Where Did All Of This Waste Come From?

By: Mr. Paskell

The exploration vessel *Bolus* slid down the esophagus, and was barreling towards the stomach. In the mouth, it had been crunched and chewed and had its starchy exterior partially melted by the enzyme amylase. Now slightly wounded, it passed the cardiac sphincter, and dropped into the churning, bubbling vat of hydrochloric acid and proteases that would cause it's proteins to dissolve into their basic building blocks, amino acids. Tossed about incessantly, its very fibers were being ripped away, and its core was transformed into a molten, gooey slime that the headquarters called chyme.

After being squeezed through the pyloric sphincter into the small intestine, it was washed in an alkaline fluid from the pancreas designed to neutralize the acidity carried over from the stomach, and expose it to other enzymes, such as amylase to further break down starches, and lipase (aided by bile) to breakdown fats. As the chyme weaved its way around the maze of the small intestine, the enzymes worked to rip the final shreds of the ship's structure into smaller and smaller molecules that would be assimilated through the epithelium of the small intestine.

The simple carbohydrates and amino acids migrated their way into the capillaries surrounding the intestine, while the lipids found themselves entering the lymph vessels next to the blood capillaries. Both vessels made their way away from the intestine, with the lymph vessels dumping their contents into the portal vein, the major vessel that carries nutrients to the liver. This is where all the substances absorbed by the intestines go for processing first.

Glucose, which contains carbon, hydrogen, and oxygen, is used by the body as fuel for cellular respiration, the process of ATP production. Its waste products are CO2 and H2O. In the liver, glucose not used directly in cellular respiration gets converted to either glycogen or fatty acids for storage by rearranging the carbon, hydrogen and oxygen in its molecule.

Lipids can be used by the body as the precursors for reproductive hormones, transport molecules for other lipids, or in some cases, the carbon hydrogen and oxygen can be once again rearranged to be converted back to glucose for use in cellular

respiration. This conversion occurs in the liver, and results in a chemical waste product called ketones. Excess lipids can be stored as fat in our bodies

Proteins are used for numerous processes in our bodies. In the liver, they are used to make many enzymes, blood clotting factors, and transport proteins. They are also used to build muscle, make other hormones and are an integral component of cells. Excess proteins not used for these purposes undergo a process called deamination in the liver, in which the nitrogen containing “amino group” is removed, and the carbon, hydrogen and oxygen are rearranged into glucose. The amino group forms ammonia, a substance which is toxic to organisms and must be excreted in a timely manner. When muscles are used, the massive release of energy by ATP results in a buildup of both heat and other chemical wastes as well.

Another function of the liver is detoxification of poisons that are absorbed by the liver, including alcohol. This is why many alcoholics develop a condition known as cirrhosis, which impairs the liver’s ability to function. Some medicines are processed by being attached to transport proteins that carry them like taxicabs to their destinations. Since the liver has a limited capacity, large quantities of many medications are toxic to the liver.

Meanwhile, in the large intestine, water, the last remaining usable remnant of our ship was being absorbed into the bloodstream. The only thing left was undigestable fibers, such as cellulose, and some unabsorbed bile, which had once aided in breaking down fats. Our once majestic ship was now just a pile of feces awaiting egestion.