AMERICAN KENNEL CLUB SM

AKC Breeder

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THE AMERICAN KENNEL CLUB'S QUARTERLY NEWSLETTER FOR BREEDERS

FROM THE AKC

In this issue of *AKC Breeder,* we have part two of an article on "Evaluating Your Litter,' containing lots of thoughts and advice from some top AKC breeders on this important subject. From our sponsor, Royal Canin, we have valuable information on "Fetal Development and Birth Defects in Dogs" written by Dr. Bretaigne Jones, DVM.

From our AKC Breeder of the Year contributors, we have Miriam "Buffy" Stamm, of the premier "Anstamm" Scottish Terrier fame, discussing the importance of great stud dogs, outcrosses, and her over 50 years of breeding Scotties in general.

"Inside AKC" brings us a piece written by the AKC's AVP of Performance Events, Doug Ljungren, on the sport of performance and the importance of evaluating dogs on how well they perform the function for which they were originally bred. This is accompanied by a short article on the ultimate gundog accomplishment, "the dual dog."

Finally, we have an article titled "Preventable Parasites" by Chair of the AKC Delegates Canine Health Committee, Connie Vanacore. In March, Mrs. Vanacore was honored by AKC President and CEO Dennis Sprung for the many years and important roles she has served as part of the AKC Delegate Body.

Enjoy this issue, and feel free to share with me your suggestions and thoughts.

Ronald N. Rella

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Courtesy Sandra Fikes

Evaluating Your Litter

Tips and Insights from Top Breeders (Part Two)

By Arliss Paddock

Learning how to evaluate your puppies is one of a breeder's most daunting challenges—and no matter how long you've been breeding, there's always more to learn. In Part One [see our Spring 2009 issue], several top breeders shared their comments on puppy evaluation. Following, we continue as more breeders offer their thoughts and advice on this important topic.

Grading the Litter

2008 AKC Breeder of the Year Joan Savage, of Banks, Oregon, has bred more than 60 AKC champion English Setters under the Stagedoor kennel name. Her Ch. Stagedoor Rock It Man was Best of Breed at the English Setter Association of America's national specialty in 2006 and 2007, and he won Best in Show at the 2007 World Show held in Mexico. Savage is also an AKC Delegate and judge.

As do many successful breeders, Savage "grades" each litter when they've reached a certain age. "I like to officially grade the pups at 8 weeks. Of course, I watch them interact and move in their pen before that. I do table stacking and take digital photos, including stacked shots of the head straight on, side view, and rear. I can easily e-mail the photos to others on the same day. I also watch them move."

Like many skilled breeders, over time Savage has developed an "eye" that allows her to quickly assess each puppy in terms of specific important qualities. "The first thing that strikes me is the puppy's balance, muscle tone, and athleticism," says Savage. "I also look for good head planes, good bite, topline, and attitude. A good show dog and breeding prospect has to have the attitude to go along with the good body and head."

Savage observes each puppy's temperament and personality from early on. "I watch the pups interact with each other as they grow," she says. "Personalities start to show at 6 weeks. The pecking order starts to become evident as they

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Inside

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AKC MISSION STATEMENT

THE AMERICAN KENNEL CLUB IS DEDICATED TO UPHOLDING THE INTEGRITY OF ITS REGISTRY, PROMOTING THE SPORT OF PUREBRED DOGS AND BREEDING FOR TYPE AND FUNCTION. FOUNDED IN 1884, THE AKC AND ITS AFFILIATED ORGANIZATIONS ADVOCATE FOR THE PUREBRED DOG AS A FAMILY COMPANION, ADVANCE CANINE HEALTH AND WELL-BEING, WORK TO PROTECT THE RIGHTS OF ALL DOG OWNERS AND PROMOTE RESPONSIBLE DOG OWNERSHIP.

"TIPS AND INSIGHTS FROM TOP BREEDERS" continued from page 1

play and tussle with each other. English Setters generally have great temperaments, and extreme dominance isn't an issue. Some are more sure of themselves, and others can be timid. I like the outgoing, confident pups for my breeding-showing program."

For Savage, certain structural flaws quickly eliminate a puppy from consideration as a show or breeding prospect. "The bite has to be scissors, and both testicles must have dropped by 8 weeks. Serious flaws include a pup that is not balanced, is weak in the front or rear, has a bad topline, or has a weak head (lacking sufficient muzzle or having bad planes). These are not show prospects. I am pretty picky about which ones I determine to be show prospects. I would be slightly forgiving of a mismark (a body patch)."

"If a pup is lacking in balance at 8 weeks, it will not improve," she continues. "Generally they grow into what they were at 8 weeks. Of course, they mature at different rates, but if they were nice at that age, they will mature nicely."

