



## Upper GI: Mind, Mouth, and Stomach Anatomy and Physiology of the GI Tract

### Transcript

Now let's move on to optimizing your upper GI tract. When I talk about the GI tract I'm talking about gastrointestinal, gastro referring to the stomach and intestinal of course referring to the intestine. Today we are going to review the structure and function of the upper GI tract, the physiology of the upper GI tract.

How does it work? How does it do what it does and why is that important to you? How do you know when something's gone wrong? This is what most people want to know, why am I gassy or bloated or why does my stomach burn. And then finally, what you really want to know is, how do I correct what's wrong?

It's my belief that when you understand the underlying process at least on a basic level it's much easier for you to stick with the program that helps you to correct it. Your digestive tract has three main functions, this is what it does, this is its whole purpose in life. One is to **digest** the food, break down the food into molecules your body can use.

Your body can't use a piece of broccoli or a hunk of meat, it can't use it that way. It has to be broken down into molecules your body can use and these are what we call nutrients: macronutrients and micronutrients.

The other piece of it is **absorption**. It's one thing to break those foods down into a molecule that the body can use, but if you can't actually transport it from the intestinal tract and into the body, it's not going to be of much use for you so they have to be absorbed. And then finally whatever your body can't use needs to be **eliminated** from the body.

All three of these are equally important in order for you to be healthy you need to have strong digestion in all of these pieces, not just some. There are really two kinds of digestion, one is the **mechanical digestion** where your food is actually physically, mechanically ground into small pieces and then the **chemical digestion** where the larger food molecules that have been broken down mechanically are broken down further into tiny molecules by enzymes, the importance of enzymes in this whole process.

Let's take a quick look at the different parts of the system and then we'll talk about what can go wrong and how you can correct whatever feels like is going wrong with you right now. Your mouth is the gateway, right, it's the entryway, you can keep stuff out or take stuff in, and it has saliva inside to moisten the food, and teeth to mechanically break it down.

But you've also got these three salivary glands and you've got the tongue which pushes the food down and this really important little flap here called the epiglottis and I'll show you that in a minute. I don't want to get too technical, I just want you to see what's really happening when you are swallowing food.

The green is the bolus of food, it's in your mouth. Your tongue pushes it back down further towards your throat, as it gets towards your throat there is a little flap at the top of your wind pipe, also called your larynx (which goes into your lungs), and it closes so the food doesn't go down into your lungs. Smart body; we wouldn't want that to happen.

As the food passes by down the back of your throat, it forces the epiglottis to close over the windpipe to protect you. And then the food makes its way down, down, down, down the esophagus until it reaches the stomach. The esophagus is a muscular surface, it contracts the food down, it doesn't just fall down.

You can be standing on your head and still be able to digest your food. The trachea, which sits in front of the esophagus, needs to be protected from food going down. I don't know if you've ever had the experience of food going down the wrong pipe and you start choking and your body is naturally going to keep choking and choking till it pushes it up. Because you really don't want a piece of broccoli go down your lungs. As healthy as it is if it goes down your digestive tract, it is not good if it goes down your lungs.

Next we move on to the stomach; and your stomach has very, very important work to do. First of all, it's the only place in your body that receives food in its native state, when the food falls down into your stomach it's mostly undigested except for maybe a little bit of partially digested starch.

If you eat starch that starts to begin to be digested in your mouth by the function of salivary amylase, an enzyme that's found in your saliva. Your stomach has this muscular wall and it starts like a washing machine and it's churning it around trying to break the food down further.

There are no teeth so it's breaking it with stomach acid. If you don't have strong stomach acid, you may see a lot of big particles of food ending up coming out the other end in your poop. The stomach actually begins the digestion of both protein and minerals.

It doesn't do much with fat, doesn't do much with starch, it focuses on protein and minerals and it churns the food down and tries to get it broken down as much as possible. But it's got some other important functions like making intrinsic factor, which escorts B12 into your blood.

If you don't have intrinsic factor, if you have a poorly functioning stomach, you don't make intrinsic factor, and you will not get your B12 absorbed; it happens to a lot of people.

Your stomach also secretes something called pepsinogen, which is a precursor to the enzyme pepsin, which breaks down the protein. Pepsinogen is the inactive form of the protein and it only becomes activated in the presence of hydrochloric acid.

The other thing that the stomach does, and part of this is due to the function of hydrochloric acid, is that it kills pathogens in the food. If you don't have a really strong stomach acid a lot of the pathogens, meaning bad bugs, bacteria, viruses, funguses, yeasts, moulds, can make your way further down your digestive tract.

The other thing that stomach through chemical processes and through hormonal processes, which we don't really have to get into at this level, it warns and signals, 'hey, coming through, we've got food coming on down, get ready.'

Let's talk about some of the things the stomach secretes and this is meant to be an overview for you to get you to understand this, not to memorize it necessarily unless you plan to go into a physiologic field or teach other people.

But it's good to understand it because when you understand it you have a sense of what's going on and when something is going wrong you might be able to pinpoint it much more easily on your own. First of all we have the **mucus** and the mucus cells in the stomach produce this to *protect* the lining from the acids and also from dangerous things in your food that could be caustic and grating.

Next we have **gastrin**, which is a hormone that gets secreted by the epithelial cells, which are the surface cells, this *stimulates acid production*. Next we have your **gastric acid**, which is stimulated by the parietal cells, and the acid activates *protein and mineral digestion*. It's really critical to having strong bones, hair and nails; and general function relies on you having active, good mineral and protein source.

Next we have **pepsinogen**, the precursor to the enzyme that makes the *protein digestion* happen. It's activated by acid and then that gets changed into *pepsin*.

The next thing that the stomach secretes is **intrinsic factor**. We mentioned that earlier and that is *escorting B12* from the stomach down to the lower part of your small intestine called the ileum where it's absorbed. And finally we have **ghrelin**, which is the *hunger hormone*. It's secreted by the cells in your stomach when it detects you need more fuel. The beauty of ghrelin is that it can also *stimulates growth hormone*, which is wonderful for growth and repair.

All of these are major players in what the stomach does for you. It does this all behind the scenes. It would be kind of scary if we had to remember to do all these things consciously.

Let's look briefly at the pancreas and some of the enzymes that are produced to help your food break down.

The pancreas produces enzymes that chemically break down the food: the protein, the starches and the fat; and it starts helping with the breakdown of fat-soluble vitamins, E, A, K and D. The names of these enzymes are protease, amylase and lipase. They are not the names per se; they are the categories, so there are several enzymes in each of the protease, amylase and lipase categories.

It also produces bicarbonate; you know it in your kitchen as baking soda that is neutralizing, it's a very alkaline substance. It is produced to neutralize the contents of the stomach as it comes into the intestine, so the acids don't injure the lining of the small intestine. The activity of these enzymes is best at a higher pH (around 8) versus the stomach, which has a pH of around 2, as it needs a more acidic environment.

The pancreas secretes juices into the duodenum and it has other functions that are not necessarily related to digestion such as producing insulin and glucagon to regulate your blood sugar.