Summary and Comments on Fats in Nutrition and Health

GRACE A. GOLDSMITH, Tulane University, New Orleans, Louisiana

CURRENT INTEREST in the role of fats in human nutrition is attested by the many symposia on this subject. Fats have long been recognized as important as a source of calories, a constituent of body cells, as carriers of fat-soluble vitamins, and as contributors to the palatability and satiety value of diets.

Grace A. Goldsmith

In animals a dietary need for certain polyunsaturated fatty acids has been demonstrated. Whether man requires these essential fatty acids is unknown, but evidence suggests that this will be found to be the case. Newer concepts of the role of essential fatty acids in animals have been discussed by Roslyn B. Alfin-Slater.

Recent interest in dietary fats has centered on their possible role in the development of atherosclerosis and its complication, coronary artery disease with heart damage, which is a major cause of death in this country. Implication of dietary fat in the genesis of atherosclerosis has arisen from several avenues of research.

a) Experimental atherosclerosis has been induced in animals by diets high in fat and/or cholesterol. It should be noted also that atherosclerosis has been produced by diets low in protein, by diets deficient in pyridoxine, and by other dietary and hormonal manipulations.

b) Clinical observations have indicated an increased incidence of atherosclerosis in human diseases associated with high levels of blood lipides.

c) Epidemiologic studies of population groups have shown a *correlation* between the intake of dietary fat and the incidence of coronary artery disease. Relative to these studies it should be emphasized that there are many differences between these population groups, in addition to fat intake, which could influence findings; *e.g.*, protein and vitamin intake, heredity, longevity, physical activity, and the accuracy of medical diagnosis and vital statistics.

d) Metabolic studies in man have shown that marked reduction of total dietary fat lowers serum lipide levels; cholesterol is the lipide most often measured.

e) Metabolic studies, such as those reported by E. H. Ahrens, have indicated that the substitution of unsaturated for saturated fats in the diet leads to reduced serum lipide levels. The mechanisms by which unsaturated fats lower serum lipides is not known. Is it by influencing absorption, excretion, transport, or utilization? It has not been demonstrated as yet whether unsaturation *per se*, the content of polyunsaturated fatty acids, or some other factor in fats, such as sitosterol, is responsible for the decrease in serum lipides which follows administration of unsaturated fat.

ALTHOUGH these metabolic studies show a relationship between dietary fat and serum lipides, it does not necessarily follow that there is a relationship between serum lipides and atherosclerosis. Even if such a relationship is demonstrated, it remains to be shown that coronary artery disease, with heart damage from vessel closure, is related to the intake of dietary fat. Only recently have investigators been able to produce occlusion of coronary arteries, with damage to heart muscle, in experimental animals. This has been accomplished by Hartroft and associates by a complicated dietary regimen. This experimental tool should prove most useful in further studies.

A few recent investigations have indicated a relationship between serum lipides and the coagulation of blood. Further studies in this area should prove fruitful. Studies of the mechanisms by which blood is "cleared" of fat—in particular, investigation of lipoprotein lipase—are adding to our basic knowledge of fat metabolism.

It is obvious that much has been learned about fat metabolism in recent years but that much remains unknown. A few unsolved problems, in addition to these already discussed, may be mentioned. Pathologists are not agreed as to the manner in which the lesions of atherosclerosis develop. R. T. Holman's studies of the development of arterial changes from infancy to old age are contributing important information in this area. The normal or desirable levels of cholesterol and other lipides in blood are unknown. Serum lipide levels may not reflect changes in the total fat pool. Lipides other than cholesterol may be important in the atherosclerosis problem. In man the effect of dietary factors other than fat on serum lipide levels remains largely unexplored. Interrelationships among nutrients should be given more consideration.

The association of elevated serum lipides with atherosclerosis may not be one of cause and effect but may rather be related to some other common cause. It should be emphasized that, in all likelihood, atherosclerosis is the resultant of a number of factors, some operating locally in the vessel, others systematically through the blood stream and nervous system. Heredity, mechanical factors such as blood pressure, anatomy of the arterial wall, hormones, serum lipides, and dietary factors, including substances other than fat, may all be involved. Unfortunately research is handicapped in that atherosclerosis in man cannot be diagonosed at an early stage. In most instances the diagnosis is made only when complications develop.

IN our present state of knowledge, with many hypotheses and few established facts, it is unfortunate that so much speculation and opinion has appeared in the lay press. It seems obvious that to date there is insufficient evidence to recommend any basic change in the diet of the average healthy American. We do not yet know either the kinds of fat or the amounts which are desirable for good nutrition. A diet containing adequate amounts of all of the known essential nutrients and furnishing only enough calories to maintain normal weight should be recommended now as formerly. For persons with coronary artery disease or with a strong familial tendency to this disease, or for persons with elevated serum lipide levels, the physician may wish to prescribe some change in dietary fat intake, as an experimental procedure, to be carefully followed and evaluated.

Finally, in spite of the paucity of current knowledge, there is sufficient evidence which suggests that dietary fat and serum lipide levels may be implicated in the development of atherosclerosis and coronary heart disease to justify intensive exploration of all facets of this and related fields. Information obtained from this research should prove valuable in understanding the role of fats in human nutrition irrespective of findings relative to the atherosclerosis problem.