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Dietary fat quality: a nutritional epidemiologist's view

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Introduction - Fat intake worldwide has increased substantially, with East and South-East Asia and China among the foremost, having doubled and tripled intake (g/capita/day) respectively in the past three decades. The major dietary source of energy in developing countries is vegetable oils, but their intake of animal fat is increasing, from 8% of total calories in the 1960s to 13% in the 1990s.

Dietary fat quality - The implications of dietary fat in the etiology of chronic diseases, including cardiovascular disease, some types of cancer, type II diabetes, obesity, osteoporosis, osteoarthritis and other inflammatory disorders, have been extensively studied. While debate ensues on whether dietary fat is the primary determinant of excess body fat, the evidence is compelling for the greater importance of types of fat, rather than total amount of fat, as risk of chronic disease.

Total fat, saturated fat - Between-population ecologic studies have demonstrated an association between intake of fat, specifically saturated fat and total cholesterol and coronary heart disease (CHD) mortality. However, results are inconsistent from within-population cohort studies. Likewise, the association between intake of total fat and saturated fat and with risk for stroke remains elusive. The paradox of high stroke risk with low CHD risk among East Asian countries is increasingly attenuated by lifestyle changes including higher intake of animal fat and protein. As for the hypothesis that dietary fat is a key cancer risk, particularly with cancers of the colon, breast and prostate in western countries, case-control and prospective cohort studies have produced mixed results. The pooled analysis of several large prospective studies reported weak or no associations between fat intake and cancer. Probably fat intake in combination with other concomitant dietary factors, as well as other confounding factors (e.g. insulin resistance, method of food preparation) may enhance carcinogenesis.

Saturated fatty acids (SFA) - In metabolic studies different classes of saturated fatty acids (SFA) have different effects on plasma lipid and lipoprotein levels. Specifically, SFA with 12-16 carbon atoms tend to increase plasma total and LDL-chol levels, whereas stearic acid does not have a cholesterol-raising effect, but may lower HDL-chol especially in women, and increase Lp(a) concentration. Among the cholesterol-raising SFA, myristic acid appears to be more potent than lauric acid or palmitic acid, but the data are not entirely consistent.

Monounsaturated fatty acids (MUFA) - Ecological studies indicate an inverse association between intake of MUFA and CHD mortality. Prospective cohort studies that adjusted for intake of saturated and trans fatty acids have found a similar finding. Oleic acid exerts significant beneficial effects on atherosclerosis and thrombosis. Relatively low CHD mortality rates in southern Europe is attributed to the traditional Mediterranean diet that is characterized by, inter alia, high dietary ratio of MUFA/saturated fat.

Polyunsaturated fatty acids (PUFA) - The North American diet is typically high in linoleic acid (n-6) (LA), which has been promoted for its cholesterol-lowering effect. It is now recognized however, that dietary LA favours oxidative modification of LDL chol, increases platelet response to aggregation, and suppresses the immune system. In contrast, alpha linolenic acid (n-3) (ALA) has been found in several studies to exert positive effects in reducing CHD mortality risk. The major effect of n-3 PUFA appears to be anti-arrhythmic rather than anti-atherothrombotic. The emphasis is on the dietary ratio of LA to ALA, rather than the absolute amounts of ALA, that is critical for disease prevention, due to the competition between these two essential PUFAs for their entry into the elongation and desaturation pathways leading to the synthesis of their respective eicosanoids. Increasingly, attention is focused on the long-chain n-3 PUFAs in nonhydrogenated fish oils, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Studies that have demonstrated the protective effects of fatty fish intake against myocardial infarction outnumbered those that did not. Evidence of an inversed association between fatty fish intake and cancer risk tend to be confined to countries with high fish intake.

Concluding remarks - The main focus of national recommendations on dietary fats is on reduced intake of saturated fat and *trans* fatty acids, and balanced intake of n-6/n-3 essential fatty acids. Importance should also be accorded to the consumption of fat from a variety of sources, both plant and animal. Just as the consumption of a variety of foods is more likely to provide essential nutrients and other biologically beneficial components, the consumption of fat from various foods including fish, nuts, seeds, plant oils and fruits should be encouraged. These and other dietary guidelines, combined with regular physical activity, moderate alcohol consumption and abstinence from smoking, remain the underpinnings of a healthy lifestyle.