

## Issue 107 In a nutshell

## Fat and endothelial function

Arbor Clinical Nutrition Updates 2001 (November);107:1-2  
ISSN 1446-5450

The arterial endothelium is involved in many functions that are thought to be part of the process of atherosclerosis.

The type of dietary fat intake is one influence (along with such things as some of the statin drugs) on endothelial function. If further trials confirm current early trends, it may add a new dimension to our approach to heart disease.

### ARCHIVES

The full list of archived issues can be found at [www.arborcom.com/archives/](http://www.arborcom.com/archives/). Some issues of our translated language editions are also available in archive, for Spanish, Portuguese and French.

### COPYRIGHT, disclaimer and terms of use

This copy from our archives is for your private use only, and is NOT to be forwarded to any other party. Your use of these Updates constitutes your agreement to our disclaimer and terms of use: see section at the end of this publication.

## NUTRITION RESEARCH REVIEW

### Study one: Trans fatty acids impair endothelial function

Replacing saturated fatty acids with trans fatty acids (TFA) worsens endothelial function, according to recent Dutch research.

**Subjects:** 29 healthy volunteers.

**Method:** Randomised, cross-over study in which subjects were fed two controlled diets over 4 weeks each. In one diet 9.2% of the energy was made up of TFA. In the other diet the same proportion of energy was made up of saturated fatty acids.

**Results:** Substitution of TFA for saturated fatty acids produced a 21% fall in HDL cholesterol, associated with a decrease in endothelial function (brachial artery flow mediated dilation = 6.2% on saturated fat and 4.4% on TFA diet,  $p < 0.05$ ).

Reference: de Roos NM et al. Replacement of dietary saturated fatty acids by trans fatty acids lowers serum HDL cholesterol and impairs endothelial function in healthy men and women. *Arterioscler Thromb Vasc Biol* 2001;21:1233-7

### Study two: Mediterranean diet improves function more than low fat

A Mediterranean diet (one rich in monounsaturated fat) produces a greater improvement in endothelial function in hypercholesterolaemic men than does a diet low in total and saturated fat. This is the conclusion of a recent Spanish study.

**Subjects:** 22 hypercholesterolaemic men.

**Method:** After a period on a high saturated fat diet, subjects were assigned in a crossover design to a low total and saturated fat diet, or a high monounsaturated, Mediterranean type diet. Each diet was given for 28 days.

**Results:** Both the low saturated fat and Mediterranean diets produced falls in total and LDL cholesterol and apolipoprotein B. However, only the Mediterranean diet produced an improvement in endothelial function, as measured by flow mediated dilation.

Reference: Fuentes F et al. Mediterranean and low-fat diets improve endothelial function in hypercholesterolemic men. *Ann Intern Med* 2001;134:1115-9

### Study three: Oats and wheat cereal counter the effect of fat

Eating oats or wheat cereal can prevent the negative effect of a high fat meal on endothelial function, according to American research published this month.

**Subjects:** 50 healthy adult subjects

**Method:** Randomised cross-over trial with washout. Endothelial function was measured through brachial artery reactivity, before and after a high fat meal. These meals were eaten with either a bowl of oats, wheat cereal or supplementary vitamin E. The supplementation of oats and wheat cereal was then continued for one month.

**Results:** In the initial part of the study, the high fat meal produced a 14% worsening of endothelial function ( $p=0.02$ ). However, this worsening was not seen in patients given wheat or vitamin E at the same time. After one month of supplementation with oats or wheat cereal, there was no significant impairment of endothelial function after the high fat meal.

Reference: Katz DL et al. Effects of Oat and Wheat Cereals on Endothelial Responses. *Prev Med* 2001;33:476-484

## Comments

The arterial endothelium is involved in many functions that are thought to be part of the process of atherosclerosis. These endothelial functions include: the control of vasomotor tone (arterial constriction and dilation), platelet function and the balance between fibrinolysis and thrombosis, the inflammatory response, and the growth of vascular smooth muscle.

The relationship between these different functions of the endothelium is only slowly being unravelled. But it may turn out to be a common pathway between many known risk and prevention factors for cardiovascular disease. These factors include: hypertension, diabetes, genetic predisposition, homocysteine, and the dietary intake of various types of fat (e.g. trans, saturated, monounsaturated and omega-3 fatty acids).

We are still at an early stage of understanding all the elements of endothelial function. For the time being, researchers are tending to rely on just one of these functions - vasomotor tone - as a simple measure for the other functions. This is assessed as flow-mediated dilation (or reactivity) of the brachial artery, and this is the measurement which is used in the three studies we have summarised.

It is already known that a high fat meal decreases flow mediated dilation. This is of great interest, because it is an immediate effect. It therefore provides a crucial link in our understanding of the relationship between fat and heart disease at the very short term level.

There is also good evidence that the cardiovascular benefits of some lipid lowering drugs (e.g. the statins) may be mediated through effects on endothelial function, in addition to their direct effect on lipid levels.

The three studies summarised above offer insight as to how known epidemiological associations between diet and heart disease operate at the endothelial level. They are particularly interesting because they extend the time period from single meals to one month. They confirm that dietary advice needs to be more sophisticated than simply telling our patients to: "reduce saturated fat". They show just how important it is to advise patients on the balance of fatty acids in the diet, and emphasise the important role that dietary cereals can play.

It has been more than 50 years that the relationship fat and heart disease has been studied. In this time, the progress from strong epidemiological and laboratory evidence to large scale dietary intervention trials which show convincing, consistent benefit to patients with atherosclerosis has been slow. But it does now appear that the atherosclerotic process is significantly reversible. Studies on endothelial function may well provide us with crucial help in understanding how to best reverse the damage.

## Disclaimer, copyright and terms of use

Your use of these Updates constitutes your agreement to our disclaimer and terms of use which can be found on our web site at: <http://arborcom.com/disclaim3.htm>. You can also obtain the disclaimer and terms of use by emailing us at: [upD@arborcom.com](mailto:upD@arborcom.com).

© Copyright Arbor Communications PTL 2001. All rights reserved. This publication may NOT be forwarded onto others without our written permission.

If you want to receive the Clinical Nutrition Updates on an ongoing basis, please send us a request email to [upD@arborcom.com](mailto:upD@arborcom.com). This is a FREE service to health professionals and students. Include details of your name, email address, which country you live in, institution you are associated with (if relevant) and professional background. The Updates are available in English, Spanish, Portuguese, Italian, French, Korean and Russian