organic alkali (containing carbon), without the volatility of ammonia, but also not as effective in all cases. Alkanolamines are formed by a chemical reaction that produces MEA, DEA and TEA, harsh chemicals that can be very hazardous even if they don't smell bad. Referred to as ammonia-free, it can still damage the hair like ammonia because it increases the pH of a lightener in the same way ammonia does. Modern color products use less ammonia now than before, which causes less damage and fading.

In permanent hair coloring, alkalinity neutralizes the acid stabilizers in the hydrogen peroxide, triggering the release of an oxygen molecule. This chemical process – the release of the oxygen molecule – is oxidation.

Oxidation process

Hydrogen Peroxide (H2O2 ; also called a developer), mixed with an alkaline substance like ammonia (NH3), causes a chemical reaction. This chemical process – the release of the oxygen molecule in the hydrogen peroxide – is referred to as "oxidation." This process both lifts color and deposits newly formed pigment.

The dyes in permanent hair coloring are sometimes direct, preformed dyes (usually the bright primary colors you see in the tube), but more often are aniline derivatives (also called indirect dyes, intermediates, and precursors), which require oxidation to color the hair. They begin the hair coloring process as small uncolored dye molecules, but through oxidation, become large and colorful dye molecules. Hair coloring requires each component: the indirect dye molecules, the oxygen from a developer (hydrogen peroxide), and the ammonia as a catalyst to begin the reaction for oxidation to occur, lifting natural color and depositing artificial color.

As soon as the separate hair coloring products are mixed, the reaction begins. This is why you need to mix quickly and work efficiently. Lift begins right after ingredients are combined, and begins to taper off after 10 to 15 minutes, or so). Oxidation is capable of lifting the natural color (melanin), developing new dye molecules, depositing the new color (pigment), and fusing it permanently into the hair structure.

Lift works most quickly right after application, while deposit processing accelerates near the end of the waiting period. Early removal can mean insufficient deposit of new color. If the oxidation process is slower than it should be, it can mean insufficient lift. The lifting power of the formula corresponds with the amount of oxygen in the hydrogen peroxide; a higher percentage of oxygen in peroxide, the more lifting power.

Oxidation colors typically have two parts and are not used directly from the bottle. Instead oxidation colors must be mixed with an activator or developer immediately before application. The color in the bottle is not the color deposited on the hair because each individual's specific hair color contributes to the final color that develops on the hair, and new dye molecules are formed in the chemical process.

The depositing capability of the dye is associated with the percentage of dye content in the hair color. Also known as "pigment weight," this refers to the amount of pigment concentration associated with each level of color. Darker colors mean higher counts of pigment weight. Level 1 (black) has a pigment weight around 250, while a level 10 blond may have a pigment weight of about 5.

Oxidation on a molecular level

The chemical reactions that produce permanent dye molecules are very complicated. Most of the raw ingredients used in hair color are colorless molecules called intermediates. They are able to penetrate the cortex and change their structure, through oxidation, to form large molecules that cannot escape the hair shaft, becoming fused into the keratin structure of the hair.

Specific chemical reactions must occur at exactly the right time, with as many as five or six different intermediates used to produce a specific shade. In the process of oxidation, lift (or lightening), the removal of natural color (melanin) in the hair, begins at the same time as the deposit process. The molecules in the hair shaft are attracted to one another (a function of the hydrogen peroxide), and cluster in the hair shaft.

Each primary color is associated with a specific molecular size and weight, and will interact with other primary colors in a characteristic way based on its particular physical properties. Within the hair shaft, blue molecules, which have a greater molecular weight and are larger than either red or yellow molecules, are located near the cuticle and remove most easily from the hair. When hair becomes oxidized by the ammonia in hair coloring, the hair shaft expands, allowing the large blue molecule to escape or dissipate from the strand of hair.

The second primary color is red. Its location in the hair shaft and its molecular size (smaller than blue but larger than yellow) make it more resistant to removal during the lightening process. Red molecules are deep within the cortex, requiring greater oxidation to allow the red molecules' release from the hair. Yellow molecules, which are found near the core of the hair shaft, are even more resistant to removal (producing the excess warmth seen in lightened hair).

The chemical reaction causes the intermediary color molecules to rearrange and lock together, creating new color molecule combinations. The final permanent color develops on and with the hair.

Working volume

When the color product is combined with developer, the hydrogen peroxide achieves a working volume (WV). Working volume is the actual volume of the diluted formula. Color systems typically use equal portions of color and hydrogen peroxide (2 oz color, for example and 2 oz hydrogen peroxide – using a 20-volume hydrogen peroxide) would yield a combination with a WV of 10 volume. The more hydrogen peroxide (developer) added, the higher the working volume.

The concept of working volume is critical to your coloring success. In cases where you need to adjust the volume or use two different volumes of developers, use equal amounts of each of the hydrogen peroxides; add the volumes (ex: 20 volume + 30 volume = 50 volume), then divide by the number you combined – in this case, 2. The resulting working volume (WV) is 25.

Figures 14 and 15 show how hydrogen peroxide is diluted by water to produce working volume.

Amount 100 Volume Hydrogen Peroxide (in ounces)	Amount Water (in ounces)	Total Quantity (in ounces)	Working Volume Hydrogen Peroxide
4	6	10	40 volume
3	7	10	30 volume
2	8	10	20 volume
1	9	10	10 volume

Amount 130 volume Hydrogen peroxide (in ounces)	Amount Water (in ounces)	Total Quantity (in ounces)	Working Volume Hydrogen Peroxide
5	11	16	40 volume
3.5	12.5	16	30 volume
2.5	13.5	16	20 volume
1.5	14.5	16	10 volume

Figures 14 and 15: Diluting hydrogen peroxide in water

Most product lines use developers that range from 10-volume and up, although volumes beyond 40 volume tend to become unstable. The volume of peroxide determines how long the process of lifting will continue (not how powerful the lifting will be). Lower volumes of hydrogen peroxide and ammonia create shorter processing times, which is associated with less lift (loss of natural pigment) and more deposit. Higher volumes of hydrogen peroxide and ammonia produce a longer processing time and more natural hair color lifted.

Each formula will have specific information about recommended volumes with the product instructions, and scales to help you determine the right amount. Always consult the table of developers provided by the manufacturer and follow manufacturer's instructions regarding the appropriate volume to use for the specific amount of lift desired. Using the recommended hydrogen peroxide volume ensures you have the appropriate working volume at the appropriate time for the optimum chemical process.

Deposit-only versus lift and deposit

Not all permanent oxidation colors lift hair color, thought most have that ability. The percentage of ammonia (the alkalinity) and volume of hydrogen peroxide (developer) in deposit-only color is much lower than in lift and deposit color. If the client desires a deposit only, without lifting of the natural color, a mixture of equal parts 5- or 10-volume peroxide will provide the same concentration of peroxide used in semi-permanent long-lasting colors. At this level and/or with a slightly higher pH, the peroxide concentration is adequate for developing the dye in the color, but not enough to produce any obvious lightening of the natural color. Corrective coloring and reverse highlighting all use deposit-only color, which appear to brighten color by adding subtle tones.

Never attempt to accelerate the process with additional alkalinity or stronger peroxide, which can be dangerous and may cause serious harm to the hair and scalp. Always use manufacturers' recommended materials and amounts. Strand testing is absolutely essential, providing necessary information about how the hair reacts to chemical exposure. Timing is also critical to protecting the scalp and hair from damage.

Consultation/assessment

The consultation or assessment is a critically important part of creating the client's perfect hair color. You will want to have a written record to which you can refer in the future. Note important details in writing as you examine the hair. At the end of this chapter are two types of forms for color consultations that you can adapt to meet your own needs.

Assess before you begin: Identify your client's:

- Natural base color (at the scalp).
- Percentage and distribution of gray.
- Hair texture (course, average or fine).
- Hair porosity (normal, overporous, or resistant).
- Existing artificial pigment in the hair (ask and check for yourself).

A tricky part of assessing hair is finding appropriate lighting for an accurate determination of color. The best light is indirect natural light, or artificial light that mimics it. Your perception of the color will change according to the light you use. If you cannot use daylight, incandescent light is acceptable, but florescent light gives hair a cool look, making reds and yellows harder to see and bringing out blue. The condition of the hair cuticle also affects the look of color.

New color clients will require a thorough consultation. Assessments will be shorter with repeat clients, but the stylist should confirm that there are no changes in the hair or in the client's needs and preferences. Part of the assessment or consultation is analyzing the hair, and part is communicating with the client. Much of the consultation is listening, to find out what the client wants and his/her previous experiences with color.

Identify client's natural base color level

It has been estimated that the most common error in hair color formulation is mis-categorizing the base color. Avoid this problem by taking the time necessary to examine the hair in a number of key locations. Lift and observe hair along the part line. Check hair in the front, at the crown, at the nape of the neck, and close to the ears to confirm that it is the darkest hair on the head. Hair at the back of the neck is typically the darkest and the most resistant to change. Most clients have a number of base colors, not just one, and it is likely to be a lighter level in front than in back. Refer to Figure 10 for a chart of common tones and levels. All these subtle differences matter when you color, and all contribute to the final product, the target color.

Ideally, the optimum way to identify the natural base level is to view swatches of synthetic hair provided by the manufacturer. But these are not always available. Start with the natural (neutral) series of hair samples, and try to identify the appropriate level. Initially, narrow down selection by determining whether the hair is light or dark. Then hold the swatch against the hair near the scalp. The swatch should be viewed with some light filtering through, fanned slightly to approximate the density of the client's hair. You should be comparing about the same number of fibers in the natural hair and the synthetic swatch (Remember that swatches are typically made denser than natural hair.) Natural base levels look darker on wet or oily hair. If you formulate the new color assuming the base level is lighter than in actually is, the target level will not be achieved.

It is not unusual for a client to have a level that is between two levels. If lightening, use the darker of the two levels to avoid an overly warm or dark tone. Compare the swatch and the natural hair at the scalp. You'll identify the best match as the one that is nearly imperceptible to distinguish from the real hair ends. They should appear to blend together. If the two are easily distinguishable, move on to the next swatch.

Percentage and distribution of gray

At the same time you are determining the natural base level of your client's hair, you are also getting a sense of the amount and distribution of gray (sometimes white) hair. Gray hair has less melanin, and is sometimes referred to as unpigmented hair, although it has often has a small amount of pigment. The main concern with coloring gray is that artificial color can stand out on gray or white hair. It will contrast with the rest of the hair color, due to the lack of warm undertones in gray hair. A high percentage of gray requires a number of adjustments to your formula or application. Some products are created just for this purpose, others need to be blended. In some cases, you may need to use two different formulas: one for the gray patches (around the face for example) and another for the darker areas. In extreme cases, it may be necessary to use spot pretreatment.

Find a way of assessing the amount of gray that works for you. Hair that appears more natural than gray, for example, is usually under 30 percent gray; salt and pepper hair is about 50 percent gray; and hair that appears more gray than natural is typically over 60 percent gray. Some find it easier to use a system of quartiles: If the client appears mostly gray, it is likely over 50 percent; if not, less than 50 percent. If one out of every 4 hairs is gray, 25 percent are gray; if 3 out of 4, 50 percent are gray. Practice identifying and learn to estimate (rather than try to count) the amount of gray. How it is distributed is also important. If you use one formula on all areas of hair, the same variation of light and dark that you get in the natural hair will also be in the final result (typically lighter in the front and dark in back). Using one formula on hair with patches of gray can produce a patchy result. Other products are opaque, with a high degree of coverage that shows none of the natural variation in hair. Specific strategies for covering gray will be addressed later in the chapter.

Identify hair texture

Texture is related to the diameter of the hair and the amount of cuticle layers. Fine hair has the smallest diameter, with little cuticle layer. Medium hair has a slightly larger diameter and three or more cuticle layers. Coarse hair has the largest diameter, with many cuticle layers. In the great majority of cases, texture is average; neither very fine nor course. If it is predominantly one extreme or the other, you will need to address it, in formulation, processing time and method of application. Texture also influences how much ash (cool tones) will be needed in the desired color.

Fine hair lightens more and processes faster, and is also more likely to show tone and level of the formula. Extremely fine hair may exist around the hairline. Color penetrates course hair less and lightens more slowly (requiring a stronger developer and/or longer processing time than fine hair). Coarse hair is likely to have a more resistant underlying color, which also must be addressed.

Identify hair porosity

Healthy hair is normally porous. In normal hair, the cuticle is slightly raised, allowing a certain degree of color penetration. Normal porosity typically equals normal formulation in terms of coloring. For all other types of hair, adjustments are necessary. Hair that has never been colored or chemically treated (virgin), or is coarse, excessively oily, or gray may need more time to wet and dry due to low porosity. In many cases, hair is multiporous, with different parts of the hair exhibiting different degrees of porosity.

Porosity can also be measured by observing how much water the hair absorbs. Water will drip off normally porous hair but be completely absorbed by discolored or highly porous bleached hair. One of the reasons overbleached hair is dry and dull is because it cannot maintain or absorb liquids. Overly porous hair takes longer to dry and is harder to comb when wet. Hair that tangles more easily is often more porous. In most cases, overporous hair is weakened hair, which looks and feels rough due to the lifted (partially open) cuticle scales on the shaft. Fine and curly hair are typically more porous than coarse hair.

Sebaceous glands in the skin and scalp produce oil that lubricates the hair, in some cases excessively. When there is excessive oil and the hair is natural and healthy, the oiliness and natural low porosity of the hair shaft are typically more resistant to new color. In such cases, allow more time for the color molecules to penetrate the core of the hair shaft. In certain cases, hair coloring provides an extra benefit, evening out extremely oily skin and hair.

Resistant (tenacious) hair looks and feels smooth and is highly reflective, with a nearly closed cuticle. Less pigmented (gray) hair, as well as coarse hair, may be more resistant, requiring a stronger volume developer and more time to penetrate. In some cases, presoftening is required for resistant hair. To determine if the hair is resistant to color, conduct a “strand test” to learn if the hair will require presoftening as well as more or less developing time.

Hair porosity is critical to color. Each part of the hair has different degrees of porosity, or a porosity gradient, that will lighten more or less than other areas. Roots and ends are rarely similarly porous. Instead, porosity tends to increase from the root to the ends of the hair, with the mid-strand area particularly resistant to color.

Multiporosity occurs naturally, but chemical treatments also exacerbate the condition. The most common case of multiporosity among color clients is a situation in which most of the hair shaft is normal, but the ends are overporous. With overly porous ends, the formula, method of application and duration of exposure must be adjusted accordingly, as the overly porous ends will process more quickly and tend to pick up ash tones. Strand testing will help you confirm the degree of porosity of your client’s hair.

Strong hair that is in good condition with normal porosity and elasticity will show the most consistent color results. To assess hair strength and flexibility, do a stretch test. Take each end of a strand of hair between thumb and finger. Hair that is harder to break is stronger and healthier than hair that breaks or will not stretch. Run a nail over the hair to see how that stress affects the hair. Does it bounce back, stretch or break? Healthy hair will stretch and support a surprising amount of weight without breaking. Observing a strand of hair from the client can be an easy check-up of his or her hair health.

Hair that is repeatedly chemical processed can become dry and excessively porous, meaning it absorbs liquids faster and requires less time to develop color. Hair coloring chemicals can make healthy hair weak and damaged. Highly porous hair is damaged and requires condition, as well as a break from chemical processing. Hydrogen peroxide and alkaline agents are damaging to hair, so nonoxidative colors are essential for clients with very damaged hair. Keratin, which makes up hair and is highly porous, is also easily damaged by bleach. Don’t be afraid to tell a client not to have color done when the hair is very damaged. Baby hair with a respite from chemical treatments and regular conditioning for a month or two until the hair is stronger.

Existing artificial color

Determine whether there is artificial color in the hair currently, and if so, what kind. It is sometimes difficult to identify artificial color because hair has a great deal of natural variation and exhibits a range of effects. Hair that has never been colored before (virgin) tends to be gradually lighter from the scalp to the ends. Consider whether decolorization is required. Generally, artificial tint does not lift artificial tint, meaning that a client who wants to go lighter will need to use an additional lightener.

Clients often don’t realize the longevity of many hair products, which leave some residue in the hair long after they are used. Ask the client if he or she has used any color product in the past 12 months, their experience and results with each product, and what she/he liked and didn’t like. Also determine how long ago and for what duration the product was used. This gives you a number of important pieces of information about both the color and the client’s preferences.

Ask your client about previous products and mention any signs of color to them to help jog their memory. Explain that this question is critical because any product currently in the hair will affect the color outcome. Clients sometimes forget, however, so you will need to examine the hair shaft for any demarcation lines, patchiness or difference in levels and tones. If you determine that the client has existing artificial color in the hair, you will need to identify the level of that color, once again, using swatches.

Try to determine whether the hair is coated with any other products. If you aren’t sure, ask (the only questions you’ll really regret are those you don’t ask). Coated hair must have the coating removed for effective coloring. If the color is off-tone, it may have mineral buildup (or chlorine) or hair-product residue of some kind. Some medications, including high blood pressure and thyroid drugs, and hormones also affect hair quality and color.

The consultation: What does the client want?

Hair color serves many functions: The majority of clients begin coloring to cover gray. They may want to update their look or appear refreshed (hair color often enhances skin tone). Some clients like to be trendy, taking hair to an extreme; others use color to increase the appearance of fullness (dimension) or a healthy look. Some enjoy being playful with their hair, considering highlights or accents. Some come in for corrective color, to fix a home-hair-coloring mistake.

"What do you have in mind?" or "Were you thinking about going lighter or darker?" is a good starting point. Never let clients opt-out of the decision-making process. You'll find many clients are better able to tell what they want by telling you what they don't want or don't like about their hair. Confirm your clients' preferences along the way, and encourage them to realize their desired look.

Encourage clients to bring in visual aids, as a picture really is worth a thousand words. Keep a scrapbook of magazine clippings, including photos, color samples and swatches, or start a portfolio of your own work. You can begin by compiling photos from magazines, industry journals or current clients that demonstrate some of the looks you can achieve. This is critically important because hair color is so subjective, so individual, that you and your client both need to see what the client is envisioning. You'll find it useful to have examples of color levels and tones, including the more popular golds, reds and highlights, etc. It is incredibly easy to snap a quick photo of your client at the end of the process, to show other clients what you can do. The client will also appreciate you keeping a record of the color, so you can repeat the success in the future (include any formula notes that might help you produce optimum results).

Listen!

Give clients your full attention and apply principles of active listening to increase the accuracy and reliability of shared information:

- Don't "multitask" when you speak with a client or let competing business matters, calls or other aspects of your business keep you from listening attentively to what your client has to say.
- Give your client adequate time to contemplate your question and consider an answer. Never interrupt or rush a client's response.
- Paraphrase your client's response. Accurately restating the client's comments in your own words is a way to confirm that you interpreted the client's statements correctly.
- Address any inconsistencies or misunderstandings; identify areas in which the client's intended message or meaning and your understanding or interpretation of it differ, and clarify those differences.

Ask questions

When you ask questions, keep them simple, specific and clear. Listen carefully to the answer, and follow up, if necessary, with further questions. Avoid technical jargon and define any specialized lingo in simple terms to assure your meaning is understood. Ask questions in a logical order, and don't combine a number of related questions in one sentence; instead, ask one question at a time, and clarify each answer before moving on.