8 Weeks: A "Magic" Age for Many Breeds

Sandra Fikes, of Mobile, Alabama, is an AKC judge and longtime breeder of Rhodesian Ridgebacks. She competes with the breed in both conformation and performance events. The many champions bearing her Kalahari kennel name include Ch. Wetu of Kalahari, winner of multiple specialties and Bests in Show and first in the Hound Group at Westminster Kennel Club in 2002.

Like Savage and many other experienced breeders, Fikes has found 8 weeks to be a key age at which to assess a puppy's structure, both in terms of specific traits and overall balance. She has learned that topline is one of the traits that can be reliably predicted at this point for most dogs. "From 8 to 12 weeks," she says, "toplines remain fairly true and probably represent what the dog will have as an adult. Topline faults that are apparent at 8 weeks will persist in the adult to some degree."

She finds that substance, too, can be assessed quite reliably at this age. "Substance is made up in both bone and muscling," she notes. "Good muscling on the inside of the leg will give a rounded look to the leg, even though the bone is oval. Too light a muscling is an indicator that the puppy may be too refined as an adult."

Other structural aspects that Fikes evaluates at 8 weeks include head, rear, tail-set, front assembly, and depth of chest.

"I like to see a good width of chest and fill between the front legs," she says. "The elbows should hug the ribbing when standing and moving. This requires adequate angulation between the shoulder and upper arm, as well as a good layback. In my dogs, puppies at 8 weeks have the depth of chest they will have as adults. As they grow, they may get a bit shallow as teenagers, but it does come back to what they had at evaluation. In some lines, the chest may drop as the dog matures, but the ribbing should remain about the same."

Finding the Right Balance

Attention to the strengths or weaknesses of specific areas must not distract from the important consideration of overall proportion and balance. "Proportion in an 8-week-old pup is a good indicator of what it will be as an adult," notes Fikes. "A balanced puppy will become a balanced adult. A square puppy will be a square dog."

But what, exactly, is meant by *balance*? As Fikes describes it, "If you look at a puppy, whether it is standing still or moving, no one part of its body stands out from the other parts. Just let your eye settle on the pup, and see if something jumps out at you.

"I like to see a puppy that stands four-square in a balanced position when it is attentive to something," she continues. "This is why you should sit with them in the yard-so that you can watch them in normal, relaxed surroundings, and observe each one's natural stance."

In her book *Tricks of the Trade,* AKC judge Pat Hastings describes many puppy-evaluation techniques in detail. Advice offered in the book—also shared through her *Puppy Puzzle* DVD and seminars—reflects her extensive research on the subject and years of experience (with her late husband) as a Doberman Pinscher breeder and professional handler. She provides the following tips on assessing balance in the puppy:

"Stack [the puppy] in as natural a position as possible. Remember, the shape of the puppy at 8 weeks is the shape it will grow into as an adult.

"Check the puppy's proportions, in accordance with your breed standard. In

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GREAT SCOTS!

Buffy Stamm discusses stud dogs, outcrosses, and her 55-year reign of terrier.

On the day I was notified of my selection as the 2008 AKC Terrier Breeder of the Year, I confess, my first thought was *not* of the honor of the award, but the horror of shopping for a formal dress for a very little, old lady.

That problem, like so many others, was solved by my longtime friend and Anstamm Kennels partner, Cindy Cooke. She tracked down a dress shop in nearby Holland, Michigan, and within minutes of entering the shop, I had the perfect dress. Now I could relax enough to contemplate my more than five decades in this sport.

In the 150 years since the first dog show, the rules for founding a successful kennel have changed very little (with one exception, which I'll discuss later). Nearly every newcomer to the sport is told, "Buy the best bitch you can't afford." At Anstamm, it was done a little differently.

Anstamm was originally the kennel name of Anthony Stamm. Tony sold me my first show bitch, and then, as the late incomparable terrier handler George Ward used to tell it, he married me to get her back. In any event, for several years Tony and I bred good bitches with some degree of success. It wasn't until we imported English Ch. Bardene Boy Blue, however, that we realized that we could build a more successful breeding program based on stud dogs.

Boy Blue was the first of the Bardene dogs to be imported to the United States. English Ch. Bardene Bingo, Boy Blue's most famous son, was imported by Bob Bartos for Carnation Farms, and then we imported the Bingo son Ch. Bardene Bobby Dazzler. These three dogs were widely used by breeders all over the United States.

The Second-Pick Strategy

Tony and I decided to ask for a second-pick puppy from the bitches bred to Boy Blue and Bobby Dazzler, instead of a stud fee.

The idea was a novel one, but it was popular with breeders for several reasons. First, it meant that a breeder didn't have to lay out a big stud fee up front. Second,

Mary Bloom ©AKC

breeders knew ahead of time that they could keep the best puppy in their litters. Third, the breeders knew that the second-pick puppy was going to a kennel where it would be shown to its best advantage and have a good chance at becoming a champion.

