'Cleaner' protein protects against atherosclerosis

February 3 2015

We have an innate mechanism that ensures that our blood vessels do not become blocked. The protein A1M, alpha-1-microglobulin, is naturally present in the body and prevents oxidation of blood fats—a major cause of atherosclerosis. The discovery, published today in the open-access journal *Frontiers in Physiology*, is the work of a research group led by Professor Bo Åkerström from Lund University.

"Atherosclerosis is largely caused by oxidised blood fats. The research findings that we have presented in this paper show that A1M stops the oxidation of blood fats and keeps them in good condition. Not only that, A1M can also repair oxidised blood fats", said Professor Åkerström from the Faculty of Medicine at Lund University.

The protein A1M, alpha-1-microglobulin, exists in the body to clear out oxidised heme and other harmful molecules. Heme contains iron and is found in haemoglobin, which has the job of transporting oxygen around the body. When the oxygen is metabolised, harmful molecules known as free radicals are formed. The heme-molecule can also generate free radicals and release the toxic iron into our tissue, cells and DNA. The body has many methods of keeping both heme and free radicals in check.

Ten years ago Bo Åkerström and his research group demonstrated that A1M has the ability to bind the free radicals and the toxic heme molecules and convert them into harmless substances.

"You could say that the tissue is rinsed by A1M in a 5-10 minute cycle, with the protein absorbing the free radicals and heme-groups. A1M acts like a bin that captures and neutralises toxic substances throughout the body - in and around all cells - that would otherwise cause inflammation and damage to surrounding tissue", said Professor Åkerström.

In the present study, Bo Åkerström and his colleagues focused on two of the main causes of atherosclerosis: oxidation of LDL (commonly called 'bad cholesterol') and myeloperoxidase (MPO). MPO is a molecule in the white blood cells that is activated in inflammation and infection and, like haemoglobin, contains toxic heme substances.

"By studying and testing A1M's properties in relation to LDL and MPO, we discovered that A1M can clean and reduce oxidised blood fats from LDL, as well as taking care of the dangerous substances from MPO and breaking them down.

"This means that A1M protects against damage to the molecules that we know is a cause of atherosclerosis", said Bo Åkerström.

The findings were obtained through lab research carried out in test tubes, but Bo Åkerström is hopeful:

"The next step is animal experiments, as well as analysis of human tissues. We want to study the blood to see if there is a link between the level of A1M, the concentration of oxidised blood fats and the development of atherosclerosis.

"If this correlation exists, which I believe it does, I can imagine that it will be possible in the future to develop a preventive drug that reduces the risk of atherosclerosis. It's not impossible that future patients could receive one dose of A1M per month to clean the blood vessels."

More information: A1M/α1-microglobulin is proteolytically activated by myeloperoxidase, binds its heme group and inhibits low density lipoprotein oxidation, *Frontiers in Physiology* , DOI: 10.3389/fphys.2015.00011 . journal.frontiersin.org/Journa … phys.2015.00011/full

Provided by Frontiers