Open-ended questions such as, "What colors do you like?" or "What about your hair color do you like and not like?" invite the client to address a topic in their own words and at greater length. Questions should be phrased in a neutral or unbiased way to avoid "leading" the client in a particular direction. Examine your phrasing to avoid any language that might cue the client to respond in a particular way, such as suggesting by your words or tone that one answer versus another is right, wrong or preferred in any way, or expressing a preconceived notion or assumption about the client. Wording questions such as, "Do you think this red is too red?" or "You wouldn't want this color red, would you?" is more likely to skew the client's response because it suggests the practitioner's anticipation or predisposition to hearing one response over another. It would be better to ask the client, "What colors do you like or dislike?"

Your professional advice

Help your client by giving her/him honest advice based on your experience and expertise. Consider factors such as haircut, skin tone and eye color as well as what you know about the individual's career, personal style and aesthetic sense.

Skin tone and eye color

In discussing what looks good on the client, turn your attention to skin tone and eye color. Consider these questions: What color will flatter the client's skin tone? What color is the hair currently, and what color does the client ultimately want? Skin tone should be checked at the forehead, jaw, neck or inner forearm. Avoid areas, like the cheeks, that may be ruddy; or skin that has been "tanned" by a product or the sun or tinted with makeup or another process.

Volumes have been written on color analysis. Skin tone and eye color, to a lesser degree, are usually the best determiners of hair color, but because colors are so subjective, there are no strict guidelines. Each individual is a special case. Note choices in makeup, jewelry and other accents. Consider the cut as well. Again, personal style factors into this component. Some want a subtle, natural look. Others want a dynamic, eye-catching appearance. The client's current style will give you some clues.

Find out whether the client finds warm or cool colors most flattering. What are their favorite clothing colors? It is also a good practice to hold color swatches against the client's temple. You may be amazed at the ability of a contrasting tone to even out discoloration, and enhance (or detract) from the client's appearance. The best choices will be obvious. It is usually more flattering to use a hair tone that contrasts with the skin tone, but some contrasting tones may highlight negative features.

To help your client determine the most flattering tone, do a quick check of the following features:

- Examine the underside of the client's arm with palm up. If the veins look blue, the client is likely to have blue undertones and a cool skin tone. If the veins look greenish, the client is likely to have a yellow undertone, which is warm.
- Ask the client to come in with no makeup. Pull back the hair and put a white cloth against the face and neck. Look for either blue or yellow undertones in skin tone to contrast with the white material.
- While not always the case, it is sometimes assumed that people who look better in silver jewelry are more likely to have a cool skin tone, while warm skin tones are flattered more by gold jewelry.

Assess the structure and desired cut, as well as the tone of skin and hair, and discuss how the colored hair will affect the hair quality and look against the skin. Some hair colorings will require different

makeup to look their best. Make sure your client is comfortable with this and willing and ready to make a change.

Light and dark contouring can be used to frame the face, creating greater dimension (lighter areas seem to appear closer than dark areas, and eyes tend to be drawn to lighter areas). Dark hair can slim a full face, and highlights will make hair appear lusher. Fine hair looks thinner in very light or dark levels, while a medium shade appears fuller. If you are to err on one side, let it be producing a tone slightly too light rather than slightly too dark, as the latter will be harder to correct. It is almost always easier to deepen color than remove it (decolorize).

If a client's desired color is her natural color, without the gray, confirm a color swatch of the level. Clients tend to think they are lighter than they actually are because they so often see the lighter color around the face and at the ends. If you give a woman who is graying her original depth of color, it will typically not give the desired natural effect. Coloring an individual with over 60 percent gray for the first time can be a shocking change for the client. It may be best to start two to three levels lighter than the original natural color, for a more flattering look, and less abrupt change, as darker or more intense colors on older individuals can look harsh and fake.

Natural base level also determines what is likely to look natural on the client. Moving more than two levels lighter or darker than the natural level is a significant change. Natural-looking effects are most easily achieved by matching or choosing one level lighter than the natural base color.

Work with the client to determine a level and tone, and put this in writing along with any notes that will help you develop the formula or remember the formula for next time. At this point in the consultation, you should have a good sense of the answers to these questions:

- Does the client want a lighter or darker level?
- What tone is best for the client? What flatters the skin, the eyes, the cut?
- What does the client want to spend?
- How is the client willing to maintain the color?

A consultation means that information is shared, and both you and the client participate in the decision-making process. By the end of the consultation, you should know what clients are looking for, what products they use, how they felt about previous color services, and what kind of upkeep they're willing to do to preserve the color. If you don't know, ask.

Personality, lifestyle and commitment to maintaining a style

Some color processes commit the client to more maintenance than others. Make sure your client is willing to spend the time, effort and cash necessary to maintain the color and cut, retouching when necessary and so on. In general, the more the hair contrasts with the client's natural hair, the more obvious the need to maintain it and the sooner it will need to be addressed. Explain the cost and time required for the services, as well as any necessary waiting times after application, etc. Discuss how often you will need to retouch color effects (every four to six weeks, for example), and the duration of a typical appointment.

Consider how temporary or permanent the client wants the change and how people will respond to the new look. Perhaps you and the client want a flashy or trendy look, but the client's boss prefers a more conservative appearance in the office. The more you know about your client's needs and preferences, the better equipped you are to help him or her achieve the target look.

Consider lifestyle issues like the client's job, workout schedule or other factors that might negatively affect hair and become a bother to him/her. Exposure to the sun and certain medications are likely to affect the look or tone of hair color. Contact with chlorine (found in swimming pools and hot tubs as well as shower water in some places) tends to bring out a color's brassiness.

Recommend a good regimen to maintain the color, including appropriate cleaning and conditioning products. Some over-the-counter shampoos and styling aids will strip the color (high alcohol content is sometimes the culprit), and acid-balanced conditioners are not appropriate for red hair, as the acidity lightens the red, producing a "tea effect."

Previous chemical treatments and other processes can damage and strip hair. If the hair is damaged, you will need to condition before applying color. Multiporous hair (with different degrees of porosity in different areas) will require filler. In some cases, other services that restore the damaged hair to a more normal state will be necessary, followed by a waiting period to restore the hair to its best possible condition before the actual coloring is done.

The haircut

Will the haircut look good with the target color? Will it flatter or detract from the client's eyes and skin tone? Consider matching color demands to haircut demands. Is this a high-maintenance haircut or not? Some clients are more than happy to commit time and attention to color maintenance or aftercare, but not everyone. Does the client come in regularly every month for a precision haircut, or are you more likely to see the client every few months, if she/he can fit it in? Is this a good candidate for a significant color change with upkeep demand? Does she/he have the budget for specific color services every month on top of a haircut and style? It is a financial commitment of which the client must be aware before committing to a change.

Select the target color

The desired (target) color is the color you will be attempting to formulate, the color the client wants. It is the successful end product of coloring. Your target color will determine your choices regarding materials, formulation and application for the specific level and tone. A major obstacle in formulating the right color combination is that many color charts show the color on white, rather than natural, hair swatches. Don't believe that the color you see is the one you will get. Color charts don't take the pigment contributed from the natural hair (that remains after lifting) into account. You will have to use it in your equation to get the right effect.

To get exactly the right target color, you will need to identify the right inputs, including a color with the appropriate base, and lifting/depositing ability. If you don't know the base number of your color product, use a simple test to find out: Mix a small amount of tube color in a bowl and add an equal amount of 10 volume hydrogen peroxide. Apply the mixture to cotton and wait 10 minutes. The true color base will be apparent. With liquid color, combine color with an equal amount of 5-volume hydrogen peroxide. Wait five minutes for the true color base.

To get the right desired tone, you must use the correct color base. A medium brown that contains more yellow than red or blue is said to have a yellow base. Upper case letters typically indicate dominant tones and lower case letters are used for secondary tones. Percentages indicate the amount of each primary ("20 percent blue"). Sometimes, primaries are noted in triads ("BBBRRY"), as descriptions ("neutral base with warm pigments"), or with numbers and letters indicating the amount of each component. Spend some time studying the color wheel and which pigments are in your specific color product [see Figure 16 for some common color base abbreviations].

Color Base Abbreviations

Y= Yellow
R = Red
B = blue
G = Gold
O = Orange
V = Violet
YG = Yellow-green
RO = Red-orange
BV = Blue-violet
YO = Yellow-orange
GN = Green
BG = Blue-green
RV = Red-violet

Figure 16: Color base abbreviations

In general:

- Blue, black, and ash refer to cool tones.
- Gold, red, and yellow refer to warm tones.

Many new color clients require corrective hair coloring initially because they have been using a home hair coloring system, and the color has built up or the hair is damaged. Look at the natural base color: Will you be trying to neutralize (even out) an unflattering undertone in the natural color, or accentuate (enhance) a flattering one?

Confirm what you've heard

Listen, listen, listen – then confirm what you have heard from the client, including a summary of your analysis. If the client wants to do something you think will be unflattering, mention your concern. If a client can't make up her mind, she may not yet be ready for color, so don't rush, but suggest she think about her ideal color before her next appointment. Most clients have a very specific idea about their desired color and are able to communicate it through visual aids or description.

If you believe a service will damage the hair, do not do it. Instead recommend appropriate services to repair the hair to good condition.

For first-time clients, color consultation will take a little longer. Repeat clients with tried-and-true formulas should still have the hair examined carefully and confirm the status. If you take good notes, you will be able to learn what went wrong when the formula is not entirely successful, avoiding the problem in the future.

Safety issues

Different people develop allergies to different substances. Our proclivity to react is partly genetic and partly environmental, as it depends what we encounter.

Many chemicals used in hair coloring are harsh or caustic, causing dermatitis (irritation), inflammation and damage to the skin. Hairstylists regularly develop irritant contact dermatitis after years of exposure to salon chemicals. The chemicals you use every day can damage skin severely. Semi-permanent and permanent (oxidation) hair coloring products, such as these, are common culprits:

- Bleach.
- Off the scalp hair lighteners.
- Hydrogen peroxide.

Both chronic and acute dermatitis can be triggered by exposure to something as seemingly benign as hard water, a common salon irritant. Excessive moisture (caused by insufficiently drying your hands after washing them) can lead to irritation and cracking of the skin. If you shampoo often in your work, you are at risk for contact dermatitis. Some shampoos contain detergents that deplete the skin's natural acid mantle, reducing lipids that affect the natural moisturizing factor (NMF). The natural moisturizing factor is a combination of amino acids and salts that protect the skin and maintain moisture.

Gloves help keep irritating substances away from the skin and are an excellent way to reduce your risk of contact dermatitis. Using them with any chemical application is a must as the long-term health risks of your constant exposure increase over time. Gloves commonly come in vinyl, natural latex, polyethylene and polyurethane. Some provide more sensitivity or grip, resistance to chemicals or strength than do others. Try to find a material that is safe and feels comfortable to you. In some cases, hair-coloring products will recommend a particular type of glove to use with the product that may have a higher or lower resistance to the chemicals used.

Unfortunately, moisture building up underneath gloves can also be a problem, causing irritation as well. Both the glove material and the cornstarch meant to reduce irritation can cause contact dermatitis, as some hairstylists become allergic to chemicals in the rubber or the cornstarch used in the powdered versions. While this is not common, it does occur. If you develop sensitivity to rubber, find another kind that works for you. There are many alternatives.

Alkaline substances mixed with hydrogen peroxide oxidize, causing heat and the potential for chemical burns. Protect clients' skin with a protective cream or petroleum jelly, and make sure they are comfortable. Keep an eye on your client at all times that they have chemicals in contact with their hair or skin (do not leave the client in another room, for example), and watch him or her for signs of discomfort, like scratching or redness. If they feel pain or discomfort, immediately remove the product and rinse with cool or tepid water, followed with a soothing rinse.

When working with chemicals:

- Avoid contaminating the materials by pouring anything back into the original container.
- Protect your eyes from splashing chemicals.
- Wear a mask when using powdered materials.
- Read the Material Safety Data Sheets (MSDS), as well as all other package and insert instructions. Take special notice and precaution with corrosives and oxidizers. Always use the manufacturer's recommended procedure and precautions.
- Always do a predisposition/patch text.
- Always wear gloves when working with chemicals (including hydrogen peroxide).
- Do not leave color tools around; applicator bottles may swell or explode if not disposed of properly.
- Be aware that stains can ruin clients' clothing and discolor skin.
- Do not use aniline derivative color on eyelashes or eyebrows due to risk of blindness.
- Do not color if the client has any break in the skin.
- Only use heat or a hair dryer on clients with color if the manufacturer specifically states to do so.

Patch or predisposition testing

Any time a semi-permanent, demi-permanent or permanent oxidative color is used, a patch test is required, and should be performed at least 24 hours before the color appointment. In a patch test, a small amount of the color formula that is going to be used on the client is applied to the skin behind the ear (including a small portion of the hair) and also on the inside of the elbow. The location should be observed over a period of 24 hours. If there is any allergic reaction or symptoms, do not proceed.

If the client refuses a patch test, use a foil or off-the-scalp color, instead. It is best to mention the patch test when the client calls for an appointment. If the service includes color, ask if this is the first time he or she has had color. If the answer is yes, the client must come in a minimum of 24 hours before the color appointment for a patch test. Explain that federal law and their safety demands an allergy test.

The part of the hair color that is most often problematic in regard to sensitivity is the dye, with PPD (paraphenylenediamine) the most common culprit, although other dyes also cause allergic reactions. If the client has had any previous sensitivity to a product (manifested in allergic reaction, hives, asthma, swelling, burning, itching, etc.), have the client discuss color products with an allergist or dermatologist to determine which ingredients she/he should avoid. While some reactions are mild, they have the potential to be very severe, even life-threatening. A severe allergic reaction may look initially like skin irritation; there may be swelling both near the site of contact as well as other parts of the body (the throat may close up). Symptoms may not become full blown for 24-48 hours after contact. Skin breaks increase the chances of sensitization to an ingredient.

Be sure to use all the products you will be using to color the hair to make sure there are no sensitivities to ingredients left out. You can loosely cover the patch (air should still be able to circulate around it) with a band-aid so it doesn't smear off on clothing, etc. Twenty-four hours later, check the area for any irritation or swelling. Note anything abnormal in writing, for future reference.

Report the results on a history sheet. This is for the clients' protection; do not let a reluctant client skip it. You are legally liable if you do not perform a patch test. (Even if clients sign release forms for the application of the product, they are null and void if the hairstylist does not follow manufacturer's warnings and this federal law.) Protect everyone by following this procedure.

Clients who are allergic to oxidation colors may be able to use nonoxidizing semi-permanents because they do not require a developing agent, which is sometimes the offending ingredient. A good percentage of individuals sensitized to permanent color can wear semi-permanent without problem.

By the end of the consultation, you should have all the written information on one form or sheet. See Figures 17 and 18 for two examples of consultation/analysis forms.

Consultation/Analysis Form-Version 1

Consulation/Analysis Form 1

Name: _____ Date:_____
Address: _____
Phone number: _____

Patch test results: _____
Hair Form: straight wavy curly very curly
Length: very short short medium long extra long
Condition: very dry dry normal oily very oily uneven/patchy
Density: sparse medium thick
Texture: extra fine fine medium course extra course
Porosity: very porous porous normal resistant very resistant
permanent waved
Multiporous: (describe) _____
Natural hair color: level 1-2-3-4-5-6-7-8-9-10
Tone: warm cool (notes) _____
Intensity: low medium high (notes) _____
Fading: _____
Amount of gray: (%) distribution (describe) _____
Previously lightened: (when) what product(s) _____
Previously tinted: (when) what products _____
Original hair sample (attached/not attached) _____
Desired (Target) color: level 1-2-3-4-5-6-7-8-9-10
Desired tone: warm cool (notes) _____
Intensity: low medium high (notes) _____
Corrective services: color filler used (when) what product _____
Conditioning: (when) what treatment _____
Tinting: (whole head/retouching/target shade) _____
Formula: (color and lightener details) _____
Application Details: _____
Results: poor fair good too light too dark streaked/patchy
(describe specifics) _____
Price: _____

Consultation/Analysis Form-Version 2

Client's Name _____ Date _____
PRODUCT SENSITIVITIES/ALLERGIES_____
Client's Natural Base Level _____
Percentage of Grey _____ Distribution _____
Porosity _____
Texture _____
Existing Color _____
Other _____
Desired Look or Color and Maintenance Level (Notes)

_____
Target Level _____
Target Tone _____
Formula (amount of product, amount and volume developer used, procedure, mixing, special considerations, etc…)

_____
Application (Date) _____ Price _____
First time (Virgin application), begin at scalp or ½ " away _____
Retouch (Condition and color of the ends) _____
Processing time _____
Result (successful, if not successful, why?)
Other special issues or notes _____

Figures 17 and 18: Consultation/analysis forms-version 1 and 2

Know your color line

In formulating color, always refer to the manufacturer's instructions and recommendations. Any general guidelines regarding lifting and depositing, developer strength or other details of formulation are always overruled by the specific instructions that come with the product.

Each manufacturer develops its own system for defining colors in each level (color lines). Color lines are typically categorized by the predominance of a specific color or tonal quality within each particular level. Ash, gold, red and natural/neutral are the most common. Be aware that one company's auburn is not another company's auburn.

The shades and names will vary, and may or may not be a clue to base color.

Learning to see the level and tones making up hair color takes time, but is critical to successful coloring.

Select the lift level needed

Each individual volume or strength of hydrogen peroxide provides a different degree of lightening and has a specific intended use. Follow manufacturer's instructions to determine the right selection. To determine how much lift (color removal) you will need, subtract the client's natural base from the desired (target) level to determine how many levels you are lifting. This can be written as:

- Desired (target) level minus natural base level equals the amount of lift (in levels).
  - Here is an example: A level 6 ash brown wants to become a level 8 warm blonde.
    - Desired level (8) minus client's natural base (6) equals two levels of lift.

Select the color level needed

Now, to determine the level of color to use, multiply the desired color by 2 (8 times 2 equals 16). Then, subtract the client's natural base (6): 16 minus 6 equals 10. In this case, you would use color level 10 to achieve the desired target level of 8. In cases where the level of color is 13 or more, you will almost certainly have to pre-lighten to get the right target color (this is double-process coloring).

- Target level times 2 minus natural base level equals level of color required.

Being able to identify the hair's darkest color is essential if you are lifting. For the natural base color, you have checked color at the crown, nape of the neck and hairline, noting the darkest color (usually at the scalp), as well as whether the base color is the same in the front as it is in the back. Now determine if you are adding or subtracting color, or both.

In doing addition only, typically you will use your target color and a 10- or 20-volume developer, according to the manufacturer's recommendation. If shifting two levels darker, it is almost always necessary to use a filler or prepigment.

In general terms, one level of lift is usually associated with 10-volume hydrogen peroxide, up to two levels, with 20 volume, up to three levels with 30, and up to four levels with 40 volume:

- 10 volume: Typically used for subtle color lift; tends to decrease lightening action and increase color deposited. Best used on damaged, overly porous hair, for corrective color subtle highlights.
- 20 volume: Normal hair color lift.
- 30 volume: Used to produce lighter blondes and reds.
- 40 volume: Used to lighten dark hair.