For us, the advantages were many. In most cases, breeders wanted to keep a bitch, so some very fine dogs were available as second pick. Taking the second-pick puppy, and often making it a star, caused breeders to view us as generous and helpful. In addition, by bringing in the outcrossed bitches and breeding them to our stud dogs, we were able to maintain a very distinctive breed type without painting ourselves into an inbred genetic corner. Over the years, this plan enabled us to dodge a few bullets when faced with health issues.

Sigh of Relief

The first dog show took place in Newcastle, England, in 1859. That same year, Darwin published *The Origin of the Species*. Dog breeders didn't know it then, but the study of evolution and the role played by genetics was going to lead to that one big change I alluded to earlier.

No breeder can be successful today without paying attention to the ever-changing application of genetics to canine health problems.

When I first started breeding, there was only one genetic health problem that affected Scottish Terriers. Everyone *knew* about "Scottie cramp," but no one *talked* about it. No one ever admitted to producing it, so breeders worked in isolation trying to figure out how to avoid producing Scottie cramp and what to do with the affected dogs. By the time the second major genetic-health problem cropped up, I and other Scottie breeders, realized we had to try a new approach.

Von Willebrand's disease (vWD) is a bleeding disorder. When the first Scottish Terriers were diagnosed with this disorder, we and other breeders in Michigan, many of whom had never produced vWD, decided to contact the researcher who had identified the disease and work with her to develop a test to identify carriers. By today's standards, that first blood test was crude and somewhat unreliable, but it represented a huge first step in changing the secretive culture of dog breeding.

It's no accident that the first DNA test for a genetic dog disease was the DNA test for vWD. Our experience in helping to develop the vWD blood test prepared us for future work with the researchers at Michigan State University and the University of Michigan who developed the vWD DNA test.

At Anstamm, we submitted our first vWD DNA tests and held our breath. Our premier stud dog, Ch. Anstamm Happy Venture, was at that time the leading sire in the history of the breed. Our stud force included him, his sons, and grandsons. If he were a vWD carrier, we would have been in serious trouble. Fortunately, he and all his sons, save one, were clear. We breathed a sigh of relief that lasted until 2007.

Outcrosses to the Rescue

A few years ago, our most promising young stud dog had already sired the Best of Winners at two national specialties. One of his offspring was among the top Scottish Terriers in the country. We were riding high when we got the dreaded phone call from a breeder who had used him. He had produced a puppy with cerebellar abiotrophy (CA).

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AKC PERFORMANCE EVENTS

Breed vital working characteristics into the "mind, heart, and spirit" of your dogs.

By Doug Ljungren

Courtesy Doug Ljungren

The American Kennel Club provides three types of events in which owners may compete with their dogs: conformation, companion events, and performance events.

Performance events are those where dogs are evaluated as to how well they perform the function for which they were originally developed. For example, how well does a Labrador Retriever retrieve or how well does a Border Collie herd. As such, performance events are often referred to as being "breed specific." The AKC offers 15 different performance events in which 125 breeds may test their functional skills.

The results of performance events provide valuable feedback to the serious breeder. How well does a dog perform the function for which its breed was created-what could be more basic than that?

There are two major types of characteristics that make a breed unique from others. These are often referred to as "the essence of the breed." These characteristics are *proper conformation and breed type,* and *the ability to perform its function*. If a dog has lost breed type or lost the ability to perform its function, it is not a good candidate for breeding since it fails to demonstrate the characteristics that make the breed what it was meant to be. Maintaining and enhancing these characteristics is vital to preserving the essential character of the breed.

Form Follows Function, But ...

Many breed standards were developed to ensure the breed is built properly to do its job. Maintaining proper conformation and health standards are important components needed to accomplish a greater purpose: the ability of a working breed to perform its function. We often hear that form follows function; however, the reverse is not necessarily true, function does not necessarily follow form. Why? Because there are performance characteristics (in addition to structural characteristics) that a dog must possess before it is able to properly carry out the function for which it was developed.

Instincts Working breeds must possess the basic inherent ability to perform their function. Pointing dogs point, herding dogs herd, scent hounds smell tracks. An owner can enhance these abilities through exposure to situations that let these traits come to life, but the dog, in the most basic sense, does these things instinctively.

Desire A good working dog must also possess the desire to do its job. Desire is also an inherited trait. It can be fueled by making a dog's training experiences enjoyable. But if a dog lacks the desire to do its job, it is almost impossible to instill it through training.

Intelligence Intelligence makes training much easier. It is the lucky owner who can enjoy the rewards of training when the dog "gets it." Intelligence is an important characteristic for any dog that will be trained extensively, as is required for most performance events.

Temperament A dog's temperament will influence many desirable traits. For working dogs, one of the most critical is the delicate balancing act between cooperation and independence. Each type of performance event requires its own unique blend of cooperation (dog listening to its handler) and independence (dog deciding how best to handle a situation). Training can shift this balance to a degree, but fundamentally, a dog will have a difficult time performing its job properly if it is uncooperative or overly dependent on its handler. Temperament is an important inherited characteristic and should be a major consideration for any serious breeder.

