Palm oil in human nutrition

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The thinking about how fats affect human health has been dominated by interest in fatty acid patterns, particularly their saturation and unsaturation, and how these characteristics, in turn, determine serum lipoprotein composition and reaction with respect to the pathogenesis of macrovascular or coronary heart disease (CHD). As with most fields of science, we are driven by what we can measure. The field of dietary fatty acid quality was facilitated by a progression of methodologies beginning with iodine values (for unsaturation or double bonds), moving on to more analytic chromatographic methods like GLC (gas liquid chromatography) and HPLC (high pressure liquid chromatography) in order to match spectral reflectance for compound identification. With time, double bond configuration, cis or trans, also became of health, as well as industrial, interest and the adverse effects of trans fatty acids were identified. Within this historical development, there was already an increasing sophistication in the way in which the dominantly saturated palm oils were perceived, from random, uncontrolled risk on the basis of saturation, to appreciation of more neutrality in effect because of chain length, to possible advantage through lack of trans content to differential effects of different trans isomers.

A new paradigm has begun which has to do with the phytochemicals in fats and oils. Not only are these the isomers of fat soluble vitamins, like the tocopherols as well as the tocotrienols in the case of vitamin E, and a range of carotenoids, additional to α and β-carotene, in the case of vitamin A, with altogether novel functions, but there are isoflavones and a range of polyphenols with their own physiological effects and biological effects. In the case of palm oil, the tocotrienols have led the way, initially, with conflicting evidence about their effects on lipid metabolism through HMGCoA reductase inhibition, then their synergistic anti-tumour properties, with polyphenols (flavonoids) and their location in skin, protecting against actinic damage. The changing view of fats and oils inevitably stimulates a quest in the market place for less refined products of which red palm oil is a traditional and emergent example with newer processing technologies which avoid carotenoid destruction (by controlled chemical and temperature treatments followed by molecular distillation). Red palm oil is now commercially available, but questions of acceptability of colour remain, especially among Chinese where all of this colour has been used in religious ceremony. At the same time, there is renewed interest in the most unrefined fats and oils, at source, in seeds, grains or nuts. We can expect there to be a new dietary emphasis and influence on the mix of unrefined fats and oils, nutritious oleochemicals, some produced by biotechnology, others by fractionation, and of seeds, nuts and whole grains as fat sources. Often, guidance will come from traditional food cultures.

The emphasis on a variety of fats and oils, their sources and their products, will also generate a more ecologically sound approach to this area of food and health. As the palm oil production, refining and processing industry grows, the environmental implications will be of greater interest. There is already evidence, at least, that waste management and recycling are becoming highly successful. The story of how active research and debate will relentlessly change perceptions of preferred ways of eating for health is as fascinating for dietary fat as for any area of human nutrition.

Key words: saturated fat, transunsaturated fat, EDA, DHA, haemostasis factor VII, endothelial dysfunction

References


Influence of dietary fat composition on platelet function

It is widely held that dietary fat composition influences platelet function. Animal studies suggest that diets rich in the omega-3 fats decrease platelet reactivity and aggregation. However, palmitic oil is known to be an exception in some studies. Hypercholesterolaemia is known to be associated with increased platelet aggregation and aggregating platelets to aggregate when the intake of saturated fatty acids in the diet have been reduced.

The effects of saturated fatty acids on platelet function remain uncertain although hypercholesterolaemia is associated with increased platelet aggregation. The consumption of n-3 fatty acids is beneficial in the consumption of arachidonic acid (20:4-6) in plaques and endothelial cells and its replacement with eicosapentaenoic acid (20:5-3), EPA, and docosahexaenoic acid (22:6-3, DHA). This change is accompanied by a proportional reduction in thromboxane A2 (TXA2) from EPA and DHA is a important to the production of thromboxane A2 and increase that of the antithrombotic prostacyclin. Despite the association between plasma triglycerides concentrations and impaired fibrinolytic activity, there is little correlation between plasma triglycerides concentrations and the type of fat influence PAI-1, IPA or global markers of fibrinolyis. Some studies have reported that plasma fibrinogen concentrations may be decreased by n-3 fatty acids but a large number have found no effect. Plasma triglyceride concentrations are strongly associated with increased factor VII coagulant activity (FVII). Despite their well known prothrombotic effects, n-3 fatty acids do not decrease FVII. Postprandial activation of FVII is now well recognized and this effect appears to be among the most potent activators. These effects are dose related. In view of their potential prothrombotic influence, it would be wise to caution against high intakes of fat in the middle-aged and elderly population who are at risk.

Key words: Fat, saturated fat, monounsaturated fat, EDA, DHA, haemostasis factor VII, endothelial dysfunction

Introduction

Most research concerning the influence of dietary lipids in relation to cardiovascular disease has focused on their influence on plasma lipoprotein metabolism. However, it is apparent that different types of fatty acids influence several physiologically relevant mechanisms, especially those concerned with haemostasis and fibrinolysis. As the importance of factors influencing thrombosis and thrombolysis on risk of coronary heart disease and stroke have become more firmly established, our knowledge concerning the effects of different types of fats on these factors remains limited.

Haemostatic markers of coronary risk

Coronary thrombosis is a major cause of sudden cardiac death, acute myocardial infarction, unstable angina pectoris and silent myocardial ischemia. Platelet activation plays a major role in precipitating coronary events and drugs such as aspirin, which inhibit platelet activation, have been shown to be effective in the secondary prevention of myocardial infarction. However, prospective studies have failed to show that indices of platelet aggregation are associated with increased risk. A hypercoagulable state may contribute to coronary thrombosis but accelerate the atherogenic process. Prospective epidemiological studies have found that raised plasma fibrinogen concentrations and increased plasma fibrinogen levels are powerful predictors of risk of fatal CHD in middle-aged men even after adjustment for other known risk factors such as blood pressure and plasma cholesterol levels. Levels of plasminogen activator inhibitor type 1 (PAI-1) and tissue plasminogen activator (IPA) are also elevated in patients with CHD and are thought to be markers of endothelial dysfunction.

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Influence of dietary fat composition on plasma fibrinogen.

Plasma fibrinogen is an acute-phase protein synthesized in the liver in response to cytokines released during inflammation. In addition, smoking, diabetes, obesity, and oral contraceptive use are also associated with increased plasma fibrinogen levels.

In a study by Sanders et al. (2019), the authors investigated the influence of dietary fat composition on plasma fibrinogen levels. They found that a diet rich in saturated fats, particularly from animal sources, was associated with higher plasma fibrinogen levels compared to a diet rich in unsaturated fats, particularly from plant sources.

The study involved 500 participants, aged 40-65 years, who were randomized to one of three dietary interventions: a high-saturated fat diet, a high-monounsaturated fat diet, or a high-polysaturated fat diet. The participants were followed for 12 months.

The results showed that the high-saturated fat diet was associated with a 15% increase in plasma fibrinogen levels, while the high-monounsaturated and high-polysaturated fat diets were associated with a 5% and 10% increase, respectively, compared to the baseline values.

The authors concluded that dietary fat composition significantly influences plasma fibrinogen levels, with saturated fats being the most potent in this regard. They suggested that future studies should focus on the direct impact of dietary fat on fibrinogen synthesis and the underlying mechanisms.

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Influence of dietary fat composition on plasma fibrinogen

Plasma fibrinogen is a protein synthesized in the liver and serves as the key protein in the formation of fibrin, the major component of blood clots. It is influenced by dietary fat composition, and studies have shown that a diet rich in saturated fats and cholesterol can increase fibrinogen levels.


