The effects of poor eating habits persist even after diet is improved

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Almost everyone knows that improving your eating habits will most likely improve your health. What most people may not know, however, is that the effects of poor eating habits persist long after dietary habits are improved. In a new report appearing in the November 2014 issue of the *Journal of Leukocyte Biology*, scientists use mice to show that even after successful treatment of atherosclerosis (including lowering of blood cholesterol and a change in dietary habits) the effects of an unhealthy lifestyle still affect the way the immune system functions. This change in function occurs largely because poor eating habits alter the way genes express themselves, including genes related to immunity. This change in gene expression (epigenetics) ultimately keeps the risk of cardiovascular disorders higher than it would be had there been no exposure to unhealthy foods in the first place.

"I hope that this study demonstrates the importance of diet-induced changes in the epigenome and encourages further research into the interaction between dietary patterns, DNA methylation and disease," said Erik van Kampen, a researcher involved in the work from the Division of Biopharmaceutics at the Leiden Academic Centre for Drug Research at Leiden University in Leiden, The Netherlands.

To make their discovery, scientists used two groups of mice that had an altered gene making them more susceptible to developing high blood cholesterol and atherosclerosis. These mice were either fed a high-fat, high-cholesterol diet (Western-type diet, WTD) or a normal diet (chow). After a long period of feeding, bone marrow was isolated from the mice

and transplanted into mice with a similar genetic background that had their own bone marrow destroyed. The recipient mice were left on chow diet for several months, after which the development of atherosclerosis in the heart was measured. The number and status of immune cells throughout the body and epigenetic markings on the DNA in the bone marrow also were examined. They found that DNA methylation, an epigenetic signature, in the bone marrow was different in mice that received bone marrow from the WTD-fed donors compared to the mice receiving bone marrow from chow-fed donors. Furthermore, these mice had large differences in their immune system and increased atherosclerosis.

"We've long known that lifestyle and nutrition could affect immune system function," said John Wherry, Ph.D., Deputy Editor of the *Journal of Leukocyte Biology*. "The ability of nutritional history to have durable affects on immune cells demonstrated in this new report could have profound implications for treatment of diseases with immune underpinnings. The length of such effects will be critical to determine and it will be interesting to examine the effects of drugs that can modify epigenetics."

More information: Erik van Kampen, Armand Jaminon, Theo J. C. van Berkel, and Miranda Van Eck. Diet-induced (epigenetic) changes in bone marrow augment atherosclerosis. *J. Leukoc. Biol.* November 2014 96:833-841; DOI: 10.1189/jlb.1A0114-017R.
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