There are other characteristics, such as the ability to handle intensive training and the willingness to work with other dogs (particularly significant in pack sports), which are important to the success of a working dog. While perhaps not as obvious as some of the other performance characteristics, the lack of these traits will diminish a dog's ability to perform.

Maintenance and enhancement of these inherited traits are the responsibility of the breeder. No small task. These characteristics cannot be seen in a conformation ring. They must be evaluated in the field.

AKC Performance Events

AKC Performance Events provide a means to evaluate a dog's ability in the field. Performance events include both tests and trials. In tests, a dog's performance is judged against an

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PREVENTABLE PARASITES

By Connie Vanacore

Spring is traditionally the time of year when owners have their pets' blood tested for heartworm disease. Why? Because dogs who were exposed to heartworm-carrying mosquitoes last summer will begin to show symptoms of the disease in March or April.

It takes about eight months for the parasites, which the mosquito injects into the bloodstream of the dog, to reach the heart and lungs, where they are transformed into adult heartworms. Even though dogs have been on the medication regularly, veterinarians recommend testing every year because the preventative may not be 100 percent effective.

Coughing, shortness of breath, wheezing, and sometimes abnormal heart or lung sounds may indicate the presence of heartworm infestation. If heartworms are not eliminated from the dog by prolonged and expensive treatment, the lungs, arteries, and heart will eventually become clogged with heartworms, blocking the flow of blood and oxygen to those organs.

An Ounce of Prevention …

Prevention is simple. A once-a-month chewable pill will keep heartworm larvae from developing in the dog. Heartworm disease was, until about 10 years ago, largely confined to the Southeastern states, where the climate is warm and moist: Perfect breeding grounds for mosquitoes. Now, however, with changing weather patterns, and the transportation of dogs everywhere, the only place where mosquitoes and the parasites they carry are rarely found is in the desert.

Most veterinarians recommend year-round administration of heartworm preventative. However, unless you are in an area which does not freeze, or where mosquitoes grow fur, it is probably safe to suspend treatment after the first hard freeze until the temperature rises above about 40 degrees Fahrenheit. The preventative also protects against other types of internal parasites, such as roundworm and whipworm.

It is often not practical to try to eliminate mosquitoes from the environment. However, since these pests thrive in standing water, it is helpful to rid your yard of standing water as much as possible. Some people like to leave old tires or tubes which puppies use for play. These are perfect reservoirs for mosquitoes. Change water in outdoor buckets at least once a day, and don't forget to change the water in the birdbaths, too. If you are fortunate enough to have well-drained soil, you would not have to worry about spraying. If you live near swampy land or stagnant ponds, it would be worthwhile to have those areas sprayed periodically, if at all possible.

Topical sprays may keep mosquitoes off your dog, but they are not foolproof and must be constantly renewed.

When you have your dog's blood tested for heartworm disease, sometimes veterinarians test for Lyme disease at the same time. Be aware that if your dog has ever had Lyme disease, it will test positive even though there are no active bacteria present. If the dog has been vaccinated against Lyme disease it will always test positive.

Tick-Borne Trouble

Deer ticks-tiny, almost invisible crawling critters-also make their appearance, along with other tick species, when temperatures rise above 40 degrees.

The deer tick is the variety that carries Lyme disease bacteria, but other types of ticks carry different unpleasant diseases. Among these are Rocky Mountain spotted fever and erlichiosis. The range of all types of ticks has spread from localized regions to almost all parts of the United States for the same reason that mosquitoes have migrated to places never before seen.

Lyme disease and some of the other tick-borne illnesses are characterized by joint pain, lethargy, lack of appetite. If left untreated, the spirochete that carries the bacteria may migrate from the bloodstream into the heart, lungs, or other organs, including the brain. Tick-borne diseases respond very well to antibiotics, so if you suspect your dog might have been bitten by a tick of any sort and shows signs of illness, don't delay in getting treatment.

Prevention is always preferable to the cure.

Adapted from a column published in* Dog News Digest; *reprinted with permission. ✦

Connie Vanacore is AKC Delegate from the Irish Setter Club of America and chair of the Delegates Canine Health Committee.

"Tips and Insights From Top Breeders"
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other words, check the height in relation to the length, and the depth of the body in relation to the height of the leg. Make sure you are following your breed standard, as some standards require the dog to be longer than it is tall, to have a sloping topline, and so forth.

"With the puppy comfortably stacked, look at the whole picture. Learn to look for correct balance by visualizing three simple lines that apply to most breeds:

"1. Visualize a line along the entire topline. The head—jaw and all—should be above that line.

"2. Visualize a line up the front legs, perpendicular to the ground. The entire head and neck of the puppy should be in front of that line.