So, for example, if you wanted to go from a natural base of 4 to a target level of 6, use 20 volume. To lift from a 4 to an 8, use 40 volume. Most manufacturers use systems in which the desired level, or target, is the specific level of lift in the formula. For a medium brown, for example, you would use a medium brown level, but each product is different. In other cases, you may be told to deepen or lighten the formula, depending on the individual's level of gray, for example. Again, look to your product manufacturer for specific details.

Remember, the higher the alkalinity of the catalyst and the higher percentage of oxygen in the hydrogen peroxide, the more and longer oxidation occurs. Lower volumes of hydrogen peroxide and ammonia or another alkaline product create shorter processing times, which is associated with less lift (loss of natural pigment) and more deposit. Higher volumes of hydrogen peroxide and alkalinity produce a longer processing time and more natural hair color lifted, with less deposit.

Each formula will have specific information about recommended volumes with the product instructions and scales to help you determine the right amount. Always consult the table of developers provided by the manufacturer and follow manufacturer's instructions regarding the appropriate volume to use for the specific amount of lift desired. Using the recommended hydrogen peroxide volume ensures you have the appropriate working volume at the appropriate time for the optimum chemical process.

If the existing color is darker than the desired color, or if the tone is significantly different from the desired tone, you will have to decolorize. Turn to the method of removal recommended by the existing color product manufacturer. You will need the brand name and the particular line of products. Unfortunately, some semi-permanent colors are incredibly resistant to lift.

Permanent hair coloring will lighten the hair to a certain point, but bleach is sometimes necessary to achieve the lighter blondes. If the desired level is within four levels of the natural color, you can typically use one product. If the client wants to be more than four levels lighter, another product or boost is needed.

Select the tone

Producing good tone is the hardest part of hair color, and the most subtle. Clients unhappy with a color are most offended by an unflattering tone, meaning too brassy, too ashy, too something! Much of the difficulty of choosing desired tone is a communication issue. You need to have a really good idea of what your client wants and likes, something a good consultation should draw out.

How to address unwanted warm and cool undertones

If the client's current hair tone is excessively warm (yellowy-orange), a common problem, the best option is neutralizing the excess warmth with ash. When hair is too ash, or cool, you may need to lift the ash tone out to some degree to avoid differences in color due to overporous ends or to cover gray. For level-on-level toning, the level of the contrasting color should be the same level as the tone you're trying to get rid of. A lighter level will not do it. To address poor tones in the hair after coloring, review level-on-level toning principles and see the section, below, on color correction.

The tone of the final formula is a function of the desired or target tone, the client's dominant underlying pigment and the hair's porosity and texture. To get the tone right, you need to know exactly what your client wants in level and tone. Get reactions to samples and pictures before any actual color products come into play. Find out if what the client likes or dislikes about a specific look by getting his/her opinions or reactions upfront. Ask "How red is too red?" or "When does blonde begin to look brassy to you?" to gauge color thresholds.

The best way to address a problem in hair tone is to avoid it entirely. If, however, your results are not ideal, current technology and materials do allow you to effectively correct poor tonal color.

In some color lines, a cooler gold formula can impart a more natural looking blonde tone than the harsh or brassy gold of lightened hair. Remember that lifting has its limits. If you use a very high-level formula (10-12) on a midrange level natural base, the high-level dye will be too light to even out the remaining warm tone, and the existing color will be undesirable to the client.

Every hair problem has a number of possible solutions. If you're not sure how to proceed, try out a strategy with a strand test and record the results. With repeated testing (trial and error), you will refine your abilities, as well as analyze what is lacking in your unsatisfactory results. Color is only predictable if you get all the variables right. Misjudge one, and you'll be learning how to correct that error. If you let an error leave without correction, you have likely lost the client. If you are able to successfully correct, you'll have a loyal client for a long time.

Never take chances with your client's color. Always use strand testing to refine your formulation. Once you have the desired results, proceed with the whole head.

Mixing

Combining ingredients in exactly the right amounts is absolutely necessary as the ratio of color to developer is critical to the development of the target color. Follow the manufacturer's instructions regarding amounts of color to developer, and be aware that small differences can cause big problems. Using clear containers with incremental markings can ensure accuracy. Mixing ingredients thoroughly is crucial because uneven mixing can cause patchy oxidation, which can burn sections of hair. Cups with lids are a good way to mix color thoroughly, or you can use a whisk.

Stir the color paste, cream or gel before you add the developer, then add the developer slowly and mix. Oxidation begins soon after the color and developer are mixed. Only mix enough formula to apply to one section at a time. Mix the color just before applying so you don't waste development time in the bowl. Mixing fresh color as you work is important as the color needs the oxidation process to develop and drive the dye into the hair. After 15 minutes, you will typically have to mix a fresh batch of color, so keep your materials handy.

Cream and gel bases tend to make measuring, combining and applying ingredients easier. A number of high-end products have protein in their base, which assists the pigment in penetrating the hair, because pigment molecules adhere to the hair's protein. Liquids and cream colors are applied with a brush or applicator. Liquid colors tend to have more ammonia than creams colors, but cream colors typically need a higher-volume developer to oxidize.

Application

Careful application and timing are at the core of successful coloring. Apply the formula with a specific plan in mind. It is best to divide the head into sections and proceed front to back and side to side along part lines. Some use a circular pattern moving outward from the crown of the head. Develop a strategy that works for you and stick with it each time, as this makes you less likely to leave out a section.

Applying the formula to smaller, rather than larger sections of hair, is a better strategy for evenly covering hair because the formula is able to penetrate the hair more effectively. For normal color application, use very small section lines (one-eighth inch for retouches and one-fourth inch for shaft application). Pull the hair out from the scalp to encourage air flow. Loosen the hair enough so the moisture can saturate the hair.

Redip your brush in the color for each section's application, Apply more product to the porous sections. Remove any extra color from the skin immediately so you have less risk of stain. Many products suggest combing the product from scalp to ends: When the regrowth matches the length and ends, stop processing.

For the first application, choose the areas that take longest to process; the gray areas, resistant hair and the darkest areas. An application of formula should penetrate the section of hair, but not be swimming in it. Oxygen is necessary for the chemical reaction of oxidation, meaning that it needs exposure to air. Wet the hair completely and coat it nicely in color.

To color natural hair that has had no previous color treatment for the first time (virgin application), you will typically use a scalp-to-ends application. All formulas – except for reds – can be applied scalp to ends. Red permanent coloring is never applied scalp to ends. If you are matching the natural base level or going a level or more darker, apply the color scalp to ends.

Two application methods for coloring virgin hair:

- **Dark**: Application used to darken hair or if hair is being lightened less than one level.
  - Use one-eighth inch partings, apply to the scalp area for the whole head.
  - Apply to the shaft and ends using one-fourth inch partings as quickly as possible.
  - When processing is done, shampoo.
- **Light**: Application used to lighten the hair one level or more (double application).
  - Use one-fourth-inch partings, apply starting one-fourth- to one-half-inch from the scalp up to (not including) the porous ends.
  - Process until the shaft is almost the desired color.
  - Using one-eighth-inch partings, apply fresh formula to the scalp and ends (depending on their porosity).
  - When the scalp matches the shaft and ends, remove the color.

Double application

Use a virgin double application for levels lighter than the natural base level or strongly red or gold colors. These should be applied one-half inch away from the scalp. Because the scalp area lifts faster than the rest of the hair, start with the midshaft and ends. Allow the first application of color to process a bit before applying fresh color to the scalp again. Lighter or brighter formulas need this double application method. Used with red tones or when lightening hair, this is the most common form of application for virgin treatment.

With the double application, the first application (one-half inch away from the scalp) will process for about half the normal time you would use. Then, a fresh mixture of color is applied to the scalp. You may have to wipe away the first application, then apply the second mixture scalp to ends. This means the length of the hair shaft and the ends are colored twice. The second application should process for the normal period.

This method is used for lightening and reds because the area at the scalp is brightened more easily than the rest of the hair. If you apply red from the scalp to the ends, the color at the part will be brighter than the rest of the hair. High lift products work faster near the scalp, with warmer and darker tones on the length of the shaft. If you are going red or reddish, you must begin application one-half inch away from the scalp so that your finished product will be evenly colored. When going much lighter than the natural base level, always start a half-inch away from the scalp. Each product's instructions for application will vary slightly, so study the manufacturer's recommendations.

One of the striking features of bad home bleaching is an overly white scalp and yellow-gold shaft. Hair color near the scalp lifts more easily for a number of reasons:

- The hair is softer (with less keratin).
- The area near the scalp is warmer (heated by body heat) than the shaft, which is further away from the scalp. Heat accelerates the chemical reactions that produce lightening and coloring.

A virgin double application on multiporous hair leaves the ends unapplied in the first application. The color is applied to the shaft of the hair, beginning a half-inch away from the scalp (leaving out the area near the scalp that processes faster) down toward the ends (but leaving the overporous ends untreated). While you are waiting for this first application to process, you can focus on strand testing the ends, to get their optimum timing. Conveniently, hair close to the scalp processes about as fast as overporous ends. The second application will coat the area near the scalp as well as the ends.

Retouching

For normal regrowth, use one-eighth inch partings, apply to the new growth, and process until the color develops. For bottle application, keep the sections very small and be meticulous. All of the product should go on the hair or stay in the bottle. You may blend to the shaft and ends with color, or apply semi-permanent color to the shaft and ends to refresh the color. When the regrowth and shaft and ends match, remove the color.

If the client has gone too long between treatments, you will have to work to avoid "banding." If, for example, the client has two inches of natural color next to her scalp and you lighten, the hair closest to the scalp would lighten significantly, but hair one-half inch away from the scalp might have a demarcation. In this case, apply the first treatment a half-inch away from the scalp to the point where the hair color changes (1½ inches), without overlapping. Then apply a second layer to the warm area near the scalp.

In touching up regrowth, take special care to avoid overlapping the bleach onto previously lightened hair, which can cause damage and breakage. The higher the lift of your formula, the greater the risk of applying too often. Choosing how long to expose the shaft of the hair depends on the degree of fading. Some hair and products resists fading better than others do. In some cases, just coloring the new growth is adequate. In retouching, you need not always pull hair through the color. When in doubt, strand test, and keep an eye on those overporous ends.

When retouching overporous sections of hair, use a shorter exposure time or dilute the remaining formula with water, then wet the strand or shampoo for a moment to produce the right match. You may find a combination of semi-permanent color on the length and permanent color on the new growth works well. Authentic semi-permanent color is unable to lift natural pigment, so semi-perm color can be applied scalp to ends. Some colors (and products) have a tendency to stain the scalp, so should be applied just barely off scalp. Overporous ends will soak up more of the tone and depth of the color (appearing darker and redder, for example) than the rest of the hair. Fine tuning your application and processing times on multiporous hair is critical to getting a natural look.

Processing

Application should be as thorough and fast as possible. Once you are done, start timing and check the color before, at, and after the minimum time. Most oxidation colors take about 30 minutes to develop. With greater lifting and depositing, more time is needed. High-lift colors require more time to produce the full spectrum of new dye particles, which create the right tone. Maximum timing should be used to get the most tonal dimensions. Depositing effectively on gray hair is another case in which maximum processing time is needed. Clients with color that tends to fade should get the maximum processing time. Clients with very fine hair, with a small amount of gray, or those who are lifting only one or two levels are likely fine with the minimum time.

Many different products and methods have been developed to accelerate hair color change, either shorting the amount of time the product must remain on the hair or claiming to improve results in one way or another. With all the hair color accelerators out there, it is important to stress that manufacturers carefully determine an optimum rate of processing for each product. That means, when combined and used according to manufacturer's recommendations, the dyes develop in exactly the manner they are supposed to. This careful timeline for the development of dyes used in oxidation colors is wasted if accelerators are used to speed up the processing. The color, for example, might develop at less than the optimum time, perhaps before it is positioned to penetrate and deposit color into the cortex of the hair.

The appearance of color on wet hair can be deceptive. Don't attempt to assess the color when it's still damp or wet, and advise the same to your client. Always check the color before rinsing. It will save you a lot of trouble. Don't jump to any conclusions or begin to "correct" color until you know the final product. (Semi-temporary and semi-permanent products like colored shampoos and conditioners are great for correcting minor tonal issues.)

To check the color, wipe off a section of the hair, using water to spray the hair, then wipe it and repeat until the hair is wiped clean. Rub the hair dry with a towel or blow dry (if heat is appropriate). If the color is right, proceed to address stains on the skin or scalp, but do not wet the hairline or you will make stains permanent. Use the hair to rub the stain away from the skin near the hairline, then wipe the hairline to ensure that the stains are removed. If they aren't, use skin stain remover or rubbing alcohol. Clients who have skin that tends to stain should have the information noted in their notes. It is much easier to apply a product to the skin near the hairline to reduce potential staining than it is to remove stains.

Potential damage in the oxidation process

Hydrogen peroxide, more often than ammonia, is the damaging culprit in oxidation. The ionic (salt) and the disulfide (sulfur) bonds in the cortex are exposed with oxidation, with damage varying in degree according to the strength of the solution, its pH level, and the amount of time exposed to treatment. Minimizing keratin damage is largely a function of careful reading, measuring and timing. Use only the recommended amount of hydrogen peroxide and avoid peroxide boosters, which can cause severe damage to the hair and scalp. Excess ammonia should be washed from the hair with water after coloring to limit its effect. Use an acid-balanced product, which allows the cortex to shrink and the cuticle to tighten, restoring pH to the normal range for skin and hair.

Rinsing color product

In removing a color product, moisten hair with a small amount of water and massage through the hair. Too much water may change the consistency of the color, making it harder, rather than easier, to remove. Massage until the water rinses clear, and check areas of skin like the neck and ears that have a tendency to stain with color runoff. Clean the shampoo bowl of any remaining color, then shampoo thoroughly with the appropriate shampoo for color-treated hair to remove residue. Rinse. shampoo again. Apply conditioner and rinse. Reds should use a higher acid pH conditioner, not low pH, for the best color.

Be sure to rinse the hair coloring out completely before shampooing. If you are not careful and shampoo hits your color before it is rinsed, the color will fade prematurely. When hydrogen peroxide is not completely rinsed, the color may continue to process, turning a different level or tone than desired. To make sure the residues are completely neutralized, rinse the hair with an acid rinse, then shampoo with a mildly acidic shampoo to restore natural pH, and finish with conditioner. Acid rinsing will put a stop to the chemical reaction, fixing the color level and tone into the hair. Be sure to treat the scalp gently, as it may be more sensitive.

Color removal tips

Different types of bleaches can be diluted with water, hydrogen peroxide, shampoo or other products to adjust the concentration and rate of decolorization. Higher (lighter) levels of color lift more readily than lower (darker) levels. Lightening very dark colors even slightly can negatively affect the quality of hair.

Some stylists use a high-level color with a high volume developer to lift small spots, but they use a small amount. This is very useful when you have select dark spots because it's easy to remove stubborn deposits from select small areas. Color clients who want highlights may find high-lift tint provides the desired look, rather than highlighting over color with bleach.

When removing semi- or demi-permanent coloring, always follow the manufacturer's instructions for the specific product. Many require treatment with an oily product and processing with heat. In some cases, removal is only possible up to a point; then the color must be addressed through covering.

In cases where gentle color removal is necessary, what used to be called a "stripping shampoo" can be produced fairly easily. This formula can be used to remove color from hair that is going to be lightened, to remove excess deposit from hair after tinting, and help presoften hair, For a lift of less than two levels, use a combination of 2 ounces of hydrogen peroxide, 2 ounces of bleach, 1 ounce of shampoo and 1 ounce of conditioner. The formula can be strengthened or weakened by adjusting the amount of shampoo and conditioner, which both act as buffers for the bleach, making it less irritating to the hair and scalp. Higher pHs tend to cause more discomfort.

Most products developed to remove permanent oxidation color are mild bleaches. These should only be spot applied to the hair that needs decolorizing. For the most gentle and effective removal, use a weak solution (the lowest volume necessary to address the color build-up). This removal may produce an uneven lift, with some color sticking to patches of hair, depending on the porosity, build-up of color, etc. This way you can assess the nature of the color, and see the more resistant parts of the hair without overlightening vast sections of the hair. More buildup requires a higher volume solution and more time spent removing. One or two layers will lighten relatively easily with a weaker solution.

Color removers should be applied with a wet, but thin application. Usually color removers are applied at the back of the head where the darkest hair is. If the hair lightens more quickly than expected, you can rinse that hair easily, giving you time to match the front. Ends usually have the most color buildup, and the scalp lightens most easily due to increased heat and fine hair.

In clients with long hair, the midshaft is usually more resistant, lifting more slowly. Timing is everything! Keep an eye on that hair, and do not keep the product on any longer than is recommended. If more lightening is needed, apply a second application on the dark spots only, using a slightly stronger solution. Once the desired level is reached, shampoo, condition and towel dry gently before you begin the color.

Permanent hair coloring (oxidation color) is usually only applied to dry hair. There is no need to preshampoo because oxidation color will penetrate any product on the hair. Some like to preshampoo and apply to damp hair. This is mostly a matter of personal preference. The only time you must shampoo thoroughly before coloring is if heavy oils or moisturizing products have been used on the hair, because they make the hair more resistant to color products. Semi-permanent color may discolor when used with oily hair care products.

Be sure not to scrub the scalp before any chemical treatments. Put cream around the edges of the hairline, avoiding the hair, to minimize skin irritation and stains. Colors darker than light blonde have the potential to stain the skin.

Application effects

The following coloring effects can make the hair appear thicker, healthier and more lustrous, in most cases by adding depth or dimension with multiple tones and levels:

- **Highlighting**: Adding slightly lighter colors to brighten and add shine and texture. They work best with warm shades. Usually needs maintenance about every six weeks, although this varies depending on how much lighter the highlighting tones are than the rest of the hair color.
- **Twilighting or lowlighting**: Both refer to adding darker tones (but no more than three shades darker) to soften over-lightened hair, tone down too-bright hair colors, and add dimension to flat hair color. Touch-ups are required about every six weeks, depending on how much the darker tones vary from the rest of the hair.
- **Glazing or veiling**: Renewing old flat hair color by applying a semi-permanent glaze in a richer tone over a permanent shade.
- **Blocking**: Adding blocks of color to portions of the hair, like the bangs, for example, or the ponytail. In some cases, two or three colors are blocked into the hair in alternating sections to create a multidimensional look.
- **Chunking**: Coloring chunks of hair (large, random sections) with bright, trendy colors.
- **Baliage (or balayage)**: This hair painting technique from France is gaining fans. Literally, it means "to sweep" the hair with highlights. In this method, the stylist hand paints select sections of the hair with color highlights to create a unique effect. The application is best on textured, natural curls, or wavy hair. It is a natural look that tries to mimic the way the sun lightens hair.

Application effects may require:

- **Weave caps**: Used to highlight, twilight and lowlight. The stylist pulls small strands of hair through holes in the weave cap, ideally

producing a subtle change that enhances hair color. The stylist may weave a number of different colors for a subtle or striking look.

