

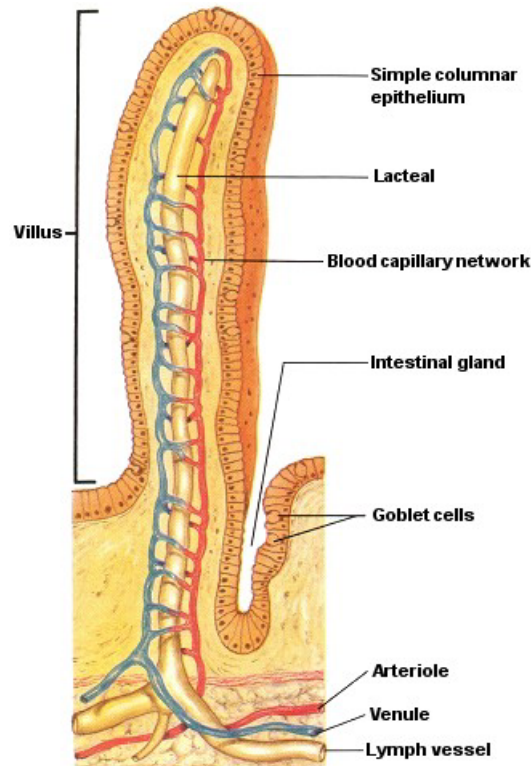
The last phase is called the intestinal phase and takes place about four hours after the gastric phase. The chyme passes through the small intestine, or duodenum, through the pyloric sphincter. This is where the most critical part of the process occurs.

It is vital that manageable portions of food are digested here at a time. An excess amount prevents the enzymes from being able to work properly. It is regulated by the entergastric reflex, in which a slowing of gastric contractions follows the entry of chyme into the duodenum. Here the duodenum uses extra buffers to counter the high pH of the gastric chyme. If this does not occur properly an ulcer may result. Evidence suggests that natural fibre can help to ensure a nice slow process instead of excess amounts.

The high acid pH area of the stomach uses a complex combination of chemical systems to try to regulate acid levels to prevent self-digestion. Often it fails resulting in an ulcer. This is a complex process that will be of additional interest to those addressing a lot of IBS or digestive related cases.

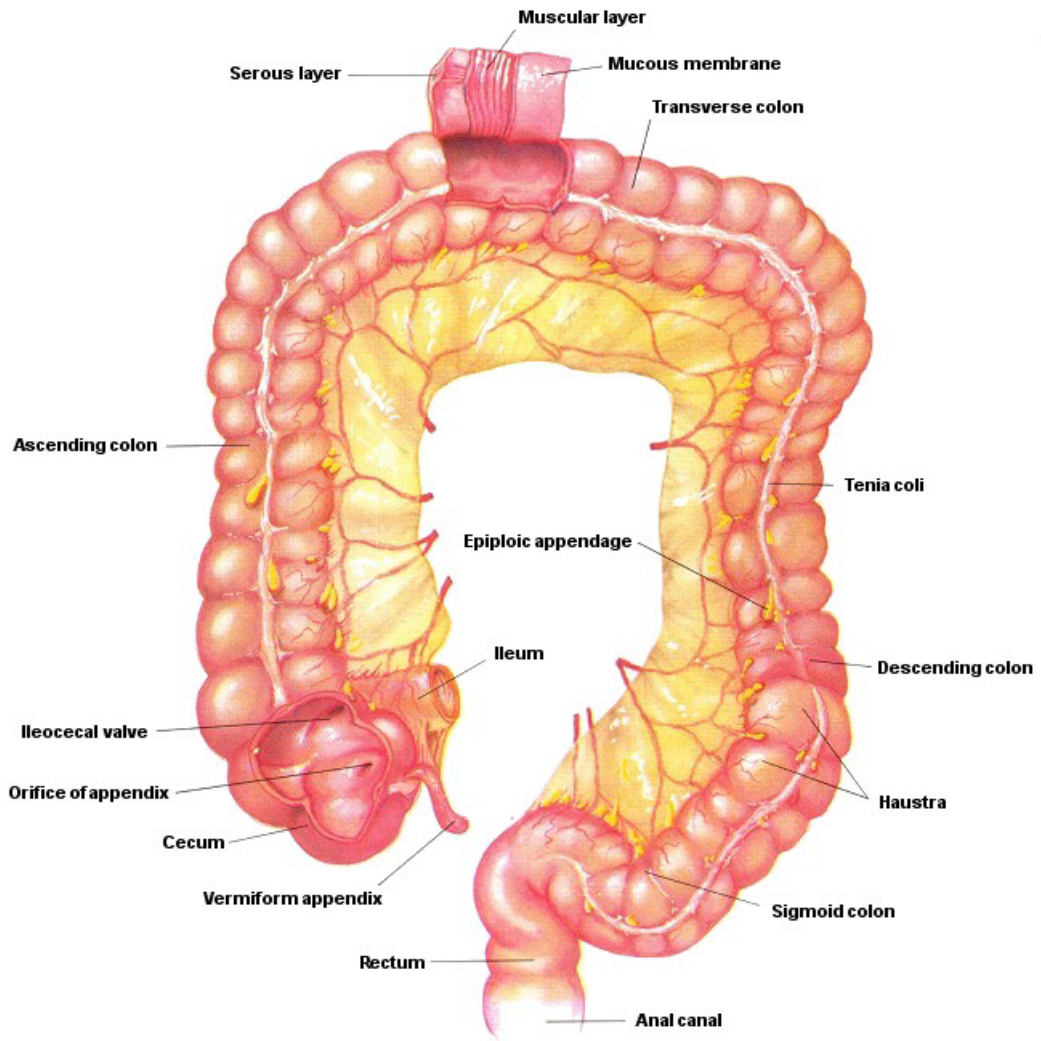
The next 3 to 5 hours take the food through the duodenum, jejunum and ileum where the enzymes really get to work in an intense way. Some come from the small intestine (epithelium), the rest come from the pancreas and bile comes from the liver, which is an emulsifier and thus breaks down fat.

