American Physical Society
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## From *The 69th Meeting of The American Physical Society – Division of Fluid Dynamics*

# Understanding the Mechanics of Breastfeeding

*Researchers combine mechanics, hydrodynamics and biology to study infant feeding*

EMBARGOED for release until 9 a.m. Eastern Time on November 21, 2016

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Washington, D. C., November 21, 2016—Breastfeeding is a topic that creates discussion and at times even controversy. However, some basic questions about its biology still remain. For instance, does successful infant feeding depend on the mechanics of the breast and, conversely, does breast health depend on breastfeeding? It has been virtually impossible to study these complex dynamics and the delicate interplay that makes breastfeeding possible, but a pair of researchers are working together to build a biomimetic breast that will allow scientists to study how the breast behaves during its primary function: infant feeding. Nicole Danos, an assistant professor of biology at the University of San Diego, and her collaborator, Rebecca Z. German, a professor of anatomy and neurobiology at Northeastern Ohio Medical University, are working together to address a gap in our understanding of breastfeeding mechanics. The work will be presented at the 69th Annual Meeting of the APS Division of Fluid Dynamics held in Portland, OR, November 20-22, 2016.

The idea that mechanics is critical for controlling milk production and flow is already well understood and there is even evidence that it might contribute to breastfeeding's protective function against cancer. Work done by German has provided significant improvements in our understanding of how infants coordinate sucking, breathing and swallowing and what happens during some of the most common neurological traumas of the head and neck in infants. What has been missing is an understanding of the paired mother-infant interaction. This is especially true in an evolutionary context, where there is a need to better understand how important the gland's anatomy and mechanical properties are to infant feeding and how, in turn, infant feeding controls lactation. The development of a biomimetic breast would allow study of this complicated, but very basic biological function.

A biomimetic breast is a working model that mimics the form, structure and function of a lactating breast. The first phase will include several iterations of feeding bottles that will have varied exterior wall stiffness and diameter of the tubes through which the milk flows. In the next phase, they want to increase the complexity of the device to add structures that mimic some of the supportive connective tissues. “The strength of our approach, though, lies in the use of the breast device with an animal model of infant feeding along with cutting edge imaging techniques to visualize both milk flow and the function of soft and hard structures in the infant mouth and larynx,” Danos said.
This research will fill a void in how we study lactation mechanics. Studying lactation with real mother-infant pairs presents two challenges: visualizing the flow and tissue mechanics is either impossible or very difficult, and manipulating the mechanical properties of the maternal gland in a controlled way that gets at the factors significantly affecting infant feeding cannot be done. Developing a biomimetic breast will allow both while working in the lab under controlled conditions, and researchers can finally get at what the natural mechanics of breastfeeding look like. Data from these studies will provide the controlled mechanical environment for studies of breast cancer mechanobiology. They may also lead to better feeding bottles for infants and milk pumps for both humans and agricultural mammals. “Our research could even lead to the design of infant feeding devices that closely mimic natural breastfeeding allowing other caretakers, like dads, to feed infants without the limitations of bottle feeding which can be especially critical for infants with health problems,” Danos said.

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Abstract: L1.00005 : "On the need for a biomimetic breast device"
by Nicole Danos and Rebecca German is at 5:22-5:35pm PST, November 21, 2016 in Room A105
For more information about the APS DFD 2016 meeting, visit: http://apsdfd2016pdx.org/

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**MORE MEETING INFORMATION**

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**USEFUL LINKS**

Main meeting website: http://apsdfd2016pdx.org/
Technical program: http://meetings.aps.org/Meeting/DFD16/Content/3199
Meeting/Hotel site: http://apsdfd2016pdx.org/?page_id=30
Press Room: http://www.aps.org/newsroom/index.cfm
Look for live updates on Twitter throughout the meeting with #APSDFD

**PRESS REGISTRATION**

We will grant free registration to credentialed journalists and professional freelance journalists. If you are a reporter and would like to attend, contact Julia Majors (jmajors@aip.org, 301-209-3103) who can also help with setting up interviews and obtaining images, sound clips, or background information.

**LIVE MEDIA WEBCAST**

A press briefing featuring a selection of newsworthy research will be webcast live from the conference on Monday, November 21st. The first briefing at 2:00pm (EST) is about the forensic analysis of blood spatter and how changing the position of your fingers can help you swim faster. The second one at 4:00pm (EST) is about cat's Velcro-like tongues and bubbles. More information can be found at the following link: https://www.aps.org/units/dfd/pressroom/

**ABOUT The DIVISION OF FLUID DYNAMICS OF THE AMERICAN PHYSICAL SOCIETY**

The Division of Fluid Dynamics of the American Physical Society exists for the advancement and diffusion of knowledge of the physics of fluids with special emphasis on the dynamical theories of the liquid, plastic and gaseous states of matter under all conditions of temperature and pressure. https://www.aps.org/units/dfd/

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