

Abstract Submitted
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Darcy permeability of hagfish slime: an ultra-soft hydrogel GAURAV CHAUDHARY, University of Illinois at Urbana-Champaign, IL USA, DOUGLAS FUDGE, University of Guelph, ON, Canada, RANDY EWOLDT, University of Illinois at Urbana-Champaign, IL USA — When under attack from predators, hagfish produces a large amount of slime. The slime is an exceptional hydrogel, which sets-up in fraction of a second and is known to choke the predators. A small quantity of exudate, released from specialized slime glands, mixes with a large volume of sea water (99.996% w/v) and forms a mucus-like cohesive mass. The exudate has two main constituents: mucins and long intermediate filament based threads. This remarkably dilute material forms into a solid and is hypothesized to have a low hydrodynamic permeability. In this work, we present the first experimental measurements of Darcy permeability of hagfish slime. Our results explain how this ultra-soft hydrogel possesses the so-called ‘gill-clogging’ ability. We also investigate the roles played by individual components of slime, namely, thread cells and mucins, via a concentration-dependent permeability study. Our results provide vital insights into the roles of individual components and it is evident from our observations that mucins play a vital role in significantly reducing the permeability of the fibrous network formed by threads.

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