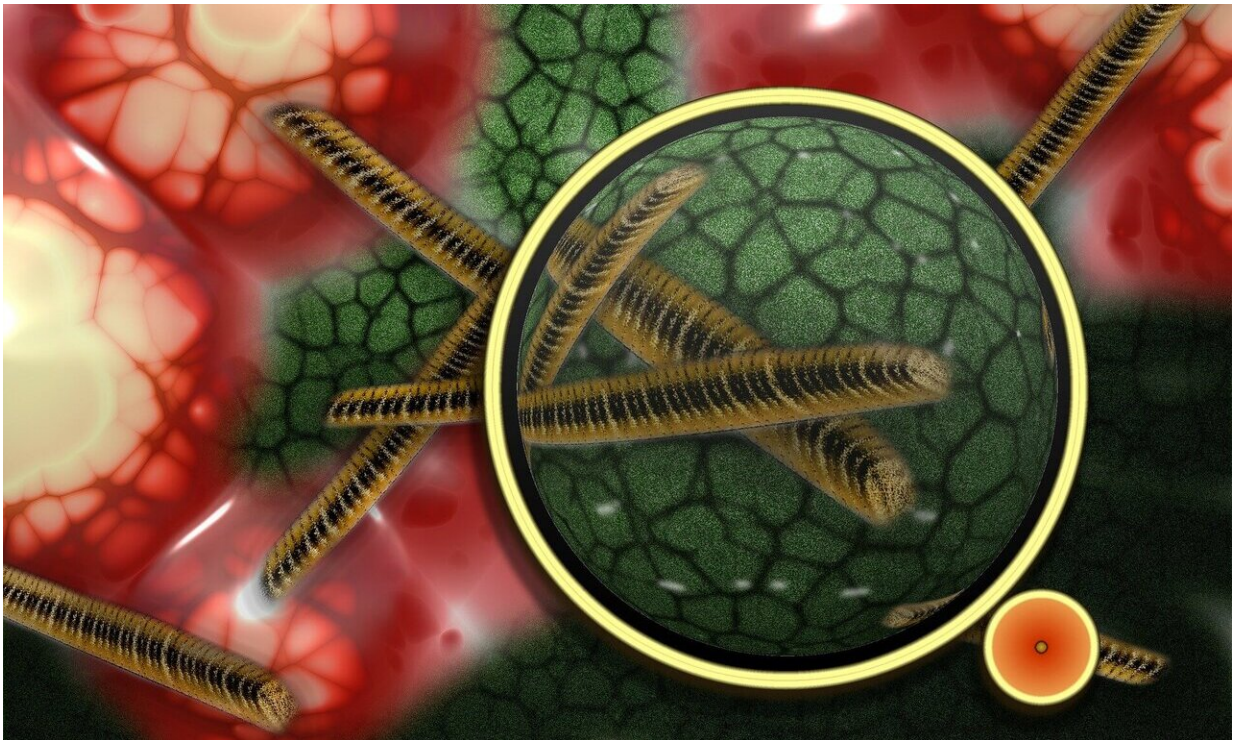


Mechanical forces of biofilms could play role in infections

October 8 2020



Credit: CC0 Public Domain

The vast majority of bacteria in the world live on surfaces by forming structures called biofilms. These communities host thousands to millions of bacteria of different types, and are so biologically complex and active that scientists describe them as 'cities.'

Biofilms are in fact the preferred lifestyle of bacteria. They form them by attaching to each other on surfaces as diverse as the [ocean floor](#), [internal organs](#) and teeth: dental plaque is a common example of a [biofilm](#). But biofilms also cause [chronic infections](#), e.g. the opportunistic pathogen *Pseudomonas aeruginosa* that forms biofilms in the lungs of cystic fibrosis patients.

Generally speaking, the interaction between biofilm and host is thought to be biochemical. But there is some evidence to suggest that the physical, mechanical interplay between them might be just as important—and overlooked as an influence on the host's physiology. For example, how do biofilms form on soft, tissue-like materials?

This is the question that a team of scientists led by Alex Persat at EPFL have ventured to answer. Publishing in the journal *eLife*, they show that biofilms of two major pathogenic bacteria, *Vibrio cholerae* and *Pseudomonas aeruginosa*, can cause large structural deformations on soft materials like hydrogels.

When bacteria form biofilms, they attach onto a surface and begin to divide. At the same time, they bury themselves inside a mix of polysaccharides, proteins, nucleic acids, and debris from dead cells. This mix forms a sticky substance that is called the EPS matrix (EPS stands for extracellular polymeric substances).

As single bacteria grow inside the EPS they stretch or compress it, exerting [mechanical stress](#). The growth of the biofilm and the EPS matrix's elastic properties generate internal mechanical stress.

The scientists grew biofilms on soft hydrogel surfaces and measured how they exerted forces upon variations of EPS components. This revealed that biofilms induce deformations by buckling like a carpet or a ruler. How big the deformations are depends on how stiff the "host"

material is and on the composition of the EPS.

The researchers also found that *V. cholerae* biofilms can generate enough mechanical stress to deform and damage soft epithelial cell monolayers, like those that line the surface of our lungs and intestines. What this means is that the forces generated by growing biofilms might mechanically compromise the physiology of their host. In short, biofilms could promote a "mechanical" mode of infection, which might warrant a whole new approach to treatments.

More information: Alice Cont et al. Biofilms deform soft surfaces and disrupt epithelia, *eLife* (2020). [DOI: 10.1101/2020.01.29.923060](https://doi.org/10.1101/2020.01.29.923060)

Provided by Ecole Polytechnique Federale de Lausanne

Citation: Mechanical forces of biofilms could play role in infections (2020, October 8) retrieved 18 April 2024 from <https://phys.org/news/2020-10-mechanical-biofilms-role-infections.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.