

Digestion and Absorption of Food Fats

By Mary G. Enig, PhD

Maintenance of a healthy digestive system requires input from lipids, which include molecules such as cholesterol, appropriate saturated and polyunsaturated fatty acids, and other lesser known components such as glycosphingolipids.

Cholesterol is the precursor to bile acids, which are needed to digest and absorb long-chain fatty acids. Cholesterol is also recognized for its physiological importance in the skin and the intestine where it plays an important structural role as a component of the organ membranes. Cells lining the digestive tract are particularly rich in cholesterol.

Saturated fatty acids play their role in membrane integrity by providing appropriate fatty acids for certain parts of membrane structures. Among their various roles are the signaling activities that, for example, tell the gastrointestinal musculature when to contract. Polyunsaturated fatty acids also provide raw material for membranes, and work as precursors to the various prostaglandins, needed to maintain important functions of intestinal motility.

Glycosphingolipids are lipids with single sugar molecules attached found in cell membranes, especially in the brain. They also protect against gastrointestinal infections, especially in infants and children. Whole milk is an adequate source, especially human milk. Fat digestion of phospholipids and other lipids makes up very minor, but sometimes important, parts of the building blocks for tissues. These special lipids are usually made by the body and diet is not the major source.

Digestion of fatty acids from triglycerides is different for the regular long-chain fatty acids (14 carbons to 22 carbons) than it is for short- and medium-chain fatty acids (4 carbons to 12 carbons). Usually about

95 percent of the fat is available for digestion when the mixture of fatty acids is varied.

The digestion of regular fats and oils, which are usually long-chain triglycerides, requires bile acids as well as lipases. In adults this digestion usually starts in the small intestine and is done with the aid of lipases and bile acids. The bile acids allow the triglycerides to be properly emulsified and the lipases break the triglycerides into individual fatty acids and monoglycerides in the small intestine. When these parts are absorbed through the wall of the intestine, they are reassembled into triglycerides and carried into the body through the lymph system on chylomicrons.

Short- and medium-chain fatty acids from fats such as milk fat or coconut oil or palm kernel oil are broken off from the triglycerides without the need for bile acids. They are then shuttled directly to the liver through the portal artery without the use of chylomicrons. In the case of a meal with a large amount of lauric acid, some of this medium-chain fatty acid does travel via chylomicrons through the lymph system.

Fat digestion of cholesterol and other sterols is frequently not described accurately. Both cholesterol and other sterols do not provide any calories, and the amount that is absorbed is relatively small except in infants. Adults probably absorb only about 25 percent of the cholesterol they consume, and even less of the other sterols. Cholesterol plays a role in membrane structure as well as for production of bile acids and hormones. Other sterols are not usually part of the body's tissues unless they are consumed in large amounts.

People ask why fat is digested more slowly than either protein or carbohydrate, and sometimes think that this means that there is a problem with digestion of fat; however, the slow digestion is really only nature's way of maintaining an even amount of the energy distribution.

Fat digestion in infants is somewhat different from fat digestion in adults, especially if the infants are fed human milk. The digestion of fats in the infant begins in the mouth with the function of several digestive enzymes that are special to the infant. The fatty acids are broken down in order to be well digested. A special enzyme coming from the mammary gland enables most of the cholesterol from the human milk to be absorbed by the infant. Cholesterol is a very important nutrient for the infant, especially for its role in brain and

other central nervous system development. The typical infant formula is greatly lacking in cholesterol and also lacks the enzyme that aids in the absorption of cholesterol.

REFERENCES

1. MI Gurr & AT James. *Lipid Biochemistry: An Introduction*. Chapman and Hall, London, 1971.
2. Mary G. Enig, Ph.D. *Know Your Fats: The Complete Primer for Understanding the Nutrition of Fats, Oils, and Cholesterol*. Bethesda Press, Silver Spring, Maryland, 2000.

This article appeared in [Wise Traditions in Food, Farming and the Healing Arts](#), the quarterly magazine of the Weston A. Price Foundation, [Summer 2004](#).