- **Foiling**: The stylist places sections of hair onto rectangular sheets of foil and applies color or lightener, then folds the foil to keep the color fixed in location. Foiling is the only highlighting that can be applied close to the root.

OTHER ASPECTS AND SERVICES

Other important aspects of color services are strand testing, using filler and the rules of decolorization.

Strand testing

Preliminary strand tests are normally performed to get a preview of the color that you intend to use. If you don't like what you get, you will need to reformulate and decide what about the color is undesirable and how to fix it. The hardest thing about strand testing is using the exact same mixture of chemicals on that one tested section as on the whole head – you will be mixing a very small amount of the formula initially, to cover only about a half inch of hair. Usually the most problematic or questionable hair is used – typically the most overporous, the darkest, etc. In cases of partial gray, the gray section may be used.

Timing of the strand test is critical. Overporous hair processes more quickly than normally porous hair. When checking the result, squeeze the excess water off the strand, place it across a clean cloth or towel, then repeatedly spray it with water and wipe it until the hair is clean. Dry it completely with a towel or blow-dryer (unless heat affects the color). Observe the color. If you are touching up (retouching) the roots, you can perform a strand test at the same time to examine results on overporous ends. This is the best way to determine how much you will need to adjust the length of time for processing. Strand tests help avoid problems with porosity gradients, unevenly damaged hair, changes in temperature and uneven mixing or application.

Hair near the scalp tends to be affected more quickly by chemical treatment because heat from the head accelerates the chemical reaction. This is always a function of lightening. The rate of a chemical reaction increases when the temperature increases. Additionally, the hair around the face is very fine, processing very quickly.

Filler color

About 5-10 percent of the hair's makeup is water, but hair also absorbs a great deal of moisture from water and air, which can swell hair as much as 20 percent in diameter. Alkaline solutions in hair color increase the swelling even more, up to 100 percent, necessary for those products to work effectively. Almost anything can be used as a filler; even water. (Stylists commonly use water as a filler when they apply color to damp hair so that it will distribute the color more evenly.)

In cases of extreme porosity, filling is essential. This is also referred to as prepigmenting, especially when a color filler is used. Conditioner can also be used as a filler, to even out porosity, improve the feel of the hair and facilitate the even distribution of color. Conditioner, however, should never be used as a substitute for a color filler. The color filler's function is to replace underlying base pigment that is missing from the client's hair so that all hair will be the same level and tone. Color filler helps the color "stick," forming a physical structure that the color can grab hold of. A color filler makes the color deposit more even and effective.

Fillers are usually needed when you are shifting two or more levels darker (tints lack primary colors that need to be replaced) or if tints fade dramatically between treatments. If tonal problems occur, i.e., there is a strange cast to the color, etc., filler can improve the look. Some fillers are color pigments that are not mixed with hydrogen peroxide, so provide no lift. Colors in the gold, orange or red-based categories are typically used for filling.

When a permanent color is used as a filler, use a very low volume developer and check the progress. Processing time may be surprisingly brief – perhaps twice as fast as the normal time required. Apply the filler more lightly than you would a permanent color – be sure it soaks into the hair, but do not apply thickly. In some cases, you may need to blot or rinse the filler before applying the color; in other cases, you can apply the color right away. Color fillers are always warm. If a cooler result is desired, use a lighter filler (gold-orange instead of orange, for example) with a neutral series over it. If your end result is too warm, the filler you used was too dark.

You will want to use color filler on overporous ends and any other parts that tend to take color unevenly. Follow manufacturer's recommendations regarding filler formulation, application, exposure time and the need for rinsing or blotting. Fill the following:

- Areas that are overporous.
- Areas that tend to fade.
- Areas that are overlightened.

For natural looking results, if you fill at the same time that you color, use the level you are targeting or one level lighter for warmer color. Color fillers should be a tiny bit lighter than the underlying pigments of the target color level and tone you want. Filler for dark blonde color would be light orange (for a red blonde result) to dark gold (for a neutral result). A light brown color would use a dark to light orange; a medium brown color, a red to dark orange.

Filler color guide

- **Neutral** – No change in tone, to reduce intensity of existing color.
- **Gold** – Adds warmth to blonde and light browns.
- **Brown** – Adds richness and depth to browns.
- **Red** – Used to accent auburn tones in red, dark brown and black.
- **Platinum** – Used to neutralize gold or yellow from lightened hair or cool a blonde tone.

Use a protein conditioner filler first on very porous hair, then follow with a color filler. If you recondition hair prior to corrective color, the reconditioners will help the pigment grab onto the hair and lock it in so it fades less. Using a filler with high lift color makes sense if the ends have faded dramatically, resulting in a two-tone, patchy or damaged look. Fill first, then proceed with the tint.

While permanent hair color is most often used as a filler, many semi- and demi-permanent colors can also be used. It is best to use products specifically intended to be used as fillers. Again, read and follow manufacturers' instructions carefully, as you will use different filling strategies to meet different needs.

Decolorizing and dominant remaining pigment (DRP)

Dominant remaining pigment (DRP), also known as remaining pigment contribution (RPC), is what is left in the hair after lifting occurs [see Figure 19]. You'll need to determine the colors that will exist at a given level of color so you can choose the appropriate base color formulation to either neutralize or brighten (enhance) and achieve the target, or desired, color. A number of charts showing remaining pigment concentration for common colors are included. While charts can be helpful, details will vary based on the specific color products you're using.

Existing Hair Color	Level	Stage
Black	1	Black
Dark brown	2	Brown
Medium hrown	3	Red-violet
Light brown	4	Red-orange
Lightest brown	5	Orange
Dark blonde	6	Gold-orange
Medium blonde	7	Gold
Light blonde	8	Deep yellow
Very light blonde	9	Yellow
Lightest blonde	10	Pale yellow

Figure 19: Hair levels and corresponding decolorization stages

Whenever hair is lightened, the result is increased warmth. Typically, red, orange and yellow become more pronounced because the first pigment to lighten is blue. While the appearance to the human eye is slightly different from when the color is looked at under a microscope, one can think of the appearance of the lightened hair progressing through a series of colors in a predictable pattern. It is commonly portrayed as a ladder with ever-lightening steps. Here are two versions:

10 Pale yellow	10 Pale yellow
9 Yellow	9 Yellow
8 Yellow gold	8 Yellow orange
7 Gold	7 Light orange
6 Orange gold	6 Orange
5 Orange	5 Red Orange
4 Red orange	4 Deep auburn (microscopic violet/red)
3 Red	3 Deep brownish red (microscopic violet)
2 Red brown	2 Very dark brown (microscopic blue violet)
1 Dark red brown	1 Black (microscopic blue)

Figure 20: Ten degrees to decolorization

Sometimes this is referred to as the "10 degrees to decolorization," lightening hair from a level 1 to a level 10 [see Figure 20]. Each naturally pigmented hair begins decolorization at a different level or stage, with black hair passing through each level or stage. You may want to try bleaching strands of black hair with a regular powder or oil bleach with 20-volume developer to demonstrate this for yourself. Note the change or lifting action every five minutes. Try to determine the time needed to lift one level of color. Because each product line is a little different and colors are subjective, each stage will vary slightly from product to product.

The results of decolorizing natural hair pigment vary based on the original underlying color. Light hair colors typically lighten easily and rapidly. Darker hair may be resistant to lightening, not losing any pallor after the yellow-gold phase. Brassiness can be addressed by neutralizing the color with a toner. A blue toner will neutralize orange hair, but produce green on light yellow hair.

- The target level and tone dictate how much color removal is required.
- The amount of removal needed and the hair's characteristics dictate the formula strength.
- You will need to decolorize slightly more than the dominant underlying color of the level desired. For light brown, decolorize to light orange; for a target of red, decolorize to a dark orange.

Target Level	Target Tone	Dominant Underlying	Decolorize Until
Dark	Brown	Red brown	Red
Medium	Brown	Red	Dark orange
Light	Brown	Golden red/dark orange	Light orange
Dark	Blonde	Reddish gold/light orange	Gold
Medium	Blonde	Gold	Yellow
Light	Blonde	Yellow/light gold	Pale yellow

Figure 21: Targeting desired color

Understanding dominant remaining pigment is the key to success with all single-process lightening formulas [see Figure 22].

Color	Remaining Pigment	Level	Formula 1	Formula 2
Dark Brown	Blue Browns	1 blue 2 blue violet 3 violet	90% deposit 10% lift 2.5-6 volume hydrogen peroxide	Depositing formula = 2 oz color + 2 oz 20 volume hydrogen peroxide = Total oz/volume (4/20) = 5 volume
Medium Brown	Red Browns	4 red violet 5 red 6 red orange	50% deposit 50% lift 7-11 volume hydrogen peroxide	Medium Lift formula = 2 oz color + 2 oz 40 volume hydrogen peroxide = Total oz/volume (4/40) =10 volume
Dark Blonde	Red Blondes	7 orange 8 yellow orange	10% deposit 90% lift 12-18 volume hydrogen peroxide	High lift formula = 2 oz color + 2 oz 60 volume hydrogen peroxide = Total oz/volume (4/60) = 15 volume
Light Blonde	Yellow Blondes	9 yellow	See 7 and 8's	See 7 and 8's
Lightest Blonde	Pale Yellow Blonde	10 pale yellow 11 palest yellow		
White		12 white		

Figure 22: Table of remaining pigment

Corrective coloring

A consultation for corrective color is equally as detailed as an initial consultation for color services. Listen carefully to find out what the client doesn't like about the current color, then assess each section of the hair, noting differences along the hair shaft, at the scalp and the ends. You will need to accurately identify different tones and levels,

and develop strategies for addressing differences between different areas of the hair (growth, shaft, ends) and differences in porosity.

After you have talked with the client and feel you have a good grasp of what he/she wants in corrective hair color, let her know your estimated price for the services and how many sessions are necessary. Color correction often requires a number of steps. Also, let her know what kind of aftercare is necessary to maintain the color.

Using one color at a time is especially important when you are training your eye to see subtle changes. Mixing colors means never knowing which effect is from which tube. With consistency in your use and application, you can learn from every job. Examine the hair very closely, both before application of color and after, to train your eye to see subtle variations. You can also learn a lot from your peer's good and bad experiences. Improving your analytical skills and ability to formulate desired colors are rare skills with great potential for financial reward. Never take chances with your client's color. Always use strand testing to refine your formulation. Once you have the desired results, proceed with the whole head.

Always address hair condition and porosity in color correction. If hair looks damaged, proceed with caution and recondition to the extent you think necessary. Color is unlikely to adhere to damaged, protein-poor hair; it is prone to fading and/or washing out sooner. Recondition the hair before corrective color treatment to help the pigment adhere to the hair, and recondition after corrective color to help lock in the color and make it more fade-resistant. The client should also use a good moisturizer at home, between visits, and a pH-balanced shampoo (4.5-5.5 pH) to maintain good color.

In some cases, oxidation color can leave the hair in better condition because it penetrates the hair's cortex. The color remover has a higher pH, opening the cuticle of the hair, while the oxidizing tint fills the cuticle, acting as a conditioning treatment (at a lower pH). Oxidation locks in hair color and makes it more reflective. Mixing conditioner with the color mixture will also help it penetrate the cortex, strengthen hair and resist fading.

Color correction usually requires a number of steps, with filling and conditioning almost always necessary. Using a filler produces a more natural looking color with higher reflectivity. It will help even out disparate porosity, deposit color to faded ends (without requiring developer), reduce streaks and patchiness, and reduce the likelihood of off-cast colors. To determine what filler is needed, follow the manufacturer's recommendations (a rule of thumb: use a filler that has deep red, plus gold levels for levels 1 through 5; orange for levels 6 or 7; and gold for levels 8 to 10. The intensity of the filler is determined by the level of the target color).

You may need to strip or remove color before lightening to achieve lighter levels. If an unwanted tone is too dark, it is best to use a color removal product, as color needs to be lifted, not covered; otherwise the look will be drab and excessively ashy (even covered with warm tones). If a color client wants to change her tone significantly and the old artificial color is not removed, the old tone will show through. Very bright reds, for example, may require decolorization, as there is no effective way to cover the color. Sometime it is easier and less damaging to hair to lift out the unwanted color instead of neutralizing the tone with complementary color. A color client who wants to go lighter than her current (artificial) color and will need to remove existing color is a good candidate for oxidation color.

The amount of ash or drab in bases varies by manufacturer and product. You may have to use a completely different formulation on the ends, depending on the amount of fading and degree of porosity you see in the hair. The longer you work with a color line, the more confident you will be about producing the color you want. If a color client wants to go two or more levels darker than her existing artificial color, prepigment with a color filler. Even a client moving one level darker is likely to benefit from a good pigmented shampoo.

Overporous hair tends to look ashy and resist warmth. You will need to use a weaker formula and adjust for the ashiness through formulation, processing time and application. Overporous hair processes more easily, so needs a lower volume developer; 10-volume is usually sufficient. Timing may be surprisingly short. Always strand test to determine proper timing when formulating for overly porous hair. You may want to add an equal part of water to the formula to dilute the working volume, emulsify and work through the hair. Applying color to damp, rather than dry hair is another way to facilitate an even application on overporous hair.

One common corrective color treatment is a tint-back; tinting overlightened hair to a darker, more natural color. This two-step process puts dimension and depth back into artificially lightened hair, using a color filler with a warm underlying pigment to prepigment (fill) then a second application to fine tune the tone. For a target of light brown hair, apply a reddish gold (light orange) formula to fill. The color should be just slightly lighter than the dominant underlying pigment of the target light brown color. If the hair is already very warm, filling may not be necessary. Assess how many levels darker the client wants the desired color, then assess whether there is sufficient warmth in the hair to maintain that level of depth.

Maintaining tint-backs is difficult as they have a tendency to fade. Some stylists address this problem with an application of filler and color before it fades too substantially (usually after two or three weeks, depending on exposure to the sun or stripping products). This allows the client to get a sufficient base of pigment that will hold the color. Colored shampoos or conditioners can also be very useful in maintaining color.

Adapt the form provided (see Figure 23) to meet your color correction needs.

Client's Name _____Date _____
PRODUCT SENSITIVITIES/ALLERGIES _____
What client specifically likes (if any) and dislikes about the color, level, tone, etc. _____
Factor Formulation
Clients Natural Base Level _____
Percentage of Grey _____ Distribution _____

	New Growth	Midshaft	Ends
Porosity			
Texture			
Existing Artificial Color: Level			
Existing Artificial Color: Tone			

What product and brand is the existing artificial color?

_____

Target (desired) level and tone _____

	New Growth	Midshaft	Ends
Formulation notes (volume developer, pigment, etc.)			
Application notes (filler used, etc.)			
Timing notes			
Maintenance notes (aftercare, etc.)			

	New Growth	Midshaft	Ends
Strand Test Results			

Notes for reformulation, if necessary (attach new form for new instructions, as needed) _____

Figure 23: Color correction form/notes

Grays

Most women start to color their hair when it begins to gray. Gray hair can be tricky if you don't know the rules, so this section will walk you through some of the most common situations related to coloring gray hair. Gray and white hair both refer to the same thing: a degree of depigmentation. White has no pigment, while gray has a minimal amount. Technically, gray is ash. Covering gray requires filling in the warm tones that gray hair loses as the color goes.

Gray hair is more resistant to color than normal hair. You will typically apply hair color to white and gray hairs first, as they will require extra treatment time to soften the cuticle, allowing the hair to absorb the color more effectively. To make gray hair less resistant, use a slightly higher volume of developer (20 volume). Avoid using anything over a 20-volume concentration as this will also reduce the effectiveness of deposit. Try to select the lowest volume developer you can that will be capable of softening the cuticle sufficiently (the more wiry the hair is, the higher volume of developer will be required). Anything below 10 volume will not soften the cuticle sufficiently. Very resistant hair will need softening at the roots.

The percentage and distribution of gray and how it is addressed is critical to natural looking coloring. We have already discussed the common mistake of coloring a gray-haired individual too dark. People get used to seeing the lighter gray hair around the face, and dark hair will contrast too sharply, making a dramatic change that the client might not be ready for. (Both very dark and very light colors can product a jarring contrast against the skin.) As people age, they tend to need softer tones.

If less than half the hairs on the head are gray, try a color level that is one level lighter than the natural base color. If more than half the hairs on the head are gray, use a target level two levels lighter than the natural base color.

Toning gray

See the manufacturer's recommendation for using a product with gray hair. Different strategies will be addressed on the package insert or accompanying materials. Gray hair is actually ash hair. It has no warm tones. Ash-based colors are capable of producing cool, unflattering tones in gray hair – violet, blue or greenish, for example. When working with ash, it is usually necessary to also use a neutral tone, which supplies warmth. Warm tones fill in the warmth in the hair that is missing, with slightly warmer tones making a substantial difference in hair tones; neutral colors will deposit warm tones more naturally.

Because gray hair has little warmth, red appears particularly bright on a head that is somewhat gray. The more predominant the gray, the brighter the red. More subtle reds may work, but many types of red are not designed for gray or unpigmented hair, and should only be used on hair with normal amounts of melanin to produce the desired effect. Avoid strong reds, and use a red-brown, golden or neutral tone to make the color appear more natural.

Very light blonde colors are usually meant to lift natural pigment (melanin), not cover gray hair. Covering gray is a matter of depositing color, and you will find gray coverage much more natural and effective if you use a light to medium blonde or darker. Some light blondes can be used for blending, but most will be almost transparent on white or gray hair. Golden blondes are the blonde that covers gray best, as the addition of gold creates good tone on high percentages of gray. While systems vary, a "gold" series will look slightly golden if the client is almost completely gray.

Use the following application strategy for covering gray: Start with the greatest concentration of gray, and wet thoroughly with the formula. Don't soak the hair in so much formula, however, that air is unable to circulate around the hair and appropriately oxidize. Make sure hair around the hairline doesn't dry out. Double application is often the best strategy for covering gray. Apply as you would a virgin double application. The first application should be applied one-half inch away from the scalp down to the ends. Wait about 20 minutes, blot the excess from the hair, and apply a new mixture of color, scalp to ends.

By coloring the hair two times, you are presoftening and prepigmenting the hair, making the deposit more successful on gray hair. Use the maximum amount of time required to ensure color endurance. Your client may not want to wait those extra minutes – until you tell her/him that sufficient processing time directly corresponds to a color's staying power. In doing retouches, make sure the regrowth is exposed for the maximum time (but check due to faster processing at the scalp). Fine-tune the process to repair faded ends.

If you are not getting a good deposit on gray hair, confirm you are using the correct strength of developer, ratio of developer to color, and are waiting the whole processing time required by the manufacturer. The product may require presoftening resistant hair before use. Not all gray has the same level of resistance. In some cases, semi- and demi-permanent colors are unable to penetrate the cuticle to any degree, so are largely unaffected by any products that do not have the penetration capabilities of a permanent (oxidizing) color.

Blending gray

Graying clients do not always benefit from total permanent coverage. Permanent products tend not to blend, but cover – with a more or less opaque look. If you are looking for natural looking coverage, use a blending formula, rather than one that covers gray. Many specifically use the term "blend" on the label to describe their effects. A blend is a combination of types of coverage, meaning that each strand is covered slightly differently. Blending also makes regrowth more subtle.

