

Can Controlling Complex Fluids In Your Body Improve Your Health?



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CURRENT RESEARCH

Complex Fluids Ooze into Engineering Applications

The Datta Lab, led by Dr. Sujit Datta, Assistant Professor in Chemical and Biological Engineering at Princeton, studies the properties of complex fluids (ie: anything squishy). Some of these fluids are created, like shower gel and hand sanitizer. Others occur in nature, like mucus that lines the airways and gut in the human body. The lab studies how gooey and thick these fluids are, how they change their microscopic structure, and how quickly they move under pressure. The information gathered is used to design better complex fluids for health applications, from purifying contaminated water to delivering pharmaceuticals to target specific parts of the human body.

Complex Fluids In The Gut

The gut houses over 1,000 species of bacteria, some of which can be "good" (like probiotics), some of which can be "bad" (like pathogens). Our gut is lined by a squishy mucus gel whose mesh structure helps to keep "bad" bacteria from getting through but enables nutrients, beneficial molecules, and some drugs to pass through unimpeded. In many diseases or disorders, this mesh structure is disturbed. The Datta Lab has been studying this squishy mucus gel as a biomaterial, using tools from physics and materials science. Recently, they discovered that polymers in the gut, such as dietary fibers from the fruits and vegetables that you eat, can compress the gel, potentially making the pores in it smaller. This level of control might offer protection and mitigation of disease.

Complex Fluids In The Lungs

The lungs are also protected by a complex fluid — a thick mucus solution that helps trap inhaled pathogens (like bacteria or viruses) or particulates. In...

AFFILIATION

 Princeton University

EDUCATION

- Postdoctoral Researcher, Chemical Engineering, California Institute of Technology (2014-2017)
- AM and PhD, Physics, Harvard University (2008-2013)
- BA and MS, Physics, University of Pennsylvania (2004-2008)

AWARDS

- 2008 LeRoy Apker Award

RESEARCH AREAS

Technology, Chemistry, Fluidics, Materials Science / Physics

FUNDING REQUEST

To support this work, the Datta Lab is requesting funding for the following needs:

- Graduate student salary and tuition: \$60,620/year
- Postdoctoral researcher salary and benefits: \$65,100/year
- Materials and supplies: Approximately \$300-500k/year
- New equipment e.g. microscope: Approximately \$100-500k each

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