"3. Visualize dropping a plumb line from the point of the buttocks to the ground. The plumb line should land at the tips of the toes.

"Practice these visualizations … Pretty soon, these lines will come easily to your mind's eye when evaluating puppies. Once they do, you will be able to look at the whole picture and immediately detect such significant structural weaknesses as a short neck or poorly placed front or rear assembly."

A Continuing Education

You've hovered over the litter for weeks. As you watch them dash and tumble happily in the yard, you may already have high hopes for one or two of them. There are tough choices to be made: *Should I run this one on for a few months? Which one should go to that good pet home next week? Which for the agility home?* Without a crystal ball at your disposal, there's much uncertainty involved-but with ongoing study, observation, and the help of breed mentors, your sense for how those pups are likely to turn out will continue to improve with each litter. ✦

Arliss Paddock breeds and shows English Cocker Spaniels and is former managing editor of the AKC Gazette.

Reference and Recommended Further Reading

Tricks of the Trade, by Pat Hastings, with Erin Rouse; Dogfolk Enterprises, 2005 (revised edition). Includes detailed discussion of puppy-evaluation techniques.

"GREAT SCOTS!"
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This was a newly discovered condition in Scottish Terriers, the first having been diagnosed in 2000. On the advice of Clinical Associate Professor of Genetics Dr. Jerold Bell, our club had established an open database where the pedigrees of all known affected dogs were published. There was controversy about participating in the database. Many breeders feared that admitting to having produced CA would cause other breeders to stop using their stud dogs and buying their puppies. Our decision to participate in the open database was a hard one. The carrier dog and his sons made up most of our stud force. For the first time in 50 years, we had to depend on our bitches to help us reduce our risk of producing CA.

As predicted, of course, stud services at Anstamm initially fell to an all-time low when we posted the name of our stud dog on the open CA database. This, however, was where our policy of keeping outcrossed bitches worked in our favor. While most of our stud dogs were at high risk for producing CA, so far, at least, our bitches were fairly low risk. With a couple of well-chosen outcrosses, we have bred low-risk males who are just starting their show and stud careers. These dogs will make it possible for us to continue to produce healthy but also typical "Anstamm" Scottish Terriers for the years (or months) remaining until we have a DNA test for our latest genetic disorder.

A Breeder's Creed

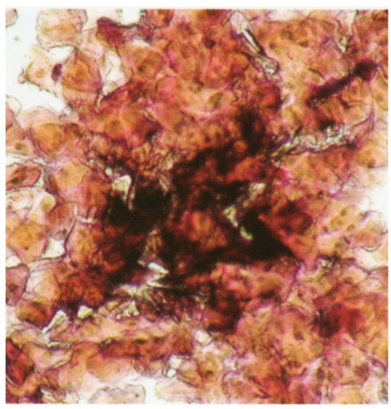
As the oldest active Scottish Terrier breeder, I feel a real obligation to set a standard for ethical conduct. I believe that our production of hundreds of champions, including many specialty, group, and Best in Show winners, would be meaningless if we failed to take responsibility for producing the healthiest dogs possible. I'm proud of the small role that Cindy and I have played in encouraging openness about health issues, and look forward to continuing the challenging job of producing healthy Scottish Terriers with correct breed type. ✦

Miriam "Buffy" Stamm has been breeding Scottish Terriers for over 55 years under the Anstamm prefix and is the 2008 Terrier Group recipient of the AKC Breeder of the Year Award.

BREEDER'S HANDBOOK

FETAL DEVELOPMENT AND BIRTH DEFECTS IN DOGS

By Bretaigne Jones, DVM



Photos courtesy Royal Canin

Since 1967, Royal Canin has been at the forefront of developing innovative nutritional responses in the field of dog breeding. Even if nutrition is fundamental in breeding, it cannot give all the keys for success. Application of reproduction techniques is the deciding factor.

As soon as fertilization occurs within the oviducts, genetic programming takes over. A chemical reaction, triggered by the penetration of a sperm into the cytoplasm of the egg, causes the outer covering to bind the surface, preventing another sperm from imbedding. After approximately 12 hours the first cellular division occurs, beginning the miraculous creation of a puppy. The divisions repeat every 12 hours, until at the 16-cell stage has migrated to the uterine horn.

The first 8 cells created are undifferentiated, meaning that they each have the potential to become any cell type necessary in the developing embryo. Only 3 of these cells are necessary to grow an entire embryo, which will continue to develop through the fetal stage, into a puppy.

