A LINE ON LIFE 4/3/85, Updated 12/26/01 Cholesterol and Your Heart * David A. Gershaw, Ph.D.

Some time ago, I received a letter from a reader asking me to write a letter about **cholesterol**. Although this is outside my area of expertise as a psychologist, I decided to do some research on the topic and write a column anyway.

Even though the reader did not tell me why this topic was of interest, I assume it is because of the link between cholesterol and heart attacks. Population studies have provided evidence for four major factors related to heart attacks:

- 1. high blood cholesterol
- 2. cigarette smoking
- 3. hypertension (high blood pressure) and
- 4. diabetes.

Secondary risk factors include:

- 1. obesity (being over 20% above your optimal weight)
- 2. stress and
- 3. lack of exercise.

However, I will deal mainly with cholesterol. The effects of cholesterol on the body are very complex, and they interact with other factors related to heart attacks. The greatest danger of excessive cholesterol in the blood is that it leads to **atherosclerosis**. This is a type of **arteriosclerosis** (hardening of the arteries) in which fatty substances (mostly cholesterol) are deposited in the inner walls of the larger arteries. This is generally a slow, progressive disease, which may start in childhood. Typically, it shows *no symptoms* for 20-40 years or longer. The fatty deposits increase gradually, reducing the blood flow through the arteries, making them less elastic. When blockage becomes great enough, we "*suddenly*" get serious complications Ñ angina (severe chest pains when heart muscles are not getting enough oxygen), heart attack, stroke (blood blockage in the brain) or death.

This may lead you to think of cholesterol as a "*bad*" substance. However, cholesterol has many *positive* functions in your body. It is part of bile, which is necessary for digestion. It is a basic component of many body hormones, including sex hormones. With the aid of

sunlight, cholesterol in the skin forms a part of vitamin D. It is important in the structure of the brain and other nerve cells. In fact, cholesterol is a *necessary part of every body cell*.

Cholesterol is a fatty substance produced mainly by the **liver** from fats and carbohydrates in your diet. In fact, in a single day, the liver typically turns out 1,000 milligrams (mg) of cholesterol to meet your bodily needs. After six months of age, you don't need any cholesterol in your food. If your diet did not even contain 1 mg. of cholesterol, you body would make enough of it from the fats and carbohydrates you eat to satisfy all your needs. If animals have a diet that is high in cholesterol, their bodies tend to drop cholesterol production greatly. However, this is *not* true for humans. If people have diets that are high in cholesterol, body production of cholesterol drops only slightly. This is part of the problem.

An increase of cholesterol in the blood is a factor that leads to atherosclerosis and later to heart attacks. Since cholesterol is a fatty substance, it does not dissolve in water. Therefore, it cannot be carried by the blood plasma itself. Cholesterol is carried in the blood in little "*envelopes*" of a fatty protein called **lipoprotein**. There are several types of these lipoproteins. Of these, two are most important in transporting cholesterol.

The **high-density lipoproteins (HDLs)** are sometimes casually referred to as *the "good guys."* As a rule, HDL does not contribute to the hardening of the arteries. In fact, HDLs seem to *protect* against it. The main function of HDL in transporting cholesterol is to remove excess amounts from the artery walls and return them to the liver. There it helps the liver to secrete unneeded cholesterol as bile through the intestines.

In contrast, **low-density lipoproteins (LDLs)** are the major transporters of cholesterol to various cells in the body. Although LDLs may be labeled as the "*bad guys*," they perform a very necessary function. However, if body cells already have enough cholesterol, LDLS still keep transporting more — relying on scavenger cells to clear excess cholesterol from the blood. Some of these scavenger cells are in artery walls, and this is thought to be one of the factors that helps to clog arteries with cholesterol deposits.

Except for primates, humans and apes, most mammals are relatively immune to getting atherosclerosis. In human blood, about 70% of the cholesterol is carried by LDLs, the "*bad guys*." In contrast the majority of cholesterol in other mammals is carried by HDLs. This is why dogs and other meat-eaters can eat so much fat and cholesterol without keeling over from heart attacks. In fact, some heart specialists routinely toss these fatty "table scraps" to their dogs rather than eating these cholesterol-producing foods themselves.

* Adapted from information in *Jane Brody's Nutrition Book*, Bantam, 1982, pages 56-74; Hamilton, Whitney & Sizer's *Nutrition: Concepts and Controversies*, West, 1985, pages 101-105; and *The American Heart Association Cookbook*, McKay, 1979, Pages xvii-xxv.