

## **Researchers discover mechanism for fixing defective mucins**

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Some pathogens target the mucin sugar to destabilize the mucin layer. (Photo: Alexander Trinitatov / fotolia)



Proper lubrication is crucial to keep not only machines but also humans functioning smoothly. The mucus membranes in our mouths, eyes, stomachs and genital area help keep friction to a minimum and also protect us against environmental hazards such as chemicals and pathogens. Professor Oliver Lieleg and his working group at the Institute of Medical Technology at TUM are investigating exactly how these mechanisms work.

In our mouths, stomachs and eyes, mucus forms a <u>protective layer</u> that prevents friction and keeps foreign bodies out. The main components of mucus are mucins, which bind <u>water molecules</u>. However, if these mucins are damaged, they can lose this ability. A team of researchers, headed by Professor Oliver Lieleg at the Technical University of Munich (TUM), has now found a way to <u>repair</u> defective mucins.

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In a recent study published in the journal *Advanced Materials Interfaces*, the researchers show how mucins - the components that give mucus its structure - can lose their lubricative ability. In the same article, they also describe how they were able to develop a repair mechanism for impaired mucins.

## **Researchers can now repair mucins**

Mucins comprise a protein backbone onto which sugar <u>molecules</u> are attached. These sugars have the ability to bind water molecules, thus



giving mucins their lubricative potential. In collaboration with researchers at the Massachusetts Institute of Technology and Johnson&Johnson, the TUM team showed that if mucins lose these sugar molecules, they can no longer bind a sufficient amount of water, which causes them to lose their lubricative potential.

However, the researchers were able to successfully repair damaged mucins in the lab by replacing the lost sugars with synthetic molecules. This procedure restored the mucins' ability to hydrate, thus reestablishing their lubricative ability.

## Synthetic molecule with an anchor

The scientists used polyethylene glycol as the synthetic molecule, adding a lectin group as an "anchor." This anchor ensures that the molecule attaches to the defective mucin. When these repair molecules are added to a solution containing defective mucins, the mucins regain their lubricative properties.

The findings could pave the way for new treatment strategies for patients with impaired mucus production. For example, some pathogens target the mucin sugar to destabilize the mucin layer. "In the future, the repair molecules could be applied through a spray or eye drops to regenerate the mucins directly on the <u>mucus membranes</u>."

**More information:** T. Crouzier, K. Boettcher, A.R. Geonnotti, N.L. Kavanaugh, J.B. Hirsch, K. Ribbeck, and O. Lieleg, "Modulating mucin hydration and lubrication by deglycosylation and polyethylene glycol binding"; *Advanced Materials* Interfaces; DOI: 10.1002/admi.201500308

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