Major types of dietary fat and risk of coronary heart disease: a pooled analysis of 11 cohort studies. Marianne U Jakobsen et al. Am J Clin Nutr 2009;89(5):1425-1432.

Background: Saturated fatty acid (SFA) intake increases plasma LDL-cholesterol concentrations; therefore, intake should be reduced to prevent coronary heart disease (CHD). Lower habitual intakes of SFAs, however, require substitution of other macronutrients to maintain energy balance. **Objective:** We investigated associations between energy intake from monounsaturated fatty acids (MUFAs), polyunsaturated fatty acids (PUFAs), and carbohydrates and risk of CHD while assessing the potential effect-modifying role of sex and age. Using substitution models, our aim was to clarify whether energy from unsaturated fatty acids or carbohydrates should replace energy from SFAs to prevent CHD. **Design:** This was a follow-up study in which data from 11 American and European cohort studies were pooled. The outcome measure was incident CHD. **Results:** During 4–10 y of follow-up, 5249 coronary events and 2155 coronary deaths occurred among 344,696 persons. For a 5% lower energy intake from SFAs and a concomitant higher energy intake from PUFAs, there was a significant inverse association between PUFAs and risk of coronary events (hazard ratio: 0.87; 95% CI: 0.77, 0.97); the hazard ratio for coronary deaths was 0.74 (95% CI: 0.61, 0.89). For a 5% lower energy intake from SFAs and a concomitant higher energy intake from carbohydrates, there was a modest significant direct association between carbohydrates and coronary events (hazard ratio: 1.07; 95% CI: 1.01, 1.14); the hazard ratio for coronary deaths was 0.96 (95% CI: 0.82, 1.13). MUFA intake was not associated with CHD. No effect modification by sex or age was found. **Conclusion:** The associations suggest that replacing SFAs with PUFAs rather than MUFAs or carbohydrates prevents CHD over a wide range of intakes.

Combined effects of saturated fat and cholesterol intakes on serum lipids: Tehran Lipid and Glucose Study. Parvin Mirmiran et al. Nutr 2009;25(5):526-531.

Objective: This study investigated the combined effect of saturated fat and cholesterol intake on serum lipids among Tehranian adults. **Methods:** In 443 subjects ≥18 y, dietary intake was assessed. Height and weight were measured and body mass index was calculated. Serum cholesterol, triacylglycerol, high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol levels were calculated. Cholesterol intakes ≥300 mg/d and saturated fat intakes ≥7% of total energy were defined as high intakes. Individuals were categorized into four groups based on cholesterol and saturated fat intakes. **Results:** Subjects' mean age was 40.1 ± 14.6 y; those in whom cholesterol and saturated fat intake was normal had significantly less energy and fat intake than those with high cholesterol and saturated fat intakes ($P < 0.01$). Saturated fat intake had a significant effect on serum total and HDL-C levels. Subjects with a normal saturated fat intake had significantly less serum total and HDL-C than those who had high saturated fat intake ($P < 0.01$ and $P < 0.05$, respectively). Adjusting for age, sex, and body mass index, the main effect of cholesterol intake on HDL-C was significant ($P = 0.05$). Mean serum HDL-C was lower in subjects who had normal cholesterol intake than in those with high cholesterol intake. **Conclusion:** These results show that cholesterol and saturated fat intakes have no combined effect on serum low-density lipoprotein cholesterol level, whereas cholesterol intake per se affects serum HDL-C level. **Keywords:** Saturated fat; Cholesterol; Combined effect; Serum lipids; Tehran.

Has the association between saturated fatty acids, serum cholesterol and coronary heart disease been over emphasized? Peter W. Parodi. Int Dairy J 2009;19(6-7):345-361.