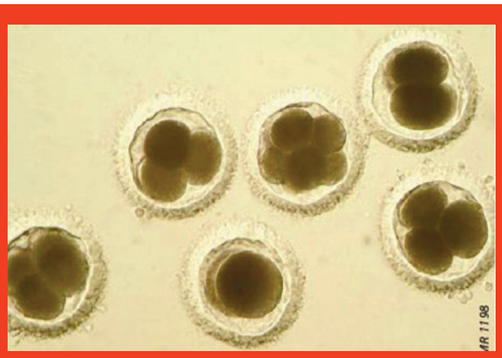
After the 8-cell stage, the cells begin to differentiate into 3 main types, from which every organ and specialized cell will result. At the time the 16-cell mass reaches the safety of the uterus, it enters the active embryo stage. Within two weeks the embryo will find a place of its own in the uterus where it will implant into the uterine tissues, and begin to form a placenta.

Placenta Stage

The placenta is an organ all by itself, with a very specialized mission. It not only provides nutrients from the mother's blood to the embryos, but also delivers oxygen. It also transfers the waste products from cellular metabolism of the embryo back to the maternal blood, to be excreted. The mother's blood and the embryo's blood never mix; each is encased in its own blood vessels, but they come into such close proximity through capillaries that the nutrients, oxygen, metabolic waste, and carbon dioxide can pass from one set to the other.

The placenta is a joint effort between the mother and baby, each developing a rich nest of blood vessels and supporting tissues that interconnect to create a whole.

Aside from these functions, the placenta also anchors the embryo within the uterus to protect it from the mother's movement. Unlike the structure of some other animals, the placenta in dogs and cats is like a cigar wrapper "ring" that circles the embryo, maximizing its function.



The picture shows the equivalent of a litter of puppies, in the very early post-fertilization stage.
"Cellular Divisions After Fertilization" courtesy Elise Malandaine, Royal Canin, France

Embryo Stage

The embryo stage lasts for about 30 days and is marked by the differentiation of the early cells into general cell types, which will further specialize mid-gestation. The simplest origins of all specialized cells begin in three layers of the early embryo. The endoderm is the layer of cells to the interior and is destined to become mucosal membranes (lining of the mouth, inner surface of eyelids, lining the nostrils, etc.), and the respiratory and digestive systems.

The next layer of the embryonic mass is the mesoderm, or middle layer. From this primordial layer the muscles, connective tissue, bone, circulatory system, urinary system and genital system will emerge. The outermost layer of cells, the ectoderm, will develop into the outermost layers of skin, with hair follicles and sebaceous glands. It will also differentiate into nervous-system tissues including the eyes, brain, spinal cord, and peripheral nerves. Finally, it further specializes into the sensory organs for sight, sound, balance, tactile sensation, and pain receptors.

The embryo develops each successive level generally from the head end first, extending through the chest region and abdomen, and then the pelvic area, gradually finishing with the tail and tail-end structures. With the rapid growth of cellular mass, the embryo will quickly outgrow its ability to feed all its cells by simple diffusion, making it necessary for a rudimentary heart to help move blood throughout the embryo.

Fetal Stage

The neural system, which includes the brain, nerves and spinal cord, is among the first of the body systems to specialize in the fetus. It is also one of the last systems to complete its formation. Dogs and cats are born before their nervous system is fully functional, and will reach 6 weeks of age by the time the tissues mature.

The limbs grow, forming the shoulders and hips first, then the forelegs and thighs, and finally the lower legs and paws. The paws develop as paddles, with the separate toes becoming independent due to the degradation of the tissues between. As joints begin to develop, it is important that they are moved to prevent becoming fixed in place. Congenital limb deformities can result, which can also lead to birthing problems if the legs can't flex to accommodate the cervix and birthing canal at whelping.

The head forms as two distinct sections, the face and the cranium.

Each has a different origin of embryonic tissue. Because of this, they may be impacted independently by genetics or teratogens (substances that cause birth defects). It is easier to understand the formation of brachycephalic faces (short-nosed or flattened face) knowing that the face forms independently of the skull.

As the lungs develop, they are filled with liquid to maintain a constant pressure. Since they will not be used to oxygenate blood until after birth, most of the fetal blood flow will bypass the lungs. Once the puppy is born, the fluid in the lungs is discharged and new airsacs (alveoli) form within the lungs.

There are three structures unique to the fetus that should degenerate within a few days after birth. The structures are important to protect the lungs and liver of the evolving fetus, but unnecessary and potentially damaging after the pup is a few days old. The anatomic features specific to fetal development are the *foramen ovale* in the heart, the *ductus arteriosus* between the pulmonary vein and the aorta, and the *ductus venosus* redirecting blood flow around the liver.