When blending, color is applied unevenly. A comb can be used to apply formula lightly, leaving some untouched around the face, for example, for men who want to retain a little dignified gray at the temples, for example. Many semi-permanent colors are used for blending clients with very little gray, while demi-permanents can be used both to blend or to cover (deposit). Many products can be manipulated to produce one effect or another.

Gray hair has a tendency to yellow, picking up materials from the air and water. Keeping it silvery often requires semi- or demi-permanent coloring. Do not use a product for this purpose unless it is specifically recommended by the manufacturer.

Reds

It is harder to produce a good red on overporous hair. It is also harder to maintain and more subject to fading. Red heads almost always require filling out the more porous sections of hair to look more natural and resist fading. Reds who fade (almost all reds) will require a color filler. Filling in ensures that the warmer tones will remain in the hair. If the hair is excessively porous, blonde or very fine, it is more likely to fade. Overporous hair will not appear as bright as normally porous hair with the same product.

As noted earlier, red pigment on gray or prelightened hair will be brighter than the rest of the head. Red formulations for predominantly gray clients often use gold or neutral tones. Like high-lift blondes, double applications should start one-half-inch away from the scalp. If

you attempt to do a scalp-to-ends, especially with a relatively bright color, the scalp will be significantly brighter. Using lower volumes of developer tends to make a more flattering, deeper red than higher volumes do. The higher volumes take away some of the intensity and depth of the pigment.

For virgin long hair, you may need to adjust the volume of developer the first time so that the length and scalp look right together, using 30 volume, for example, instead of 20 volume, on the length (avoiding the scalp), as the length of the hair is more resistant. Timing is critical with a virgin application for red hair. Mistakes can be obvious.

With reds, especially, using the maximum processing time is critical, because many different chemical reactions may need to occur in a specific sequence before the most subtle or rich colors develop. This takes time, and sometimes the maximum time. Stopping early is cheating your client of the best effects.

Do not use the same red on the ends that you would use for the regrowth, or the ends will be darker (more brown) than the part. When you retouch this individual, you'll use low volumes on the length of the strand to maintain its look. (You can add equal parts water to dilute the remaining mixture or mix a new batch with a lower volume developer.) Use a more intense red for the ends and any other spots that are overporous, as they are more resistant to red tint.

You will want to avoid damage to the shaft and maintain its healthy condition, because hair that becomes damaged and overporous fades more quickly. To avoid damaging long hair, you may choose to put nonoxidating color on the length of the hair (to avoid the damage that oxidation color may risk). Keep the hair in the best condition you can and baby the color to maintain red hair longer.

Decolorizing reds is sometimes necessary when a client wants to remove the darker tones in their red to appear lighter, when a bright red client wants to significantly change the tone, or a client wants to even out her tone after a home coloring goes awry. Some reds can be covered, but many must be removed.

Blondes

A meticulous application is particularly important with blondes. Find a methodical strategy for sectioning hair and applying color. Many people quarter the head, then apply color along the part, while some spiral down from the crown. Finding a method that works for you and using it every time is important. You need to develop a reliable strategy for covering the right sections at the right time. Technique matters more, as demarcation lines and errors are more obvious. Try to develop a consistent technique and avoid overlapping, which is more dangerous with high-lift color. In retouching, beware of potential "banding."

For high-lift blondes, address the darkest areas first in your application. Coarse hair is more resistant, and fine hair lightens more readily, so processing times will vary. Note the hair around the face. Some people with normal hair have particularly fine hair at the hairline, which is likely to lighten much more quickly, as well as hold on to ash tones. Do this section last and give it your full attention to assure good color.

Don't be afraid to use the recommended maximum time for the best color. Many of the more subtle tones take longer to develop and process fully only at the end of the maximum period. In both virgin applications and retouching as well, use the maximum time but check frequently. Natural base level usually dictates the highest level that should be attempted in a single process, but texture and porosity are also an issue. Individuals who have previously had chemical treatments of other kinds are more likely to be more porous, and therefore process more quickly. Damaged hair processes more quickly and appears more ash than healthy hair.

Any product that lightens dark hair is potentially damaging. Ammonia, bleach and permanent color all take their toll on hair. The more chemical treatments, the more likely the damage, so recondition after any lightening procedure. Some color removers designed to remove permanent oxidation colors are mild bleaches (even milder than scalp bleach) that also condition the hair. While hair can be lightened from 1 to 10, it is not necessarily a good thing to do, as harsh products and long processing times are hard on the hair and scalp. Permanent hair coloring has a maximum lift capacity of about four levels, sometimes five, if a booster is used. Attempting to boost the maximum amount of lift risks damage to the hair. If a client wants to go very light, he/she will need to undergo double-processing (also called "prelightening").

High-lift blonde

Double-process blonding is a way to get very light blonde shades on people whose hair is naturally dark. Hair is first prelightened with bleach, then toned. There are a number of ways to get this effect. Some people prefer to use bleach, followed by a toner (a two-step process), while others choose to lift and tone all in one process, with oxidation color.

For high lift blondes, choose the target level and tone:

- Very light blonde usually has an undertone of pale yellow.
- Light blonde usually has an undertone of yellow.
- Medium blonde usually has an undertone of gold.

European colors sometimes include levels 11 and 12. Any levels above 10 have very little pigment, typically producing the same effect as a mild cream bleach [see Figure 24].

Level	Remaining Pigment Contribution
Blondes	
7	Orange
8	Yellow Orange
9	Yellow
Light Blondes	
10	Pale Yellow
11	Palest Yellow
12	White

Figure 24: High lift blondes

Some double process this way to reduce potential damage to hair: A level 4 who wants to be a 10 will be lifted by bleach to a 6 or 7, then will use permanent dye and a 40-volume developer to do the rest of the job. The same process is used for the retouch. Some stylists like to emulsify high lift colors using the soap cap method (wet the hair and work the color through the hair for a minute or two.) To remove off-tones or brassiness, dilute the lightening formula with conditioning shampoo, then follow the lightening treatment with a deep reconditioner.

In double-process bleaching you'll need to gently but thoroughly rinse the bleach in warm water after the first application, followed by an acid rinse or other process that will halt the bleaching process. Rinse thoroughly and towel dry. Tend to porous hair with a leave-in treatment. Now you can turn to toning.

Toners are often oxidation dyes, or permanent colors, without the ammonia or alkalinity that is tough on hair. The toner is able to chemically react with a lower volume developer to even out underlying warm spots or neutralize tones. The greater the degree of lift, the more

warm a tone you'll produce. If a warm tone is not desired, then ash can be used to neutralize (contrast out) the excessive warmth. The greater the warmth, the more ash must be used to counter it.

Most toning is "level-on-level"; you are directed to use the same level formula as the level you want to achieve, dictated by the level of underlying natural warmth that you want. If you want to achieve a 6 level, you use a 6 level formula. In cases where a natural base level is between 2 levels, use the darker of the two, or you will be likely to get excessive warmth. If you want the same level of color in the new color, use a color formula one level lighter to avoid the darker effect of color on color. One or two brands of permanent hair coloring use level variance rather than developer variance to adjust lift. "Averaging" formulas are products designed to use only 20 volume hydrogen peroxide that tend to contain ammonia.

This chart provides very general guidelines to consider to produce the right amount of ash to neutralize remaining warmth in blondes [see Figure 25].

Lifting Blondes	Neutralize With	Developer
1 level	Neutral Series	10 –15 Volume
2 levels	Ash Series	20 Volume
3 levels	Ash Series	30 Volume
4 levels	Ash Series	40 Volume

Figure 25: Neutralizing warmth with toning

For those high-lift blondes who want to be warm, use only a slightly neutral to cool formula to tone out a little of the natural warmth, but not all of it. Gold formulas work well in this regard as they usually having a softer look and include cool pigments as well. Beiges may also look slightly warm. Blue and violets dyes are used to balance out yellow tones.

Remember that lifting is related to the volume strength of the developer and the amount of ammonia. Lighter levels of color will contain more ammonia for greater lifting ability. The higher the volume of developer, the higher the lift. (Hydrogen peroxide at a concentration of 20 volume or higher is typically considered high lift.) Be very careful to follow the manufacturer's instructions regarding the ratio of developer to color and timing.

Platinum blondes typically require services every 10-14 days. The best way to maintain this look is to retouch often. Very light blonde hair can be is fragile, so always recondition with protein after bleaching as well as after you shampoo. When lifting blondes with overporous ends for the first time, leave out the ends on the initial application, then include with the second application. For lightening retouches, apply the product to the shaft and ends only if required to lighten. Avoid using a high-lift formula repeatedly on the ends, as they become overporous and ashen-toned. High-lift colors need not be pulled through; instead, low or no peroxide treatment can be used to address the rest of the hair. In some cases, you will need to mix a new formula for the ends that has more warmth.

Bleach/lighteners

Color removers that are mixed with hydrogen peroxide are classified as bleach and are capable of lifting natural melanin as well as artificial pigment. Cosmetologists use three main types of lighteners for hair: a cream bleach for on-the-scalp lightening because it will not dry out as quickly (body heat tends to dry the product); off-the-scalp bleaches, which typically have buffers that allow for more boosting power with less negative effects on hair condition; off-the-scalp (foils weaves, frosts) products usually use powdered bleaches, which lift color more quickly than cream bleach, which is slower and milder. In all cases, bleach can be hazardous.

Applications of bleach follow many of the same rules as applications of color, as the same factors apply: texture, porosity, percent and distribution of gray, natural base level and existing color. Be sure to mix all bleaching ingredients well, as this can affect the quality of lightening. Once the crystals are dissolved, add oil and mix well again. The bleach should remain where you apply it and be wet enough to soak into the hair, not run off it. If it's too runny, add oil; too pasty, add developer.

A virgin bleach-out application is similar to a double application with a single process color (apply one-half inch away from scalp, then, when the midshaft approaches the right color, apply to the scalp and watch closely). One method is to apply bleach from the scalp to the ends, then emulsify with a shampoo. When the color at the scalp has reached the desired level, rinse, shampoo and dry with cool air to see where the second application of bleach needs to go. This method helps you avoid damaging the hair with an overlapping layer of bleach, while you can keep an eye on a fine hairline or overly porous ends. Like coloring, begin the application with the darkest, most resistant hair. Sections for bleach application should be much smaller than those used for color. Extreme lightening, in this manner, can be a lengthy process.

Bleaching hair can take its toll. Changes to the hair include increased porosity; the hair may feel dryer or more brittle; and may tangle more easily. It may take longer to dry, and the cuticle layers may be raised and roughened after the bleaching process. Hair can be significantly weakened and strands stretch more easily. In addition, increased porosity makes further services more complicated, limiting future bleaching or other chemical services because damaged, highly porous hair absorbs greater amounts of dyes and conditioners.

Slight or normal bleach application need not qualitatively degrade hair, however. Porosity and weakness can be countered through the use of proper conditioning and hair care. In fact, some increase in porosity can improve the look of hair, as tints and toners are better able to absorb into the hair after the lightening process. Repeated bleaching, however, will substantially degrade the hair's appearance and softness. One lengthy bleach application can weaken the hair by as much as 15 percent or more, with repeated treatments causing even more damage, as each time, molecules are pulled from the cortex, stripping it of proteins.

Individuals who were blonde as children may be able to go blonde without bleaching. These clients already have good skin tone and eye color to go with blonde hair. Very blond hair works best on individuals with straight hair that is very healthy. Those with darker hair may notice the texture of their hair change with the chemical process, which can be harsh to hair. In such cases, the right aftercare and maintenance is critical to maintain good- looking healthy hair. Those with dry brittle hair can easily cause breakage of the hair shaft.

Chapter 6: Sanitation, Sterilization and Infection Control

3 CE Hours

By: JoAnn Stills

Learning objectives

- Describe recent events that require your knowledge of sanitation techniques.
- Explain the difference between pathogenic and nonpathogenic bacteria.
- Contrast disinfectants and antiseptics and explain the significance of those differences.
- List the steps necessary to properly sanitize your hands and to disinfect, handle and store tools appropriately.
- List infection-control responsibilities in the practice of cosmetology in North Carolina.
- List infection-control responsibilities according to universal sanitation precautions.
- Contrast sanitation and sterilization and explain the significance of those differences.

Introduction

Why do I have to complete sanitation continuing education? Salon professionals need to be aware that we have reached a time where, quite simply, antibiotic-resistant organisms can kill, and the frequency of infections from them is increasing. Due to the sheer nature of people touching people in a salon atmosphere, the killer organisms can occur in your facility if you aren't informed and following the proper procedures. The following information emphasizes how important sanitation is in your salon.

Your responsibilities

As a salon professional, you have responsibilities to the state and your profession to learn and use appropriate precautionary measures and cleaning procedures, to protect both yourself and your clients; reduce the incidence of bacterial, viral, and fungal infections; and prevent the spread of disease. You, your instruments and workstation must be kept as clean as possible, meaning no shortcuts or omissions of any precautionary measures discussed in this chapter. Violations can result in penalization by the state of North Carolina as well as infection.

The remainder of this chapter will review these subjects:

- The biology of pathogens, how they function, reproduce and infect.
- Universal sanitation and sterilization precautions.
- State of North Carolina regulations that apply to cosmetology.
- The difference between decontamination, sanitation, sterilization and disinfection.
- How to effectively disinfect tools and surfaces in your environment, and to sanitize hands.

Microorganisms and infectious agents

Microorganisms are tiny living particles (organisms) with many different characteristics. They live in our air, water and earth, and are found everywhere on the planet. Some microorganisms are associated with infection or disease; others are harmless or even helpful. Bacteria, viruses and parasites are three major categories of microorganisms that you encounter every day.

Bacteria

Bacteria are tiny, one-celled vegetable microorganisms (plants) that can be seen only with a microscope. The most plentiful organisms on the earth, bacteria are found virtually everywhere around us, existing in dust, dirt and decay; our skin and body tissues; and the air we breathe and the water we drink. Bacteria produce slimy fluids or waxy coatings that moisten them and help them survive in inhospitable environments. Fimbri**,** hairlike tendrils that anchor the bacteria to an object, make bacteria sticky, requiring one to use some degree of pressure when scrubbing to break the hold of these tenacious fibers. Bacteria exist in one of two modes: an active, vegetative mode, and an inactive, spore-forming mode. In the active stage, bacteria grow and multiply at an astonishing speed.

Reproducing through binary fission (a process in which one bacteria splits into two), bacteria produce millions of copies within hours. Bacteria are only able to reproduce when the environment meets their specific needs in temperature and degree of moisture. They require a warm, damp, usually dark and often dirty environment that provides a supply of food adequate to sustain the bacteria and provide fuel for reproduction. If conditions are not favorable for reproduction, the bacteria will move into a spore-forming stage, producing spores with tough outer surfaces that are almost impervious to wind, heat, cold, harsh cleaners or disinfectants. These characteristics help spores survive for long periods between reproductive phases.

While there are hundreds of different kinds of bacteria, they are primarily sorted into one of two types, according to the danger they pose to us. Potentially harmful bacteria are called **pathogenic;** harmless or beneficial bacteria are called **nonpathogenic.** The great majority (about 70 percent) of bacteria are nonpathogenic. Called **saprophytes,** these organisms do not produce disease and carry out necessary functions, such as decomposing dead matter, for example. Nonpathogenic bacteria also exist in the human digestive tract and in the mouth and intestines, where they facilitate digestion by breaking down food.

A much smaller minority (about 30 percent) of organisms are pathogenic organisms, also called **microbes** or **germs.** These are harmful and produce disease when they invade animal or plant life. Pathogenic bacteria commonly exist in the salon environment. Bacterial infection occurs when a body is exposed to and cannot successfully fight off bacterial invasion.

General infections typically begin as local infections, which may start as a boil or pimple accompanied by pus (a compilation of bacteria, decayed tissue, waste and blood cells) that is often associated with infection. Bacterial toxins from local infections can spread to different parts of the body through the bloodstream, increasing the likelihood of general infection.

Pathogenic bacteria are distinguished by their characteristic shapes: **Bacilli** are rod-shaped, and the most common bacteria, causing diseases such as influenza, tetanus and diphtheria. **Spirilla** are spiral-shaped bacteria, and **cocci** are round bacteria that produce pus. Cocci rarely move on their own, but are usually transported through the air in dust particles or other substances. Bacilli and spirilla are both capable of self-movement (motility), using hairlike projections (flagella or cilia) to propel themselves.

Methicillin-resistant Staph aureas (MRSA)

Methicillin-resistant Staphylococcus aureus (MRSA) is caused by bacteria known as staphylococcal aureus. Staph aureus is a common bacteria found on skin and mucous membranes. In MRSA, a type or strain of Staph aureus has become resistant to antibiotics in the penicillin family, which includes methicillin.

People can become either colonized or infected with MRSA. In colonization, people have MRSA on their skin or mucous membranes without signs of infection. With infection, the bacteria have entered the body and have begun to multiply and cause damage to the organ or body tissue involved. Signs of infection include fever, warmth, redness of the area, pain and an elevated white blood cell count. MRSA is spread by direct contact with affected areas and is normally not spread by casual contact. Good hand washing and the use of gloves for contact with mucous membranes will avoid transferring the bacteria from one person to another.

How common are Staph and MRSA infections?

Staph bacteria are one of the most common causes of skin infection in the United States and are a common cause of pneumonia, surgical wound infections and bloodstream infections. The majority of MRSA infections occur among patients in hospitals or other health care settings. But they are becoming more common in the community setting.

What does a staph or MRSA infection look like?

Staph bacteria, including MRSA, can cause skin infections that may look like a pimple or boil and can be red, swollen, painful or have pus or other drainage. Infections that are more serious may cause pneumonia, bloodstream infections or surgical wound infections.

Are certain people at increased risk for community-associated staph or MRSA infections?

Factors that have been associated with the spread of MRSA skin infections include close skin-to-skin contact, openings in the skin such as cuts or abrasions, contaminated items and surfaces, crowded living conditions and poor hygiene.

How can I prevent staph or MRSA skin infections?

Practice good hygiene:

- Keep your hands clean by washing thoroughly with soap and water or using an alcohol-based hand sanitizer.
- Keep cuts and scrapes clean and covered with a bandage until healed.
- Avoid contact with other people's wounds or bandages.
- Avoid sharing personal items such as towels or razors.
- Practice good disinfection techniques.

If I have a staph or MRSA skin infection, what can I do to prevent others from being infected?

You can prevent spreading staph or MRSA skin infections to others by following these steps:

- **Cover your wound.** Keep wounds that are draining or have pus covered with clean, dry bandages. Follow your health care provider's instructions on proper care of the wound. Pus from infected wounds can contain staph and MRSA, so keeping the infection covered will help prevent the spread to others. Bandages or tape can be discarded with the regular trash.
- **Clean your hands.** You, your family and others in close contact should wash their hands frequently with soap and warm water or use an alcohol-based hand sanitizer, especially after changing the bandage or touching the infected wound.
- **Do not share personal items.** Avoid sharing personal items such as towels, washcloths, razors, clothing or uniforms that may have had contact with the infected wound or bandage. Wash sheets, towels and clothes that become soiled with water and laundry detergent. Drying clothes in a hot dryer instead of air-drying also helps kill bacteria in clothes.
- **Talk to your doctor.** Tell any health care providers who treat you that you have or had a staph or MRSA skin infection.

