# 9.10.2 - Lipid transport in the body

We probably all know that oil and water don’t mix. If this is new information to you, look at a bottle of Italian salad dressing. Almost as soon as you stop shaking the bottle, the oil and water separate. This is OK for salad dressing, but our body needs a way to transport lipids through the bloodstream and our blood is a water-based solution. Just letting big blobs of fats and cholesterol float around in our blood would quickly clog up the works. So, the liver makes protein molecules that can hold lipids with one “hand” (region of the protein molecule) and then mix with the water in the bloodstream with the other. These lipid transport proteins are called lipoproteins and are capable of transporting lipids to wherever the body needs them.

Let’s follow a serving of rich, fatty Hagen-Dazes ice cream down our digestive tracts to find out how the body handles these fats. As the fat in our ice cream passes down the digestive tract, it eventually gets absorbed into cells that line the tract. These intestinal cells combine the absorbed fats with proteins. The product is a lipoprotein called a chylomicron that is kind of like a chocolate covered cherry. The outer chocolate coating is the protein coat, and the inner liquid-like filling is the lipids we just consumed in our ice cream. Chylomicrons are about 99% lipids and 1% protein. The intestinal cells then secrete the chylomicron into some vessels that eventually end up dumping them into the bloodstream—kind of like how when we flush the toilet, the stuff in the toilet bowl eventually ends up in the sewer. The chylomicrons are taken up by the liver.

The liver is really the heart (pun intended) of lipid transport in the body. The liver extracts the cholesterol and other lipids from the chylomicron remnant, recycles the protein, and then repackages lipids with fresh, new proteins that are all ready to act as delivery vehicles to distribute lipids to body cells that need them. Let’s think of these lipoproteins as the US Postal Service system of the body. When USPS drivers show up to work in the morning, they load their trucks up with all kinds of packages and letters, so they can go out on their routes and deliver them. Our lipoprotein postal vans do the same thing. When they are first formed in the liver, they are jam-packed with lipids. Lipids are a lot less dense than proteins, so the first lipoprotein secreted by the liver is a very-low-density lipoprotein (VLDL)—LOTS of lipids and a few proteins (8% protein and 92% lipids, to be exact). These VLDL particles then leave the post office of the body (the liver) and start their deliveries. Gradually, the lipoproteins lose lipids, resulting in smaller, denser particles called low-density lipoprotein (LDL). Think “raisin” instead of “grape.”  LDLs contain about 25% protein and 75% lipids.

When LDLs have finished their delivery routes, it’s time to head back to the liver post office.  LDLs that are pretty much done for the day’s deliveries contain relatively small amounts of lipids and of course still contain the same proteins. These denser lipoproteins are known as high-density lipoproteins (HDLs). LDLs deliver lipids out to body cells, which is generally OK.  However, they also deliver lipids to atherosclerotic plaques, which makes the plaques larger.  This is bad.

Along their routes our little postman lipoproteins do pick up some mail as well as deliver it.  The LDLs are the delivery men, and the HDLs pick up lipids from the body and return it to the liver post office. While lipids being delivered into atherosclerotic plaques makes the problem worse, HDLs grabbing lipids out of plaques and returning them to the liver helps the situation.  The liver is a really tough organ and is able to handle extra lipids no problem. So, those of us who don’t want to die of atherosclerosis would like to have HIGH HDL levels and LOW LDL levels.

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