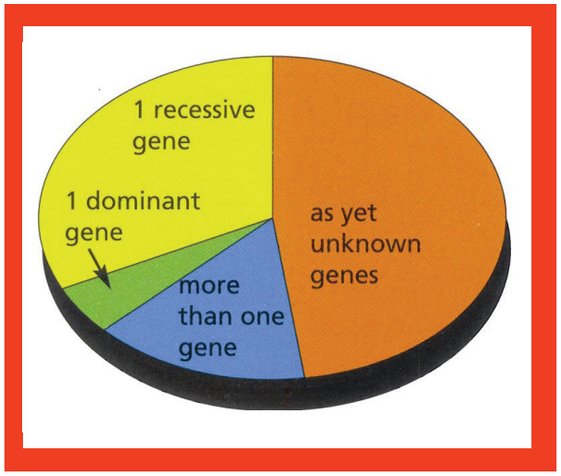
Just as the fetal lung tissue doesn't need the full extent of blood flow from the heart during gestation, neither does the liver. The dam's liver fully detoxifies the blood for both her and the unborn puppies.

Potential Birth Defects

At birth, changes in blood pressure and oxygenation trigger the closure of these protective fetal structures under normal circumstances. Occasionally, these structures persist after birth and will cause problems, ranging from mild to severe, even life-threatening.

There are a multitude of potential problems to interfere with embryonic and fetal development. These may be genetic, structural, or environmental in nature. Environmental causes encompass infectious agents, teratogenic drugs and nutritional imbalances. Each organ system has a critical period in its development when it is most at risk. Chemical exposure can include medications, anesthetics, and preventive drugs.

There are approximately 250 genetic diseases in dogs. These are due to the following:



Genetic causes of birth defects, also called congenital defects, can occur from a variety of events. Mutations, or changes in the genetic material (DNA), can result in replication errors. Under normal circumstances, DNA is copied when one cell divides into two. Not surprisingly, there are a myriad of steps involved, as well as numerous substances, that interact with the replication of the genetic code. Any step in the complex process can be interrupted. Mutations may occur from too few components produced, an extra component being interjected, or the correct components being replicated out of sequence. As animals age, these mutations occur more frequently.

Inbreeding can be another cause of genetic malfunction. The degree of inbreeding indicates the concentration of an ever-decreasing genetic pool. This increases the likelihood of homozygous gene inheritance, meaning that any detrimental genes present are more likely to have full affect on the resulting offspring.

Geneticists have established a formula to reflect the degree of inbreeding found in any individual, called an inbreeding coefficient. For an animal that is not inbred at all, that number would be zero. Conversely, for an animal that is completely inbred, the coefficient would be at or near one. The higher the coefficient value, the higher the prevalence of defects, fetal and neonatal death.

To illustrate this, a comparison between a mating of two dogs from different breeds and a mating of dogs within a breed shows a marked increase in neonatal mortality from 3.4 percent (two breeds) to an average of 15 percent (one breed).

Structural birth defects are caused by a primary error in the development of a body part. This could be caused by trauma, malpositioning, or a pharmacologic interference. Approximately 6 percent of pups born will have some type of developmental defect. These will range from very minor (kinked tail tip) to major (cardiovascular anomaly).

A major contributor to congenital defects is the inappropriate use of medicines during pregnancy. Drugs that one wouldn't automatically suspect of potentially having such side-effects include some antibiotics, deworming or antiparasitic compounds such as sulfadimethoxine (Albon) and metronidazole (Flagyl), antifungals given orally, and even some diarrhea treatments.

There are infectious agents (bacteria, viruses, parasites) that can trigger developmental defects. Among these are both types of canine parvovirus, the traditionally recognized type 2 manifesting as hemorrhagic diarrhea; and type 1, also known as the Minute virus. As far as parasites, toxoplasmosis is a disease condition that frequently results in defects.

Nutritionally, the most common defect seen may be cleft palates. However, it is important to recognize that cleft palates can result from other causes as well, such as genetic, or use of medications during pregnancy.

Certain breeds have a higher prevalence of cleft palates. This is generally associated with brachycephalic breeds such as Boston Terriers and French Bulldogs. The nutrient usually involved is folic acid, or folate, a B vitamin. Folic acid plays an integral part in DNA replication and translation. If it is not present in adequate levels, the resulting strands of DNA are fragile and break.

Cleft palates may affect a number of puppies in the same litter, particularly in brachycephalic breeds. Supplementation with folic acid at the start of gestation can help in preventing such deformities.

It is important to note that levels of folic acid in the diet may not be deficient, and that there is a chemical present that inactivates or blocks folic acid so that it can't be used in the critical processes.

Another nutrient that can trigger cleft palates is vitamin A. Excessive levels of vitamin A are the problem. The most common cause of hypervitaminosis A is liver supplementation to the regular diet. Vitamin A stores in liver tissue, so food sources rich in vitamin A can accumulate the nutrient in the dog's liver and in the blood stream. This is just one example when adding a supplemental food to a dog's diet does much more harm than good. Generally speaking, the best application of nutrition is to feed a complete and balanced dog food, appropriate for the life stage, size and lifestyle, and nothing else.