Viruses

Viruses are infectious biological entities that are very small – much smaller than bacteria – and cause disease by entering a healthy cell, maturing and reproducing. Unlike bacteria, viruses do not survive for any length of time without the protection of a living cell. Viruses are dangerous because their replication inside the cell eventually causes the death of that cell. They are parasites, taking the cell's nutrients and destroying the cell in the process. The cell is then used to breed hundreds, thousands and even millions of new mature infectious viruses that leave to infect other cells. Viruses cause diseases like hepatitis, influenza and measles, and are the source of colds, chicken pox, cold sores and genital herpes, mononucleosis, hepatitis and HIV/AIDS.

Viruses are a particular concern in salons because of their potential severity and the way they spread. Viruses occupy the surfaces of objects you touch, including door handles, coffee mugs and scissors; they can be inhaled on tiny dust particles or travel on the minute amount of saliva expelled in a cough. Viral infections can be

transmitted from one person to another through casual contact with an infected individual or contact with what he or she touched. Both hand-to-surface and hand-to-hand contacts are highly effective methods for transferring virus particles from one individual to another.

Viruses are hardy organisms. They can live for up to 48 hours on the surfaces of toys, coffeemakers, doorknobs, computer keyboards and other hard surfaces in a salon. It can take up to a week for that virus that infected you to produce symptoms.

Plant parasites

Plant parasites, such as **fungus** or **mold, mildew** and **yeasts** are multicellular organisms that are as prevalent as bacteria and consume both live and dead tissue to survive. Fungi usually prefer a damp environment, but can also survive in a warm, dry climate. They reproduce and spread a number of different ways, and can invade the human body easily, requiring no break in the skin.

Ringworm and athlete's foot are two common contagious diseases that are spread by fungi. Another is favus, which affects the scalp. Cosmetologists should not serve any individual with signs of any fungal infection. If you have a fungal infection, do not work and seek treatment immediately. If you think a client has ringworm, identified by a ring-shaped, circular pattern on the skin, or athlete's foot, do not provide service to the individual, because they are highly contagious. Tell the individual to consult a physician for treatment.

Precautions with plant parasites

Fungal infections can be stubborn. Many affect the skin, but fungal infections can also cause severe respiratory infections. More common versions of fungal infections are those caused by yeast, including nail fungus, athletes' foot, jock itch and ringworm. Both over-the-counter and prescription treatments are available for relief from the unpleasant, itchy symptoms of many yeast infections.

Plant parasites, like fungus and mold, are contagious, with nail fungus a significant risk to clients receiving nail services because fungi can spread, not only from one nail to another but also from a client to a technician or the reverse, given improper sanitation techniques at a salon. Nail fungus appears as discoloration of the nail plate (on either the fingernails or toenails), initially appearing white, but growing darker over time. Clients with nail fungus should be referred to a physician for treatment.

Molds and mildews do not infect fingernails, and rarely, if ever, appear under the nail.

Greenish bacterial infections, which may appear yellowish or yellow-green initially, can continue to stain the nail plate long after an infection has subsided, and are sometimes mistakenly attributed to mold. Nails can harbor dangerous bacteria, which can thrive on the oils and moisture that exist between an improperly prepared or unsanitized nail plate and an applied enhancement.

Clients with nail fungus or other infections should not receive nail services, but can be assisted in removing an artificial nail from the infected natural nail. If you are asked to expose the natural nail, follow these precautionary steps:

- Wear gloves during the removal of artificial nails.
- Follow the manufacturer's instructions for removal.
- Discard any implements, including orangewood sticks, items with porous surfaces and any abrasives used.
- Disinfect all implements and work surfaces.
- Refer the client to a physician for treatment once the natural nail is exposed.

Animal parasites

Animal parasites may be single-cell **(protozoans)** like amoebas or malaria, or multicell, like mites or lice. Protozoans consume both plant and animal tissue and are found in blood and body fluids, water and food. Multicell animals such as lice and mites can hide in the hair and burrow under the skin. Be aware of the signs of scabies, identified by bite marks on a client; Rocky Mountain spotted fever, or typhus, caused by rickettsia; and animal parasites carried by fleas, lice and ticks that are even smaller than bacteria.

For any individual with a visible communicable disease, like pediculosis (head lice), open sores or marks suggesting scabies, it is recommended that the person furnish a statement signed by a physician that the disease or condition is not in an infectious, contagious or communicable stage. The same is true if the cosmetologist has symptoms or indications of a visible disease, lice or open sores; he or she should not practice cosmetology until obtaining a statement signed by a physician stating that the disease or condition is not in an infectious, contagious or communicable stage.

Modes of contamination

Diseases are communicable or contagious when they move from one individual to another. Working with the public means encountering potentially dangerous pathogens and opportunistic organisms every day. Always assume your clients, co-workers and environment could be carrying illness, and use proper infection control procedures every day.

Humans have some level of immunity against infection, but our level of protection varies with age, health and a range of other factors. Skin is our first line of defense. When there are no cuts or scrapes, skin is excellent protection against pathogens.

In the vast majority of cases, bacteria, fungi and viruses enter the body through the portals of the nose and mouth, small tears or openings in the skin, and to a lesser extent, the eyes and ears. Once inside the body, the pathogen reproduces rapidly at a rate that can overwhelm the immune system, resulting in disease.

Transmission may occur through direct or indirect contact. For example, indirectly inhaling contaminated droplets in the air (airborne transmission), or touching a contaminated surface and then touching one's nose, eyes or a mucous membrane is an easy way to transmit germs. Try to avoid touching your face during the day, and always wash your hands between clients.

Yeast, scabies, lice and many other skin infections do not require an open sore or mucosal surface to infect. Athlete's foot contaminates through indirect transmission. When someone with athlete's foot walks barefoot on a wet bathroom floor, for example, the person leaves behind spores that will stick to the foot of anyone else walking barefoot on that floor, infecting the individual even if he or she has no cuts or openings on the feet.

Fungi, like athlete's foot, will survive for some time on a damp or wet floor. Spa shower stalls and soaking baths that retain small amounts of

water must be thoroughly cleaned and disinfected with the appropriate disinfectant.

The primary modes of travel for common contagions are:
- Unclean hands.
- Unclean implements.
- Open sores.
- Pus.
- Mouth and nose discharge.
- Shared cups or towels.
- Coughing or sneezing.
- Spitting.

Pathogenic bacteria can also enter the body through:
- A break in the skin, including pimples, scratches or cuts.
- The nose and the mouth during breathing.
- The mouth during eating and drinking.

Humans are excellent sources of contamination because we are constantly leaving organic particles behind wherever we go, a mixture of dead skin cells with viral, bacterial and fungal particles and other microorganisms that consume skin cells or use us to travel to an appropriate host. Every time you touch something, you deposit some of this organic matter on another surface. Simple actions, such as touching a client's hair, brushing some of your hair out of your eyes with your hand or touching a spray bottle can move microorganisms from one item to another, from you to your client or your client to you.

Individuals who are susceptible to infection because of a compromised protection system or some failure in their ability to resist invasion are also the targets of opportunistic microorganisms. In contrast to pathogens, opportunistic organisms do not cause initial illness but will infect an individual once pathogenic organisms have already weakened its immune system. Opportunistic organisms cling to the skin and the hair and exist in the bodies of healthy people.

Microbes also contaminate ventilation systems; to discourage their growth, vents, filters, humidifiers and dehumidifiers should be cleaned and maintained regularly. Investigate any mildew or musty odors, which are a good indication of microbe growth. Germs in a ventilation system easily spread throughout a salon, landing on people, surfaces and implements, whenever the blower or fan turns on.

Germs not only float through the air, settling constantly on salon surfaces such as sinks and countertops, and they can also "hitchhike" on human skin, hair and clothing, contaminating anything with which they come into contact.

Pathogenic and opportunistic microorganisms are able to thrive in a salon's warm, moist places, like the drain of the shampoo sink, the footbaths, hot- and cold-water handles and taps. Implements such as scissors, files, brushes or nippers can be major sources of contamination because they often contain organic matter, an optimum growth environment for pathogenic and opportunistic microorganisms.

Some of the most dangerous areas in your salon are the places you keep contaminated manicuring tools or equipment, including the manicure table and the trashcans in which you deposit dirty implements. Microbes can also exist on seemingly unlikely products, like bars of soap, for example. Because germs and other microorganisms have been shown to thrive on bar soap, many salons prefer to use liquid soap that can be dispensed from a container for each customer. In addition, soaking solutions, lotions and creams that initially are uncontaminated may lose preservatives that keep them safe from pathogenic or opportunistic microbes from growing in them. Changes in color, texture, appearance or odor can be signs of contamination.

Fighting infection may be a matter of staying home when you are sick. Just as you should avoid working with contagious clients, you should not go to work if you have an infection, such as a bad cold or flu. Cover your mouth and nose to control pathogens escaping through sneezes and coughs. Avoid causing wounds if your client's skin is dry or fragile; tears and breaks can occur easily, even when filing nails. Use abrasive instruments with care and a gentle touch, especially around the nail bed.

The problem of antibiotic resistance

Viruses cause:
- All colds and flu.
- Most coughs.
- Most sore throats.

Antibiotics cannot kill viruses. This is a common misconception. Many of us demand antibiotics from our doctor when we have a severe cold, but antibiotics in that situation can actually do you more harm than good.

Bacteria cause:
- Most ear infections.
- Some sinus infections.
- Urinary tract infections.
- Antibiotics do kill specific bacteria.

Drug-resistant bacteria

Each time you take an antibiotic, bacteria are killed. Sometimes bacteria may be resistant or become resistant. Drug-resistant bacteria do not respond to the antibiotics and continue to cause infection.

Each time you take an antibiotic unnecessarily or improperly, you increase your chance of developing drug-resistant bacteria. So it is really important to take antibiotics only when necessary. Because of these resistant bacteria, some diseases that used to be easy to treat are now becoming nearly impossible to treat.

What do you need to know about antibiotics?

- Remember that antibiotics don't work against colds and flu, and that unnecessary antibiotics can be harmful.
- Talk to your health care provider about antibiotics and find out about the differences between viruses and bacteria – and when antibiotics should and shouldn't be used.
- If you do get an antibiotic, be sure to take it exactly as prescribed; that may help decrease the development of resistant bacteria.
- Antibiotic resistance is particularly dangerous for children, but it can occur in adults as well.

Taking antibiotics appropriately and getting immunized will help prevent having to take more dangerous and more costly medications. If we use antibiotics appropriately, we can avoid developing drug resistance. We just need to take our medicine exactly as it is prescribed and not expect to take antibiotics every time we're sick.

The troubling result

The triumph of antibiotics over disease-causing bacteria is one of modern medicine's greatest success stories. Since these drugs first became widely used in the World War II era, they have saved countless lives and blunted serious complications of many feared diseases and infections. After more than 50 years of widespread use, however, many antibiotics don't pack the same punch they once did.

Over time, some bacteria have developed ways to outwit the effects of antibiotics. Widespread use of antibiotics is thought to have spurred evolutionary changes in bacteria that allow them to survive these powerful drugs. While antibiotic resistance benefits the microbes, it presents humans with two big problems: It makes it more difficult to purge infections from the body, and it heightens the risk of acquiring infections in a hospital.

Diseases such as tuberculosis, gonorrhea, malaria and childhood ear infections are now more difficult to treat than they were decades ago. Drug resistance is an especially difficult problem for hospitals because they harbor critically ill patients who are more vulnerable to infections than the general population and therefore require more antibiotics. Heavy use of antibiotics in these patients hastens the mutations in bacteria that bring about drug resistance. Unfortunately, this worsens the problem by producing bacteria with greater ability to survive even our strongest antibiotics. These even stronger drug-resistant bacteria continue to prey on vulnerable hospital patients.

To help curb this problem, the Centers for Disease Control and Prevention (CDC) provides hospitals with prevention strategies and educational materials to reduce antimicrobial resistance in health care settings.

According to CDC statistics:

- Nearly 2 million patients in the United States get an infection in the hospital each year. Of those patients, about 90,000 die each year as a result of their infection – up from 13,300 patient deaths in 1992.
- More than 70 percent of the bacteria that cause hospital-acquired infections are resistant to at least one of the drugs most commonly used to treat them.
- Persons infected with drug-resistant organisms are more likely to have longer hospital stays and require treatment with second- or third-choice drugs that may be less effective, more toxic and more expensive.
- In short, antimicrobial resistance is driving up health care costs, increasing the severity of disease and increasing the death rates from certain infections.

Environment forces evolutionary change

A key factor in the development of antibiotic resistance is the ability of infectious organisms to adapt quickly to new environmental conditions. Bacteria are single-celled creatures that, compared with higher life forms, have small numbers of genes. Therefore, even a single random gene mutation can greatly affect their ability to cause disease. And because most microbes reproduce by dividing every few hours, bacteria can evolve rapidly.

A mutation that helps a microbe survive exposure to an antibiotic drug will quickly become dominant throughout the microbial population. Microbes also often acquire genes, including those that code for resistance, from each other.

The advantage microbes gain from their innate adaptability is augmented by the widespread, and sometimes inappropriate, use of antibiotics. A physician wishing to placate an insistent patient ill with a cold or other viral condition sometimes inappropriately prescribes antibiotics. And when a patient does not finish taking a prescription for antibiotics, drug-resistant microbes not killed in the first days of treatment can proliferate. Hospitals also provide a fertile environment for drug-resistant germs as close contact among sick patients and extensive use of antibiotics force bacteria to develop resistance. Another controversial practice that some believe promotes drug resistance is adding antibiotics to agricultural feed.

A growing problem

For all these reasons, antibiotic resistance has been a problem for nearly as long as we've been using antibiotics. Not long after the introduction of penicillin, a bacterium known as Staphylococcus aureus began developing penicillin-resistant strains.

Today, antibiotic-resistant strains of Staphylococcus aureus bacteria as well as various enterococci – bacteria that colonize the intestines – are common and pose a global health problem in hospitals. More and more hospital-acquired infections are resistant to the most powerful antibiotics available, methicillin and vancomycin. These drugs are reserved to treat only the most intractable infections in order to slow development of resistance to them.

There are several signs that the problem is increasing:

- In 2003, epidemiologists reported in The New England Journal of Medicine that 5-10 percent of patients admitted to hospitals acquire an infection during their stay, and that the risk for a hospital-acquired infection has risen steadily in recent decades.
- Strains of S. aureus resistant to methicillin are endemic in hospitals and are increasing in non-hospital settings such as locker rooms. Since September 2000, outbreaks of methicillin-resistant S. aureus infections have been reported among high school football players and wrestlers in California, Indiana and Pennsylvania, according to the CDC.
- The first S. aureus infections resistant to vancomycin emerged in the United States in 2002, presenting physicians and patients with a serious problem. In July 2002, the CDC reported that a Michigan patient with diabetes, vascular disease and chronic kidney failure had developed the first S. aureus infection completely resistant to vancomycin. A similar case was reported in Pennsylvania in September 2002.
- Increasing reliance on vancomycin has led to the emergence of vancomycin-resistant enterococci infections. Prior to 1989, no U.S. hospital had reported any vancomycin resistant enterococci, but over the next decade, such microbes have become common in U.S. hospitals, according to CDC.
- A 2003 study in The New England Journal of Medicine found that the incidence of blood and tissue infections known as sepsis almost tripled from 1979 to 2000.

Other federal agencies are involved in combating the problem of drug-resistant microbes. See the links below for more information.

- Centers for Disease Control and Prevention
  http://www.cdc.gov/drugresistance/community/
- Food and Drug Administration
  http://www.fda.gov/oc/opacom/hottopics/antiresist.html
- National Library of Medicine Medline Database
  http://www.nlm.nih.gov/medlineplus/antibiotics.html
- Public Health Action Plan to Combat Antimicrobial Resistance
  http://www.cdc.gov/drugresistance/actionplan/index.htm

ALLIANCE FOR THE PRUDENT USE OF ANTIBIOTICS (APUA) ANTIBACTERIAL AGENT INFORMATION SHEET

What is an antibacterial and how are antibacterials classified?

In its broadest definition, an antibacterial is an agent that interferes with the growth and reproduction of bacteria. While antibiotics and antibacterials both attack bacteria, these terms have evolved over the years to mean two different things. Antibacterials are now most commonly described as agents used to disinfect surfaces and eliminate potentially harmful bacteria. Unlike antibiotics, they are not used as medicines for humans or animals, but are found in products such as soaps, detergents, health and skincare products and household cleaners.

What are some common antibacterials?

Antibacterials may be divided into two groups according to their speed of action and residue production. The first group contains those that act rapidly to destroy bacteria, but quickly disappear (by evaporation or breakdown) and leave no active residue behind (referred to as non-residue-producing). Examples of this type are the alcohols, chlorine, peroxides and aldehydes. The second group consists mostly of newer compounds that leave long-acting residues on the surface to be disinfected and thus have a prolonged action (referred to as residue producing). Common examples of this group are triclosan, triclocarban and benzalkonium chloride.

How common are antibacterials in consumer products?

All products that claim to kill bacteria or viruses have some kind of antibacterial agent. Alcohols, chlorine and peroxides have been used for many decades in health care and cleaning products. Within the past two decades, the residue-producing antibacterials once used almost exclusively in health care institutions have been added to increasing numbers of household products, particularly soaps and cleaning agents. A recent survey reported that 76 percent of liquid soaps from 10 states in the U.S. contained triclosan, and approximately 30 percent of bar soaps contained triclocarban.

Many cleaning compounds contain quaternary ammonium compounds. Because these compounds have very long chemical names, they often are not easily recognized as antibacterial agents on packaging labels. More recently, triclosan has been bonded into the surface of many different products with which humans come into contact, such as plastic kitchen tools, cutting boards, highchairs, toys, bedding and other fabrics.

Is the use of antibacterial agents regulated in the U.S.?

Whether an antibacterial agent is regulated depends upon its intended use and its effectiveness. The U.S. Food and Drug Administration (FDA) regulates antibacterial soaps and antibacterial substances that will either be used on the body or in processed food, including food wrappers and agents added to water involved in food processing. If a substance is not intended for use on or in the body, it is registered by the U.S. Environmental Protection Agency (EPA) under the Federal Insecticide, Fungicide and Rodenticide Act. Substances are registered either as public health or as non-public health antimicrobial agents.

What is the difference between bacteriostats, sanitizers, disinfectants and sterilizers?

The EPA classifies public health antimicrobials as bacteriostats, sanitizers, disinfectants and sterilizers based on how effective they are in destroying microorganisms. Bacteriostats inhibit bacterial growth in inanimate environments. Sanitizers are substances that kill a certain percentage of test microorganisms in a given time span. Disinfectants destroy or irreversibly inactivate all test microorganisms, but not necessarily their spores. Sterilizers destroy all forms of bacteria, fungi and other microorganisms and their spores.

Disinfectants can be further categorized as broad- or limited-spectrum agents. A broad-spectrum disinfectant destroys both gram-negative and gram-positive bacteria. A limited-spectrum disinfectant must clearly specify the specific microorganisms against which it works.

