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PRESS RELEASE

Geneva | December 21st, 2015

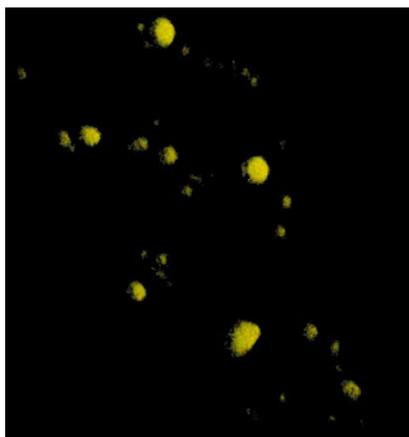
A new method to detect cholesterol

Cholesterol is essential for life and plays an important role in our membranes. It is taken up from our diet from animal products, but it is also made by our bodies. Due to its low solubility, when too much cholesterol is taken up or produced, it can provoke deposits inside our arteries, leading to cardiovascular disease. Observing where and how the cholesterol is deposited in arteries should permit a better understanding of the evolution of certain cardiovascular diseases. This is now possible. A research team from the University of Geneva (UNIGE), Switzerland, in collaboration with the Universities of California and Helsinki, has created a natural cholesterol that can be detected in the body. This discovery opens the door to a more precise diagnosis in the fight against cholesterol-related disorders. A publication to be discovered in the journal of *Biomedical Optics*.

When the body accumulates too much cholesterol, it can stimulate the formation of plaques and block arteries, provoking vascular injuries. Until today, these accumulations could be detected, but cholesterol could not be distinguished from other components in the plaques. It was thus necessary to find a method to be able to observe cholesterol specifically. To do this, the team of Professor Howard Riezman, Director of the Swiss National Research Pole (NCCR) in Chemical Biology at UNIGE, created a novel cholesterol that can be visualized using an instrument conceived by the scientists at the University of California: stimulated Raman scattering (SRS). This innovative and non-invasive technique images molecular resonances, as does NMR.

The scientists developed a modified yeast that produces cholesterol and instead of growing it in normal water (H₂O), composed of hydrogen and oxygen, they used “heavy” water, called deuterium oxide (D₂O). This change allowed to naturally label the cholesterol and render it detectable inside cells. “Hydrogen is the most abundant atom in our bodies, in contrast to deuterium. Consequently, once modified, the deuterated cholesterol can be differentiated from all other substances in cells. It is now possible to see it, because deuterium is twice as heavy as hydrogen. This means that it changes the resonance of the molecule and this is detectable by the imaging technique called SRS”, explained Howard Riezman.

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CHEMICAL BIOLOGY
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Visualization of D-cholesterol in animal cells by Stimulated Raman Spectroscopy (SRS).

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A natural method to improve medical diagnostics

In contrast to previous methods which used cholesterol modified with fluorescent markers or other labels, this cholesterol is totally natural and non-toxic. In fact, the yeast that produces the modified cholesterol is living and makes cholesterol in exactly the same manner as animals do. The deuterated cholesterol behaves identically to our cholesterol and should permit scientists to increase our understanding of how our bodies take up and stock this substance.

The next step is to begin observation on animals, then humans, not only on cells. Being able to detect cholesterol in humans should allow the diagnosis of defects in cholesterol absorption. Once it is known where and how much cholesterol is deposited, doctors will have more information available to decide on proper treatment. In addition, the discovery by the scientists at UNIGE should allow to test whether drugs affecting cholesterol uptake are efficacious and whether they lead to a decrease in cholesterol stored from the diet.

contact

Howard Riezman

+41 22 379 64 69

Howard.Reizman@unige.ch

UNIVERSITÉ DE GENÈVE

Service de communication

24 rue du Général-Dufour
CH-1211 Genève 4

Tél. 022 379 77 17

media@unige.ch

www.unige.ch