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Fluid-structure interactions shape animal-microbe associations JANNA NAWROTH, University of Southern California, CHRISTOPH GIEZ, ALEXANDER KLIMOVICH, THOMAS BOSCH, Kiel University, Germany, EVA KANSO, University of Southern California — The surfaces of most, if not all, animals are colonized by characteristic microbial populations that often confer important benefits to the animal host including protection from pathogens. Yet, we understand little how animals gain and maintain their specific microbial partners. Here, we hypothesize that fluid-structure interactions play a major role in this relationship. We explore this concept using the model animal system Hydra, which harbors a diverse, stable, and beneficial bacterial population on its outer skin. We show that spontaneous muscular contractions of the Hydra body cause shedding of the laminar boundary layer that facilitates transfer of nutrients and waste products from and to the microbe-colonized surfaces. Our results suggest that the Hydra could actively influence the microbial growth conditions on its surface to selectively benefit desired microbial partners. Further, we find that the contractions aid in establishing distinct fluid-mechanical microhabitats along the length of Hydra's body, which may drive the observed spatial distribution of bacteria partners. Together, our results indicate a new role of spontaneous muscle contractions in general, including the peristalsis of the human gut, in shaping animal-microbe associations via fluid mechanical processes.

Janna Nawroth
University of Southern California

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