Congenital defects occur in every breed, and every breeder will have some show up in their dogs. This is normal. However, you can minimize this occurrence by feeding a diet specifically formulated for breeding, breeding animals that have been vaccinated regularly, dewormed regularly, and are healthy; and not administering any drugs during pregnancy unless advised by your veterinarian. Good record keeping can help determine what occurrence of birth defects is within normally expected levels, and what is excessive. It can also help pinpoint any inbreeding issues, genetic predisposition, or inadvisable mating. ✦

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"AKC Performance Events"
continued from page 4

established standard. It is a pass/fail event. In trials, a dog's performance is judged against that of the other competitors. Dogs are placed first through fourth.

Most people new to performance events enjoy entering a test as the first step. Tests are divided into skill levels in order to accommodate different degrees of training and experience. A good way to get started is to watch a test in order to become comfortable with the setting and requirements (see sidebar).

Evaluating Performance Characteristics Takes Time

As one progresses through the testing program, test levels become increasingly difficult. It takes time for a dog to gain the experience and training necessary to pass. As the skills required become more difficult, some dogs will reach the limits of their potential. It varies among sports, but it is not unusual for it to take three to five years to obtain a true picture of a dog's performance characteristics. This provides important feedback to the serious breeder. It also does not lend itself to a fast cycle in one's breeding program.

Dogs and their owners who are committed to reaching the highest levels of accomplishment should be held in the highest regard. These animals can potentially play a valuable role in the enhancement of the breed.

Build Upon What Others Have Done

Once a conscientious breeder decides that paying attention to performance characteristics is important, the question becomes "How do I start?"

A logical first step is to test your dog. However, to build a line with proper conformation and performance characteristics is a long-term project. No matter which working breed you have, there will have been others before you who have stressed the importance of performance characteristics in their breeding program. It makes sense to jump-start your program by building upon the work others have already done. The other breeder will be flattered, and your program will be generations ahead.

Breed Stewardship

In addition to proper conformation and breed type, there are performance characteristics a working breed must possess in order for it to perform the function for which it was originally developed. Only by putting the dog to work can one determine the degree to which these characteristics exist. Allow the dog to awaken its instincts and gain experience, and then make a truthful evaluation of its abilities. Performance characteristics reside in the most delicate of places—the mind, heart, and spirit of the dog. Serious breeders, those interested in maintaining and improving the essential character of the breed, will give significant consideration to performance characteristics when contemplating their breeding program.

Breeders bear a significant responsibility: the stewardship of the breed. For working breeds, that means maintaining the breed's ability to perform its function. ✦

Doug Ljungren is AKC assistant vice president of Performance Events.

Getting Started

Tests in your area can be found by visiting the AKC web site at *akc.org/events/search/*.

To obtain regulations pertaining to the different performance events, call the AKC order desk at 919-213-9767 or e-mail to *orderdesk@akc.org*.

Dual Wins Gun Dog Championship

Robert Young ©AKC

"In the genes": Katie Tazza stacks Sioux, her Dual Champion GSP.

It is difficult to become a Dual Champion in the pointing-dog world. A dog must possess the proper conformation and breed type, retain hunting instincts and drive in order to perform at a competitive level, have the disposition to work cooperatively with its handler while also maintaining its independence, and have the temperament and intelligence to accept intensive training.

The owners of these dogs are striving for the ultimate accomplishment: the dual dog.

DC/AFC Up n' Adam's Super Sioux, CDX, SH (Sioux), a German Shorthaired Pointer owned by Katie and Tom Tazza, won the 2009 AKC Retrieving Gun Dog Championship and took fourth place in the Non-Retrieving Championship, held in March near Danville, Virginia.

Katie's advice for those wishing to strive toward a dual dog: patience.

Start with a structurally sound dog. Make sure it has a high desire to hunt and possess style on point. You can't put these in the dog; they must be "in the genes."

Hunting tests are a good place to start. Field trials will take a while longer if you want to handle your dog yourself since it takes time to become a good handler. Always look for the positive, even when things don't go as planned. Study those pedigrees, and with patience, hard work, and a little luck you may end up with a dog like Sioux!**—D.L.**

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GENOME BARKS PODCAST

Here is a list of partial podcasts currently in our library which can be found on both *www.akc.org* and *www.akcchf.org*

- *Canine Lymphoma, with Dr. Steven Suter*
- *Chronic Rhinitis, with Dr. Adam Birkenheuer*
- *Using Blood Tests to Diagnose Disease, with Dr. Heather Flaherty*
- *Cerebellar Degeneration, with Dr. Natasha Olby*
- *Reproduction, with Dr. Sylvia Bedford*
- *Canine Neurological Disease, with Dr. Karen Kline*
- *Canine Nutrition, with Dr. Joe Wakshlag*
- *Elbow Dysplasia, with Dr. Denis Marcellin-Little*
- *Canine Cardiac Disease, with Dr. Wendy Ware*
- *ABC's of Breeding, with Dr. Claudia Orlandi*

Don't forget to check the Genome Barks archives—a new podcast is released every two weeks.