Cholesterol a key player at the lung surface

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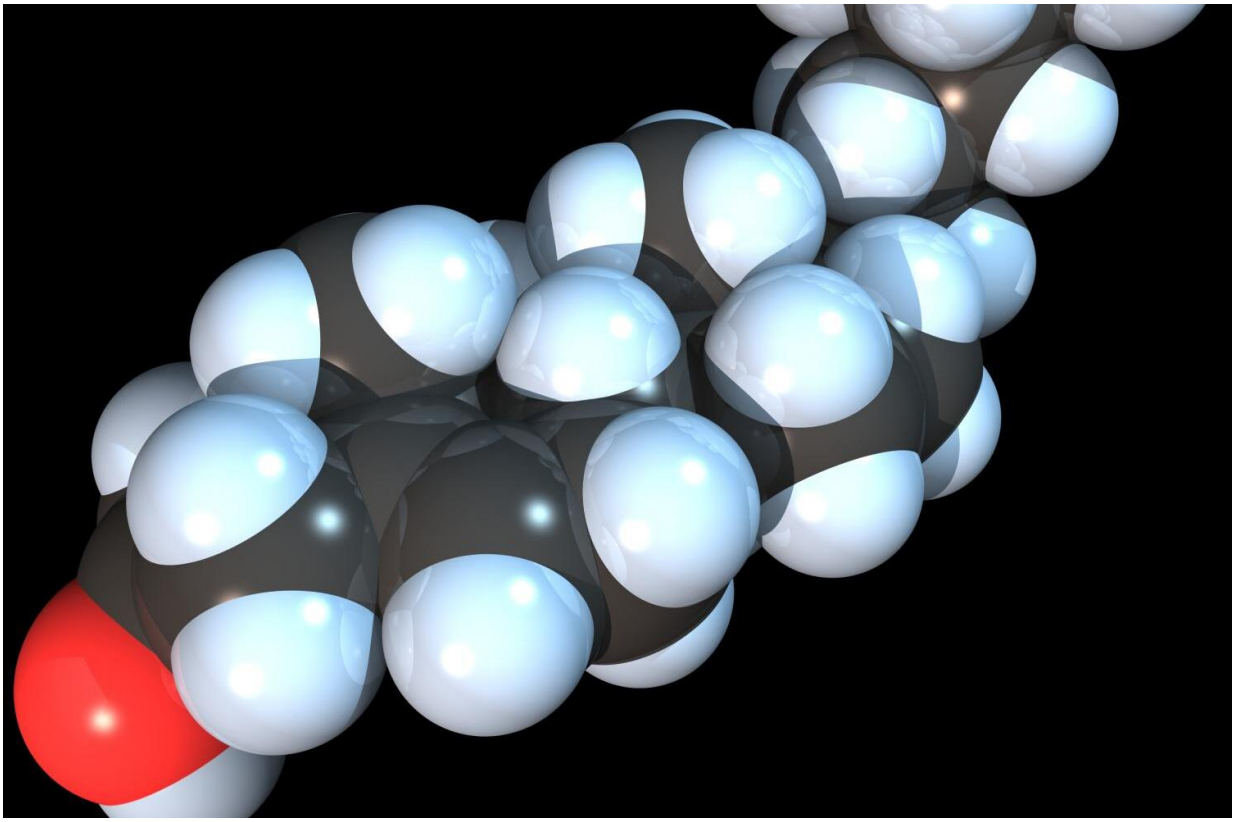

Space-filling model of the Cholesterol molecule. Credit: RedAndr/Wikipedia

Cholesterol, a naturally occurring compound at the lung surface, has been shown to have a clear effect on the properties of this nanoscale film that covers the inside of our lungs. Cholesterol levels in this system may affect the lung's function, according to researchers at Lund University in Sweden who have published a new study on the significance of

cholesterol for lung surface properties. The new findings provide new insights into this vital physiological system.

The zone in the lung where the exchange of oxygen and carbon dioxide takes place between the body and the air we inhale are called the alveoli. Now, in a joint study, researchers in chemistry and medicine at Lund University have more closely examined the thin film of proteins and fats that stabilises and protects the alveoli.

This film, known as surfactant, also affects the transport of various molecules between the air and the body's blood vessels.

"Our study addresses the effect of cholesterol on the surface of the alveoli. We have obtained astonishingly clear results," says Emma Sparr, professor of chemistry at Lund University.

Cholesterol constitutes a natural ingredient in the thin surfactant that covers the inside of our lungs, but it is almost completely absent from the clinical preparations used in healthcare to treat premature babies.

"In very premature babies, the film on the surface of the alveoli has not had time to develop completely. Although we administer surfactant drugs, usually extracted from pig's lungs, to good effect in the acute phase, we still see pronounced long-term damage to the lungs of these extreme premature babies," says Marcus Larsson, a physician and researcher at Lund University's Faculty of Medicine.

In the current study, the researchers used advanced NMR technology, or nuclear magnetic resonance, to map how cholesterol affects the molecular structure of the thin film in the alveoli. The method enabled the researchers to extract completely new molecular information and to compare the appearance of the structure with and without cholesterol.

"This difference in the molecular structure of the film could be very significant to its function; both the transport of substances and the mechanical properties could be influenced by this," says Emma Sparr.

She now hopes that the research study will contribute to elucidating the significance of cholesterol for the surface of the alveoli and that resulting knowledge about this bodily surface layer can support the development of new clinical methods.

"The effect of cholesterol on the surface of the alveoli is very clear and could eventually be included in the clinical preparations, which makes good sense as our own bodily surfactant contains this substance in quite significant levels," says Marcus Larsson.

More information: Jenny Marie Andersson et al. Effect of cholesterol on the molecular structure and transitions in a clinical-grade lung surfactant extract, *Proceedings of the National Academy of Sciences* (2017). DOI: 10.1073/pnas.1701239114

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