Abstract: Despite 50 years of research and public health messages, coronary heart disease is still the major cause of death in developed countries. This review outlines the elaboration of risk factors for coronary heart disease with emphasis on total and LDL cholesterol levels and discusses the dynamic and heterogeneous nature of serum lipoproteins. The role of saturated fatty acids in hypercholesterolemia is examined and it is concluded that those acids that increase levels concomitantly increase antiatherogenic HDL cholesterol and decrease proatherogenic lipoprotein[a] and small dense LDL particles such that they could be atherogenically neutral. Evidence from epidemiological studies does not supply convincing evidence for an association between saturated fatty acids and coronary heart disease. The surprisingly few randomised controlled trials that examined isocaloric substitution of saturated fatty acids for vegetable-derived fats mostly fail to show a benefit for reduction in saturated fatty acid intake on coronary heart disease risk. The contention that

the benefits accruing from the potent hypocholesterolemic action of statin drugs ends the cholesterol controversy is disputed.

Metabolic fate of saturated and monounsaturated dietary fats: The Mediterranean diet revisited from epidemiological evidence to cellular mechanisms. Audrey Bergouignan et al. Progr Lipid Res 2009;48(3-4):128-147.

Abstract: Increasing evidence indicates favourable effects of the Mediterranean diet, partly associated to its monounsaturated fatty acids (MUFA) content on both obesity and diabetes. However, neither the underlying mechanisms by which the Mediterranean diet exerts its protective effect, nor the interplay with other environmental factors (i.e. physical activity), are fully characterised. In this review, we examined recent data on how the metabolic fate of MUFA and saturated fatty acids (SFA) differs. Because of differential packaging into lipoproteins, hydrolysis of triacylglycerol-rich lipoproteins by lipoprotein lipase and transport into oxidative tissues, MUFA are oxidised more than SFA. This high MUFA oxidation favour lipid oxidation and according to the oxidative balance concept reduces the risk of obesity. It also improves the intra-muscular triacylglycerol turnover, which mitigates the SFA-induced accumulation of diacylglycerol and ceramides, and thus protects the insulin sensitivity and cell viability. Finally, physical activity through its action on the energy turnover differentially regulates the metabolism of SFA and MUFA. The putative combined role of AMP-activated kinase and mitochondrial glycerol-3-phosphate transferase on the intra-muscular partitioning of MUFA and SFA provides new areas of research to better understand the beneficial effects of the Mediterranean diet and physical activity on obesity and diabetes. **Keywords:** Oleate; Palmitate; Fatty acid oxidation; AMPK; GPAT; Physical activity; Obesity; Diabetes.

Dietary saturated and unsaturated fats as determinants of blood pressure and vascular function. Wendy L. Hall. Nutr Res Rev 2009;22(1):18-38.

Abstract: The amount and type of dietary fat have long been associated with the risk of CVD. Arterial stiffness and endothelial dysfunction are important risk factors in the aetiology of CHD. A range of methods exists to assess vascular function that may be used in nutritional science, including clinic and ambulatory blood pressure monitoring, pulse wave analysis, pulse wave velocity, flow-mediated dilatation and venous occlusion plethysmography. The present review focuses on the quantity and type of dietary fat and effects on blood pressure, arterial compliance and endothelial function. Concerning fat quantity, the amount of dietary fat consumed habitually appears to have little influence on vascular function independent of fatty acid composition, although single high-fat meals postprandially impair endothelial function compared with low-fat meals. The mechanism is related to increased circulating lipoproteins and NEFA which may induce pro-inflammatory pathways and increase oxidative stress. Regarding the type of fat, cross-sectional data suggest that saturated fat adversely affects vascular function whereas polyunsaturated fat (mainly linoleic acid (18 : 2n-6) and n-3 PUFA) are beneficial. EPA (20 : 5n-3) and DHA (22 : 6n-3) can reduce blood pressure, improve arterial compliance in type 2 diabetics and dyslipidaemics, and augment endothelium-dependent vasodilation. The mechanisms for this vascular protection, and the nature of the separate physiological effects induced by EPA and DHA, are priorities for future research. Since good-quality observational or interventional data on dietary fatty acid composition and vascular function are scarce, no further recommendations can be suggested in addition to current guidelines at the present time. **Key Words**: Saturated fatty acids; Unsaturated fatty acids; Blood pressure; Vascular function.