These areas are crucial to absorption – in other words the transference of nutrient to the blood and thus around the body. This happens through the cell membrane surfaces along the lumen of the mucosa. There are folds in the lining called olicae, each lined with thousands of villi, creating a velvet like surface. These microvilli act as receptors, the nutrients being absorbed into the vessels within them. Lipids are absorbed into the lacteal, emptying into the cisterna chyli and then into the blood. In effect these are like a layer of little hairs (although obviously very different material) that transfer the nutriment into the bloodstream, much like the equivalent in the lungs with oxygen).



An Intestinal Villus

The large intestine, or colon, is designed to remove liquid or water and absorb it. It removes naturally occurring water in the food, and the liquid from the mucus that is added en route in order to reduce pH. Without this water recovery method we would quickly dehydrate. This journey can take 8-15 hours since the process takes a long time and the system is a long one! This part of the system also absorbs vitamins B5 and K, Biotin, urobilinogen, bile salts and toxins; kidneys then excrete the last three. It is the pigment from the breakdown of urobilinogen that makes out faeces brown. In this area we have the natural ‘good bacteria’ that are responsible for about half our daily vitamin K intake. They also break down undigested peptides and plant matter producing gas and flatulence.



The last part of course is the rectum, which is about 6 inches long, and is the final resting place of faeces before it is expelled in bowel motions. The internal and external anal sphincter muscles control this. When the internal muscle relaxes you are aware of needing to have a bowel movement. When the external one relaxes you actually pass a motion.

Accessory organs and system

The Liver:

Carbohydrate metabolism

Excess glucose is converted into glycogen and stored.

Lipid metabolism

The amount of lipids in the bloodstream is regulated through both release and uptake in the liver.

Amino acid metabolism

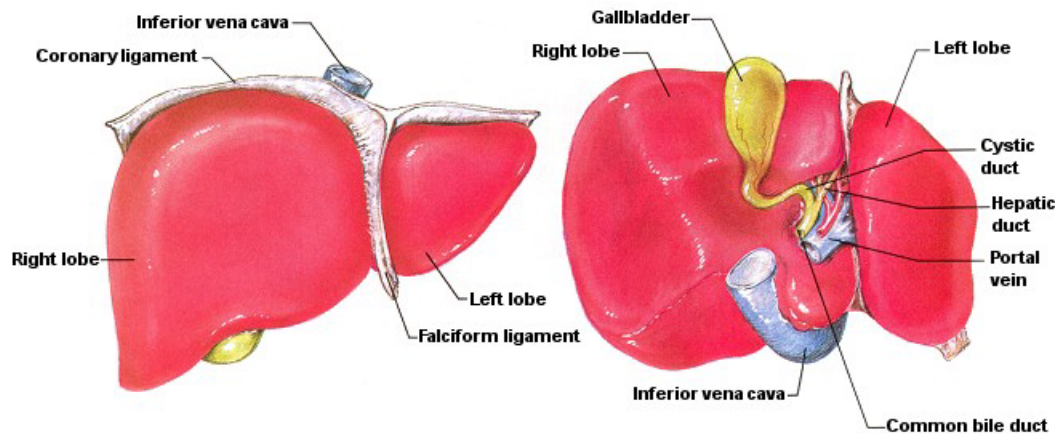
Removing excess amino acids for protein synthesis or energy use.

Waste removal

When amino acids are used for energy, through breakdown or conversion, the amino acid group must be removed in a process called deamination. The kidneys ultimately excrete these.

Bile

As mentioned above, this emulsifies and breaks down fats.



Gall-bladder

As mentioned above. A good anatomy and physiology reference book will provide more details on this area to those who require it for specialised work.



Key Learning Points

- Digestion is a multiple step process consisting of both mechanical and chemical steps.
- We use extra cellular digestion, breaking down polymers outside the cells into monomers so that they become small enough to absorb.
- Mucus is used to protect the various organs along the route, together with replenishing the mucus membrane protective coating.
- Once the chemical process is complete the organs need to absorb the nutrients and water so that these can be distributed to the other systems of the body.

The Urinary System

The main organs in this system are the kidneys.