How beneficial are antibacterials?

Antibacterials are definitely effective in killing bacteria, but there is considerable controversy surrounding their health benefits. The non-residue-producing agents have been used for many years and continue to be effective agents for controlling disease organisms in a wide variety of health care and domestic settings.

When used under strict guidelines of application, the residue-producing agents have proven effective at controlling bacterial and fungal infection in clinical settings such as hospitals, nursing homes, neonatal nurseries and other health care facilities where there may be a high risk of infection. A certain few consumer products have demonstrated effectiveness for specific conditions: antibacterial toothpaste helps control periodontal (gum) disease; antibacterial deodorants suppress odor-causing bacteria; and antidandruff shampoos help control dandruff. However, to date, there is no evidence to support claims that antibacterials provide additional health benefits when used by the general consumer.

Are antibacterial agents safe?

When used as directed for external surfaces, antibacterial agents are considered to be relatively non-toxic. However, some may cause skin and eye irritation, and all have the potential for doing harm if not stored or used properly. Furthermore, evaluations of risk are based on single agents and do not consider the effects of multiple uses or multiple compounds.

Recently, triclosan has been reported in surface waters, sewage treatment plants, the bile of fish and breast milk, but the significance of these findings is presently unknown.

Do antibacterials create resistant bacteria?

Because of their rapid killing effect, the non-residue-producing antibacterial agents are not believed to create resistant bacteria. Resistance results from long-term use at low-level concentrations, a condition that occurs when consumers use residue-producing agents such as triclosan and triclocarban. Until recently, it was accepted that these agents did not affect a specific process in bacteria, and because of this, it was unlikely that resistant bacteria could emerge. However, recent laboratory evidence indicates that triclosan inhibits a specific step in the formation of bacterial lipids involved in the cell wall structure. Additional experiments found that some bacteria can combat triclosan and other biocides with export systems that could also pump out antibiotics. It was demonstrated that these triclosan-resistant mutants were also resistant to several antibiotics, specifically chloramphenicol, ampicillin, tetracycline and ciprofloxacin.

Resistance to antibacterials has been found where these agents are used continuously (as in the hospital and food industry); however, at the present time, this modest increase in resistance has not yet created a clinical problem.

Can the widespread use of antibacterial agents lead to bacteria that are more resistant?

Many scientists feel that this is a potential danger, but others argue that the laboratory conditions used in the research studies do not represent the "real world." So far, studies of antibacterial use in home products such as soap, deodorant and toothpaste have not shown any detectable development of resistance. However, such products have only been in use for a relatively short time, and studies of their effects are still extremely limited.

Are there other concerns about the use of antibacterial agents?

Yes, experts believe that the use of these agents creates a false sense of security that may cause individuals to become lax in their hygiene habits. Antibacterial use should not be considered an alternative to normal hygiene, except where normal hygiene practices are impossible.

It should always be remembered that most bacteria are harmless and in many cases, even beneficial. Very few bacteria actually cause disease. Antibacterials are not discriminating, and an all-out attack on bacteria in general is unjustified. Constant use of disinfecting agents tends to disrupt the normal bacteria that act as barriers against invading pathogens. This may cause shifts in bacterial populations and create a "space" for disease-causing bacteria to enter and establish infection.

In addition, some scientists have gathered evidence showing that overly hygienic homes during early childhood may be linked to the appearance of allergies later in life. In this "hygiene hypothesis," allergies develop because the childhood immune system fails to mature properly due to lack of contact with immune-stimulating bacteria. This hypothesis remains controversial and requires further research for validation.

When are antibacterials useful?

While there is no evidence that the routine use of antibacterials confer a health benefit, they are useful where the level of sanitation is critical and additional precautions need to be taken to prevent spread of disease.

Thus, they are important in hospitals, day care centers, salons and health care facilities and other environments with high concentrations of infectious bacteria. In the home environment, they may be needed for the nursing care of sick individuals with specific infections, or for those whose immune systems have been weakened by chronic disease, chemotherapy or transplants. Under these circumstances, antibacterials should be used according to protocol, preferably under the guidance of a health care professional.

Please visit the following link to learn more about antibiotics: *http://www.cdc.gov/ncidod/op/antibiotics.htm*.

Addressing the problem

You have a responsibility to control exposure to pathogens by decontaminating your environment and tools using what are known as universal precautions, standards used in health care and other environments.

Remember that pathogens collect any time an object or surface is exposed to air. Doorknobs, handles, the telephone, money, cabinets, and the cash register – all are surfaces touched by co-workers and clients that may harbor harmful pathogens, so all must be decontaminated to some degree. Cleaning is only the first step of the process. The following sections review the meaning of **sanitation, sterilization**, and **disinfection**, terms that are commonly used interchangeably, but have very different meanings and require different procedures.

Sanitation

Sanitation is the lowest level of decontamination. Sanitation will reduce germs on a surface, but will not kill all organisms. Sanitation provides a minimum level of cleanliness, protecting public health by preventing the spread of some, but not all, bacteria and fungi. Instruments that are sanitized are **not** sterile. Countertops and workstations should also be sanitized, wiped down with soap and water; this process should not be confused with, and does not replace, disinfection, which requires an appropriate disinfectant. Remember that soap and water will kill most of the bacteria on your hands, workstation or chair, but will not kill all the bacteria or fungal spores.

The term "sanitation" is most often used in reference to cleaning the hands. Hand washing is absolutely essential to controlling bacteria and the most effective way to prevent the spread of infectious agents from one person to another. Hands cannot be sterilized because it is impossible to remove all microorganisms from the surface of the skin. Water and soap, in fact, are not sterile, and can introduce new bacteria and infectious agents.

Both resident and transient organisms populate your hands. **Resident organisms** are a normal part of your skin's environment, their natural habitat. They grow and multiply in an oxygen environment, and rarely cause infection or harm the individual who is their host. These organisms cannot be removed easily by hand washing. Sanitation controls minimize exposure to **transient organisms**. These organisms, like E. coli and salmonella, cause dangerous infections in humans. In contrast to resident organisms, transient organisms cannot live long on the surface of our skin. They function poorly in an oxygen environment, usually surviving less than 24 hours. These organisms can be removed easily through the process of hand washing, using friction, soap and water.

Wash your hands

(http://www.cdc.gov/Features/Hand washing/)

Hand washing is a simple thing, and it's the best way to prevent infection and illness.

Clean hands prevent infections. Keeping hands clean prevents illness at home, at school, and at work. Hand hygiene practices are key prevention tools in healthcare settings, in daycare facilities, in schools and public institutions, and for the safety of our food.

In health care settings, hand washing can prevent potentially fatal infections from spreading from patient to patient and from patient to health care worker and vice-versa. The basic rule in the hospital is to cleanse hands before and after each patient contact by either washing hands or using an alcohol-based hand rub.

At home, hand washing can prevent infection and illness from spreading from family member to family member and sometimes throughout a community. In the home, the basic rule is to wash hands before preparing food and after handling uncooked meat and poultry; before eating; after changing diapers; after coughing, sneezing, or blowing one's nose into a tissue; and after using the bathroom.

Wash your hands: The right way

When washing hands with soap and water:

- Wet your hands with clean running water and apply soap. Use warm water if it is available.
- Rub hands together to make a lather and scrub all surfaces.
- Continue rubbing hands for 15-20 seconds. Need a timer? Imagine singing "Happy Birthday" twice through to a friend.
- Rinse hands well under running water.
- Dry your hands using a paper towel or air dryer. If possible, use your paper towel to turn off the faucet.
- Always use soap and water if your hands are visibly dirty.
- If soap and clean water are not available, use an alcohol-based hand rub to clean your hands. Alcohol-based hand rubs significantly reduce the number of germs on skin and are fast-acting.

When using an alcohol-based hand sanitizer:

- Apply product to the palm of one hand.
- Rub hands together.
- Rub the product over all surfaces of hands and fingers until hands are dry.

(*http://www.health.state.mn.us/handhygiene/wash/fsgermbuster.html*)

Hand washing: The beginning of infection control

http://www.cdc.gov/Features/HandWashing/

Ignaz Semmelweis, an Austrian-Hungarian physician, first demonstrated more than 150 years ago that hand hygiene can prevent the spread of disease. Hand hygiene as a practice includes performing hand washing, or using antiseptic hand wash, alcohol-based hand rub or surgical hand hygiene/antisepsis.

Dr. Semmelweis worked in a hospital in Vienna whose maternity patients were dying at such an alarming rate that they begged to be sent home. Most of those dying had been treated by student physicians who worked on corpses during an anatomy class before beginning their rounds in the maternity ward.

Because the students did not wash their hands effectively between touching the dead and the living – hand washing was an unrecognized hygienic practice at the time – pathogenic bacteria from the corpses regularly were transmitted to the mothers via the students' hands.

The result was a death rate five times higher for mothers who delivered in one clinic of the hospital than for mothers who delivered at another clinic not attended by the student physicians.

In an experiment considered quaint at best by his colleagues, Dr. Semmelweis insisted that his students wash their hands before treating the mothers – and deaths on the maternity ward fell fivefold.

Unquestioned today as the most important tool in the health care worker's arsenal for preventing infection, hand washing was not readily accepted in Dr. Semmelweis's era. Indeed, his pleas to make hand washing a routine practice throughout the hospital were largely met with derision. Another 50 years would pass before the importance of hand washing as a preventive measure would be widely accepted by the medical profession. Sanitation is now a standard and thousands of lives have been saved because of Dr. Semmelweis's discovery.

Cleaning agents for hands

Cleaning agents assist in the process of removing substances from surfaces. Soaps and detergents are two common cleaning agents that are often confused for one another, but are composed of very different ingredients, with different cleaning properties. Soaps are the product of a chemical reaction, formed by vegetable oil reacting with lye, for example, and chemicals that add a desirable smell or quality to the soap, such as glycerine, to make it milder. While soap does not kill microorganisms, soap and water will help remove them from surfaces.

Detergents are manufactured for the express purpose of cleaning specific substances off specific items, and are created using chemicals that can be very harsh to skin. In contrast to detergents that do not leave a residue or require rinsing, soaps leave a coating or residue on the body, typically one designed to make skin smoother or more attractive. Soaps also remove less fat from the skin than detergents, which have a drying quality and may strip the skin. Be sure to use the appropriate cleaning agent for the job. Different cleaning and disinfecting agents have many different properties. Always read the ingredients, instructions and recommendations for use on the item's label.

Sterilization and disinfection

"Sterile" means free from all germs; sterilization is the most effective level of decontamination, involving the removal of all bacterial life from a surface. This is the level of decontamination required for tools and surfaces in hospital surgeries. Hospitals use steam autoclaves to heat instruments to a very high temperature and many salons are investing in autoclaves to reinsure clients that their safety is the number one priority.

Disinfection is the process of killing specific microorganisms, bacteria or germs using physical or chemical processes. Disinfectants are chemical agents that destroy organisms on contaminated instruments or surfaces. Disinfectants can be dangerous and must be used with caution. Disinfectants are used to destroy bacteria on equipment and implements, but they should not be used on the skin. In a salon atmosphere, disinfectants must be able to kill viruses, fungus and dangerous bacteria.

Disinfectants

Controlling bacteria in a salon requires some degree of effort, vigilance and good sense. In choosing a disinfectant, always look for the EPA registration number (awarded by the Environmental Protection Agency) to ensure you are using an approved disinfectant. This number indicates a level of safety for specific kinds of disinfection. To be registered by the EPA, it must be effective in killing bacteria, including Staphylococcus, aureus, salmonella and pseudomonas. Cosmetology salons must use not only EPA-approved disinfectants, but also those with an EPA rating of **hospital-level (tuberculocidal) quality.** These disinfectants are especially effective for salon use and are capable of killing viruses, dangerous bacteria and fungus.

Disinfectants can be hazardous if prepared incorrectly. Consult the manufacturer's material safety data sheets (MSDS) for information on preparing the solution; check the listing of chemicals in the disinfectant and how they can pose safety hazards, if any. Be certain to follow manufacturers' instructions and all written directions for the preparation and use of a specific disinfectant. Remember to follow all directions when using this type of disinfectant or any other disinfectant.

To ensure safety, use an appropriate ratio of concentration in the solution, and clean only approved items, according to label instructions. Wear gloves and safety glasses, as indicated when mixing and using solutions. Do not confuse disinfectants, which destroy harmful microorganisms, with **antiseptics**, products designed to slow the growth of microorganisms. Antiseptics do not kill microorganisms and should not be confused with disinfectants or used for salon disinfection.

Household disinfectants, commonly used to clean offices and homes, may be used to clean floors, doorknobs, walls and so on as directed on the container label, but should not be used in place of a hospital-grade salon disinfectant, which is required to sterilize instruments.

Bleach can be used as an effective disinfectant, but it is not a cleaning agent and should only be applied to clean surfaces. Bleach must be used with caution because it can release toxic fumes when mixed with certain substances. Bleach is far too harsh for day-to-day disinfection and will damage instruments. It may be used for washing towels and other salon laundry.

What are efficacy tests?

The tests used to measure the effectiveness of disinfectants on various pathogenic (disease-causing) organisms are called efficacy tests. The EPA must pre-approve all "efficacy test methods" used to measure the effectiveness of disinfectants against specific microorganisms. The most common efficacy test prescribed by EPA is the Association of Official Analytical Chemist (AOAC) test. Currently, for a disinfectant cleaner to be registered by EPA as hospital strength, it must be effective at its recommended dilution in killing target pathogens in the presence of 400 ppm hard water and 5 percent organic serum and must kill 100 percent of the target test organisms.

It is a good idea for you to require the manufacturer or distributor of a disinfectant or disinfectant-cleaner to provide efficacy data to you before you select it for use in your salon.

What factors affect how well a disinfectant works?

There are six main factors:

1. **Concentration** – This is dilution rate. Proper dilution is very important. Read label for complete dilution directions.
2. **Contact time** – For most all disinfectants, such as bleach, contact time is not very critical.
3. **PH** – Certain disinfectants work best under acidic conditions, and others work best under alkaline conditions.
4. **Temperature** – Certain disinfectants work best in cold water (bleach). Most work best in warm water.
5. **Soil load** – Disinfectants do not know the difference between soil and bacteria. That is why heavy soil should be removed before disinfecting. See explanation above for more details.
6. **Organism type** – Not all disinfectants work on all types of organisms. When in doubt, read the product label for a complete list.

How can you calculate active parts per million (ppm) of the disinfectant you are using?

To calculate active ppm, you'll need three things – the active ingredient list from the disinfectant label, dilution rate of the product and a calculator. The following is an example of how this would be done using a neutral germicidal cleaner:

- **Step 1:** Add together active ingredient percentages from the label: For example, 5.07 percent + 3.38 percent = 8.45 percent total active ingredients.
- **Step 2:** Multiply by 10,000: 8.45 X 10,000 = 84,500.
- **Step 3:** Divide the result of Step 2 by the dilution rate (128 in this example): 84,500 / 128 = 660 ppm.

Parts per million (ppm) is a ratio figure that represents the amount of one substance that is in one million parts of another substance.

NORTH CAROLINA SANITATION RULES

You will learn more regarding the laws rules governing the state of North Carolina later in our course, but below is a major section regarding sanitation rules in your salon. Failure to follow these rules can result in substantial fines.

Copy of rules to cosmetology students

Cosmetic art schools shall give a copy of the sanitation rules governing the practice of the cosmetic arts to each student for study.

Copy of rules to beauty establishments

The board shall give copies of the rules of sanitation governing the practice of cosmetic art to all beauty establishments.

Sanitary ratings and posting of ratings

a. The sanitary rating of a beauty establishment shall be based on a system of grading outlined in this subchapter. Based on the grading, all establishments shall be rated in the following manner:
   1. All establishments receiving a rating of at least 90 percent or more shall be awarded a grade A;
   2. All establishments receiving a rating of at least 80 percent and less than 90 percent shall be awarded grade B;
   3. All establishments receiving a rating of at least 70 percent or more and less than 80 shall be awarded grade C.
b. Every beauty establishment shall be given a sanitary rating. A cosmetic art school shall be graded no less than three times a year, and a cosmetic art shop shall be graded once a year.
c. The sanitary rating given to a beauty establishment shall be posted in a conspicuous place at all times.
d. All new establishments must receive a rating of at least 90 percent before a license will be issued.
e. The willful operation of a beauty establishment which fails to receive a sanitary rating of at least 70 percent (grade C) shall be sufficient cause for revoking or suspending the letter of approval or permit.
f. A re-inspection for the purpose of raising the sanitary rating of a beauty establishment shall not be given within 30 days of the last inspection, unless the rating at the last inspection was less than 80 percent.
g. A whirlpool and foot spa sanitation record must be kept on each whirlpool and foot spa for inspection on a form provided by the board.

Water supply

a. A beauty establishment shall have a supply of running hot and cold water in the clinic area, approved by the local health department.
b. When a service is provided in a room closed off by a door, the water supply required in this rule must be within 20 feet of the door or 25 feet from the service table or chair. The restroom sink shall not be used to meet this requirement.

Floor coverings

All floor coverings shall be washable and kept clean and in good repair.

Ventilation and light

a. All doors and windows shall be kept clean and, if open for ventilation, effectively screened.
b. Necessary ventilation shall be provided at all times. In the clinic areas of all cosmetic art schools and in the areas where patrons are serviced in all cosmetic art shops, there must be an adequate, continuous exchange of air.
c. Adequate light shall be provided for each operator.

Bathroom facilities

a. Toilet and hand washing facilities consisting of at least one commode and one lavatory with hot and cold running water, liquid soap and individual towels shall be provided.
b. A residential beauty salon shall furnish bathroom facilities separate and apart from the residence.

Cleanliness of operators

a. All operators and students shall be personally clean and neat.
b. Every person employed in a beauty establishment shall wear clean, washable outer garments with sleeves while serving patrons.
c. Each licensee and student shall wash his or her hands with soap and water or an equally effective cleansing agent immediately before and after serving each client.

Cleanliness of clinic area

a. The clinic area shall be kept clean.
b. Waste material shall be kept in covered receptacles. The area surrounding the waste receptacles shall be maintained in a neat and sanitary manner.
c. Sanitation rules which apply to towels and cloths are as follows:
   1. Separate and clean protective drapes, linens and towels shall be used for each patron.
   2. After a protective cape, drape, linen or towel has been used once, it shall be placed in a clean, closed container until laundered. Any paper or nonwoven protective drape or covering shall be discarded after one use.
   3. There shall be an adequate supply of clean protective drapes, linens and towels at all times.
   4. All plastic capes used on patrons shall not be allowed to come in contact with the patron's neck.
   5. Clean drapes, linens and towels shall be stored in a covered receptacle when not in use.
d. At least six combs and brushes shall be provided for each cosmetology operator and cosmetology student.
e. All combs, brushes, and implements shall be cleaned and disinfected after each use in the following manner:
   1. They shall be soaked in a cleaning solution that will not leave a residue and, if necessary, scrubbed.
   2. They shall be disinfected in accordance with the following:
      A. EPA registered, hospital/pseudomonacidal (bactericidal, virucidal, and fungicidal) or tuberculocidal, that is mixed and used according to the manufacturer's directions; or
      B. 1⅓ cup of 5.25 percent household bleach to one gallon of water for 10 minutes.
      The disinfectant shall not shorten the service life of the comb, brush, esthetics or manicuring instrument. In using a disinfectant, the user shall wear any personal protective equipment, such as gloves, recommended in the material safety data sheet prepared on the disinfectant manufacturer.
   3. They shall be rinsed with hot tap water and dried with a clean towel before their next use. They shall be stored in a clean, closed cabinet or container until they are needed.

f. Disposable and porous implements must be discarded after use or upon completion of the service.
g. Product that comes into contact with the patron must be discarded upon completion of the service.
h. Clean items and items needing to be disinfected shall be kept in separate containers.
i. A covered receptacle may have an opening so soiled items may be dropped into the receptacle.

