Scientists discover what makes cholesterol-containing surfaces so repulsive

June 22 2023

The Collembola Tetrodontophora bielanensis in its natural habitat. Credit: Stephan Floss, Leibniz-Institut für Polymerforschung Dresden/NATURE

Living organisms use powerful physical principles to control interactions at their surfaces. Researchers at the Leibniz Institute of Polymer

Research Dresden, Leipzig University and TU Dresden have now discovered why cholesterol-containing surfaces can exhibit greatly reduced attachment of proteins and bacteria.

The interdisciplinary team led by Carsten Werner had previously identified cholesterol as a component of the skin of widespread invertebrates (collembolae), which breathe through their skin and therefore need to protect it from contamination. In their paper published in *Nature* on June 22, 2023, the scientists have now elucidated a repulsive mechanism of cholesterol-containing surfaces.

Using experiments, simulations and thermodynamic analyses, they were able to show how the spontaneous change in the orientation of interfacial cholesterol molecules creates an "entropic barrier" that makes cholesterol-containing surfaces repellent.

The development of synthetic materials using the discovered principle is promising, as it is important for many products and technologies to effectively minimize the attachment of biomolecules and bacteria. However, such "translation" of the effect to scalable, robust surface functionalization requires further research.

More information: Jens Friedrichs et al, Entropic repulsion of cholesterol-containing layers counteracts bioadhesion, *Nature* (2023). DOI: 10.1038/s41586-023-06033-4

Provided by Leibniz-Institut für Polymerforschung Dresden e. V.