Cleanliness of scissors, shears, razors and other equipment

a. All scissors, shears, razors, and other metal instruments must be cleaned and disinfected after each use in the following manner:
   1. If the implement is not immersible, it shall be cleaned by wiping it with a moistened clean cloth and disinfected with a disinfectant used in accordance with the manufacturer's instructions that states the solution will destroy HIV, TB or HBV viruses and approved by the federal Environmental Protection Agency.
   2. If it is immersible, it shall be disinfected by immersion and whenever it comes in contact with blood, with:
      A. Disinfectant, used in accordance with the manufacturer's instructions, that states the solution will destroy HIV, TB or HBV viruses and approved by the federal Environmental Protection Agency.
      B. EPA-registered, hospital/pseudomonacidal (bactericidal, virucidal, and fungicidal) or tuberculocidal, that is mixed and used according to the manufacturer's directions; or
      C. Household bleach in a 10 percent solution for 10 minutes.
   3. If the implement is not used immediately after cleaning, it must be stored in a clean, closed cabinet until it is needed.
b. Furniture, equipment and fixtures must be of a washable material and kept clean and in good repair.
c. Lancets, disposable razors, and other sharp objects shall be disposed in puncture-resistant containers.

Care of creams, lotions, and cosmetics

All creams, lotions, and other cosmetics used for patrons must be kept in clean, closed containers, and must conform in all respects to the requirements of the Pure Food and Drug Law. Lotions or fluids must be poured into a clean glass or other sanitized container and applied to patrons by means of cotton or other sanitized methods.

First aid

Each beauty establishment must have antiseptics and other necessary supplies available to provide first aid when necessary.

Animals

Animals or birds shall not be in a beauty establishment. Trained animals accompanying disabled persons are exempt.

Systems of grading beauty establishments

The system of grading the sanitary rating of cosmetic art schools and shops based on the rules set out in 21 NCAC 14H .0106 to .0117 shall be as follows, setting out areas to be inspected and considered, and the maximum points given for compliance:

1. Clean and repaired entrance and reception room 2;
2. General condition of the entire establishment 8;
3. Water system; hot and cold running water 2;
4. Walls, ceiling and floors:
   A. Construction and coverings 4;
   B. Clean 4;
   C. Good repair 3;
5. Lighting and fresh continuous ventilation (windows included); their adequacy and cleanliness 3;
6. Public toilet:
   A. Clean and ventilated 5;
   B. Liquid soap and individual towels furnished 5;
   C. Hot and cold running water 2;
7. Appearance of operators and students 4;
8. Linens:
   A. Supply of clean drapes, linens and towels stored in clean closed containers 2;
   B. Soiled drapes, linens and towels properly stored in closed containers 3;
9. Waste in closed containers and clean area 4;
10. Equipment cleanliness:
    A. Disinfectants selected from those approved by the Federal Environmental Protection Agency 6;
    B. Disinfectants used properly 5;
    C. All implements cleaned, disinfected, and properly stored 12;
    D. Furniture, fixtures, and equipment clean and in good repair 7;
11. Working area:
    A. Workstation clean 4;
    B. Lavatories clean 4;
    C. Jars and containers closed, clean and disinfected 2;
    D. No unnecessary articles in work area 2;
12. Antiseptics and first aid supplies on hand 1;
13. Cosmetics:
    A. Clean and sanitary conditions 2;
    B. Storage area for supplies clean and in order 3;
14. No animals or birds kept or allowed in the establishment except as provided by Rule .0117 of this subchapter.

Whirlpool, foot spa and facial steamer sanitation

a. As used in this rule, whirlpool or foot spa means any basin using circulating water.
b. After each patron, each whirlpool or foot spa must be cleaned and disinfected as follows:
   1. All water must be drained and all debris removed from the basin;
   2. The basin must be disinfected by filling the basin with water and circulating:
      A. Two tablespoons of automatic dishwashing powder and ¼ cup of 5.25 percent household bleach to one gallon of water through the unit for 10 minutes; or
      B. Surfactant or enzymatic soap with an EPA-registered disinfectant with bactericidal, fungicidal and virucidal activity used according to manufacturer's instructions through the unit for 10 minutes;
   3. The basin must be drained and rinsed with clean water; and

4. The basin must be wiped dry with a clean towel.

c. At the end of the day, each whirlpool or foot spa must be cleaned and disinfected as follows:
   1. The screen must be removed and all debris trapped behind the screen removed;
   2. The screen and the inlet must be washed with surfactant or enzymatic soap or detergent and rinsed with clean water;
   3. Before replacing the screen, one of the following procedures must be performed:
      A. The screen must be totally immersed in a household bleach solution of ¼ cup of 5.25percent household bleach to one gallon of water for 10 minutes; or
      B. The screen must be totally immersed in an EPA-registered disinfectant with bactericidal, fungicidal and virucidal activity in accordance to the manufacturer's instructions for 10 minutes;
   4. The inlet and area behind the screen must be cleaned with a brush and surfactant soap and water to remove all visible debris and residue; and
   5. The spa system must be flushed with low-sudsing surfactant or enzymatic soap and warm water for at least 10 minutes and then rinsed and drained.

d. Every week after cleaning and disinfecting pursuant to Paragraphs (a) and (b) of this rule, each whirlpool and foot spa must be cleaned and disinfected in the following manner:
   1. The whirlpool or foot spa basin must be filled with water and ¼ cup of 5.25 percent household bleach for each one gallon of water;
   2. The whirlpool or foot spa system must be flushed with the bleach and water solution pursuant to Subparagraph (d)(1) of this rule for 10 minutes and allowed to sit for at least six hours; and
   3. The whirlpool or foot spa system must be drained and flushed with water before use by a patron.

e. A record must be made of the date and time of each cleaning and disinfecting as required by this rule, including the date, time, reason and name of the staff member that performed the cleaning. This record must be kept and made available for at least 90 days upon request by either a patron or inspector.

f. The water in a vaporizer machine must be emptied daily and the unit disinfected.

Prohibited practices

a. Licensees must not use or possess in a shop any of the following products:
   1. Methyl methacrylate liquid monomer, a.k.a. MMA;
   2. Razor-type callus shavers designed and intended to cut growths of skin such as corns and calluses;
   3. Permanent makeup, defined as beautifying the face by inserting or implanting facial cosmetic pigment under the surface of the skin or mucosa;
   4. FDA-rated Class III devices;
   5. Any adulterated chemical exfoliating substances;
   6. Carbolic acid (phenol) over 2 percent strength;
   7. Animals including insects, fish, amphibians, reptiles, birds or mammals to perform any service; or
   8. Variable speed electrical nail file on the natural nail unless it has been designed for use on the natural nail.

b. A licensee must not:
   1. Use product in any other manner than the product's intended use;
   2. Diagnose any medical condition or treat any medical condition unless referred by a physician;
   3. Provide any service unless trained prior to performing the service;
   4. Perform services on a client if the licensee has reason to believe the client has any of the following:
      A. A communicable disease;
      B. A contagious condition;
      C. An inflamed, infected, broken, raised or swollen skin or nail tissue; or
      D. An open wound or sore in the area to be worked on that would contraindicate the efficacy of the service;
   5. Alter or duplicate a license issued by the board; or
   6. Advertise or solicit clients in any form of communication in a manner that is false or misleading.

c. Class II devices may be used by licensees while under the supervision of a licensed physician.

OTHER THINGS YOU CAN DO

Cleaning salon computers and reception areas

Almost all modern salons now work with computers and computer appointment books. These computer appointment books are generally at the reception desk and are also found in break areas so that salon workers can view their schedules.

Few people think about the germ havens these areas have become. Experts say the computer keyboard, phone and desk areas of salons are major germ areas that must be sanitized.

Believe it or not, you could put your fingers on a toilet seat and collect fewer germs than the average desk or keyboard. Charles Gerba, a microbiologist at the University of Arizona, counted bacteria on several surfaces.

He found the office toilet seat had an average of 49 germs per square inch. When he looked at keyboards, he found 3,295 bacteria per square inch, 60 times higher than the toilet seat. Even worse were tops of desks at 21,000 bacteria per square inch and telephones at 25,000 per square inch. People are constantly coughing and sneezing on them. Germs from unwashed hands can remain alive for days. In other words, if you share computer keyboards in your salon, a phone or a desk, you are sharing germs.

To combat the problem, you must assign cleaning duties to staff. First, you should remove the screws on the underside of the keyboard and separate the two parts. Brush the debris away and then wipe with a sanitizing cloth.

Once you put it back together, spray the entire keyboard with a disinfectant spray like Lysol. Do this lightly so as not to ruin the electronics. You can also use sanitation wipes commonly found in drug stores.

Staff should clean phones daily with a disinfectant spray and more often when someone is known to be sick or feels sick. Also, remember to daily disinfect your workstation. Often stylists forget to perform this important step, yet they routinely place combs, scissors and other items on top of the workstation.

Disease and infestation

Salons and schools should not knowingly permit a person afflicted with an infection or parasitic infestation capable of being transmitted to a patron to serve patrons or train in the establishment or school.

In addition, salons and schools should not knowingly require or permit a licensee or student to work upon a person with an infection or parasitic infestation capable of being transmitted to the licensee or student.

Infections or parasitic infestation capable of being transmitted between licensee or student and patron include the following:

- Cold, influenza or other respiratory illness accompanied by a fever, until 24 hours after resolution of the fever.
- Streptococcal pharyngitis ("strep throat"), until 24 hours after treatment has been initiated, and 24 hours after resolution of symptoms.
- Purulent conjunctivitis ("pink eye"), until examined by a physician and approved for return to work.
- Pertussis ("whooping cough"), until five days of antibiotic therapy has been completed.
- Varicella ("chicken pox"), until the sixth day after onset of rash or sooner if all lesions have dried and crusted.
- Mumps, until nine days after onset of parotid gland swelling.
- Tuberculosis, until a physician or local health department authority states that the individual is noninfectious.
- Impetigo (bacterial skin infection), until 24 hours after treatment has begun.
- Pediculosis (head lice), until the morning after first treatment.
- Scabies, until after treatment has been completed. No person working or training in an establishment or school should massage any person upon a surface of the skin or scalp where such skin is inflamed, broken (e.g., abraded, cut) or where a skin infection or eruption is present.

The cosmetology industry is booming, and one of the only factors that has a chance to harm your industry is if clients do not feel safe. Therefore, you must make safe sanitation techniques a part of your daily routine and encourage co-workers to do the same.

Conclusion

As you can see from the preceding section, sanitation issues have a direct impact on the health and welfare of clients and the livelihood of the salon professional. The importance of maintaining proper sanitation procedures cannot be overstated; it can literally be a matter of life or death! Following proper sanitation guidelines will greatly reduce the potential risks to you, your clients and co-workers.

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24-HOUR CONTINUING EDUCATION COURSE FOR SALON PROFESSIONALS

Final Examination Questions

Choose the best answer for questions 1 through 35 and mark your answers on the Final Examination Sheet found on Page 93 or complete your test online at **Cosmetology.EliteCME.com**.

1. A general guide for classic proportion is that the hair should be wider than the center of the shoulders, regardless of the body structure.

   ○ True ○ False

2. There are three main body types to consider when doing hair; tall and lanky, average, and short and sturdy. Short and sturdy clients need hairstyles with height and volume on the top.

   ○ True ○ False

3. "Three-sectioning" is done by measuring the three sections of the face. Section one: The front hairline to the middle of the eyebrows; section two: the middle of the eyebrows to the tip of the nose; and section three: the tip of the nose to the tip of the chin.

   ○ True ○ False

4. Hair texture describes the number of hair follicles per square inch on the scalp and is usually referred to as light, medium, or heavy (or thin, medium, or thick). Hair density will determine the feasibility of certain hairstyles.

   ○ True ○ False

5. Asymmetrical balance is created when weight is positioned equally on both sides of the center, creating a mirror image.

   ○ True ○ False

6. Hair is composed of cells arranged in three layers: the cuticle, the cortex, the medulla. The cortex is the inner layer of cells that give hair its strength.

   ○ True ○ False

7. Common Disorders of the hair and scalp include "fragilitas crinium" which is the formal term for gray hair which is acquired during aging or at birth.

   ○ True ○ False

8. The pH scale measures how acidic or basic a substance is. It ranges from 0 to 14. A pH of 7 is neutral. Products with a pH of 4.5 to 5.5 are compatible with the natural biology of the hair and scalp.

   ○ True ○ False

9. Many hair care products contain ingredients which may hold some risk and have negative reactions in some individuals. Parabens is an active ingredient in lye relaxers that can cause skin irritation, burns and necrosis as well as breathing difficulty when inhaled.

   ○ True ○ False

10. Phthalates are widely used in hair products (sprays and shampoos) to enhance fragrances, as solvents, and to denature alcohol. These hormone-disrupting chemicals are suspected of contaminating breast milk and causing damage to the kidneys, liver, lungs and reproductive organs.

    ○ True ○ False

11. The successful endpoint of inflammation is healing.

    ○ True ○ False

12. Bacteria and viruses can be seen with the naked eye.

    ○ True ○ False

13. Naevus sebaceous is contagious and communicable.

    ○ True ○ False

14. Ringworm is a vegetable parasite.

    ○ True ○ False

15. The telogen stage is the growing phase of the hair.

    ○ True ○ False

16. OSHA has not formulated any rules and regulations that deal specifically with the cosmetology industry.

    ○ True ○ False

17. The issue of most concern to cosmetologists is chemical exposure in the workplace.

    ○ True ○ False

18. Cosmetics are subject to pre-market approval by the FDA.

    ○ True ○ False

19. FDA limits for lead in color additives are typically no more than 2 parts per million for color additives approved for use in cosmetics.

    ○ True ○ False

20. Once a person becomes sensitized to a chemical, it no longer can cause the person problems.

    ○ True ○ False

21. Melanin is produced at the root of the hair, within granules called melanosomes that release and deposit color into the hair's cortex but leave the cuticle transparent.

    ○ True ○ False

22. When discussing warm and cool colors; gold, red, orange and yellow refer to cool tones.

    ○ True ○ False

23. Hair color products are primarily defined by how long the color change lasts. Semi-permanent products are surface-acting; they coat the surface of the hair, changing its appearance, but not altering the pigment or entering the hair's cortex.

    ○ True ○ False

24. Oxidation is capable of lifting the natural color (melanin), developing new dye molecules, depositing the new color (pigment), and fusing it permanently into the hair structure.

    ○ True ○ False

25. When speaking about hair texture and color, course hair lightens more and processes faster, and is also more likely to show tone and level of the formula.

○ True ○ False

26. Alkaline substances mixed with hydrogen peroxide oxidize, causing heat and the potential for chemical burns. For safety purposes, protect clients' skin with a protective cream or petroleum jelly.

○ True ○ False

27. To determine how much lift (color removal) you will need, subtract the client's natural base from the desired (target) level to determine how many levels you are lifting.

○ True ○ False

28. When applying color, it is best to divide the head into sections and proceed from front to back and side to side along part lines.

○ True ○ False

29. Hydrogen peroxide, more often than ammonia, is not the damaging culprit in oxidation.

○ True ○ False

30. "Fillers" are usually needed when you are shifting two or more levels darker or if tints fade dramatically between treatments.

○ True ○ False

31. A much smaller minority (about 30 percent) of organisms are pathogenic organisms, also called microbes or germs. These are harmful and produce disease when they invade animal or plant life and commonly exist in salon environments.

○ True ○ False

32. Sanitizers are now most commonly described as agents used to disinfect surfaces and eliminate potentially harmful bacteria and are found in products such as soaps, detergents, and skincare products.

○ True ○ False

33. Sanitation is the lowest level of decontamination and will reduce germs on a surface, but will not kill all organisms, so it is important to remember that instruments that are sanitized are not sterile.

○ True ○ False

34. Cosmetology salons must use not only EPA-approved disinfectants, but also those with an EPA rating of hospital-level (tuberculocidal) quality.

○ True ○ False

35. Factors that affect how well a sanitizer works are concentration, contact time, pH, temperature, soil load, and organism type.

○ True ○ False

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What if I Still Have Questions?

No problem, we have several options for you to choose from! Online at **Cosmetology.EliteCME.com** you will see our robust FAQ section that answers many of your questions, simply click FAQ in the upper right hand corner or e-mail us at office@elitecme.com or call us toll free at 1-866-344-0970, Monday - Friday 9:00 am - 6:00 pm, EST.

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Step 3: Once you have received your certificate of completion you can renew your license online at ***https://www.nccosmeticarts.com/userman/useraccounts/login.aspx***, or mail in your renewal. In order to avoid late fees, your CE and license renewal must be completed before October 1.

Board Contact Information:

North Carolina Board of Cosmetic Art Examiners
1207 Front Street, Suite 110
Raleigh, NC 27609

Phone: (919) 733-4117 | Fax: (919) 733-4127
Website: https://www.nccosmeticarts.com/

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Questions? Call us toll-free: 1-866-344-0970

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Final Examination Answer Sheet

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Shade circles like this: ●
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Final Exam questions are located on pages 90-91.
Unanswered questions will be scored as incorrect.

	True	False
1	○	○
2	○	○
3	○	○
4	○	○
5	○	○
6	○	○
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CNC24E16

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Course Evaluation

We value your opinion!

Please take a minute to complete the course evaluation so that we can better serve you in the future. Any comments would be greatly appreciated.

Fill in circles below numbers
0=Not likely at all, 5=Neutral and
10=Extremely likely

- How likely is it that you would recommend Elite 0 1 2 3 4 5 6 7 8 9 10
- The course material was presented in a clear, concise and well-organized format 0 1 2 3 4 5 6 7 8 9 10
- I would rate this course..... 0 1 2 3 4 5 6 7 8 9 10
- The content of this course met my expectations..... 0 1 2 3 4 5 6 7 8 9 10
- The material presented met the course's stated objectives ..... Yes No
- I found this course a good value for my money .....Yes No

Please list any recommendations that you may have for this course _____

_____

Please list any course subjects you would like to see in the future _____

_____

Comments _____

_____

❑ I agree to allow Elite Continuing Education to use my above comments.

- Did you remember:
  1) To clearly print your name and address on the answer sheet?
  2) To fill out your license number on the answer sheet?
  3) To include your payment or credit card information?
  4) A $25.00 fee will be added for all checks that are returned for insufficient funds.

Thank you for choosing Elite for your continuing education!

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