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The hydrodynamics of defecation PATRICIA YANG, DUC DAO, RICHARD LEHNER, MIKE TENNENBAUM, ALBERTO FERNANDEZ-NIEVES, DAVID HU, Georgia Institute of Technology — According to the U.S. Department of Health and Human Services, digestive disease affects 60 to 70 million people and costs over 140 billion annually. Despite the significance of the gastrointestinal tract to human health, the physics of both digestion and defecation remain poorly understood. In this combined experimental and theoretical study, we investigate the defecation of mammals, from mice to elephants. We film defecation events at Zoo Atlanta and apply plate-on-plate rheometry to measure the viscosity of mammalian feces. Among animals heavier than 3 kg, we find herbivores defecate for only 10 seconds ($N = 13$), while carnivores do so for 19 seconds ($N = 8$). We rationalize this surprising trend on the basis of the higher viscosity of carnivore feces. We compare defecation times to theoretical predictions based on a Poiseuille flow model of the rectum and parallel experiments with a synthetic defecator that extrudes pizza dough upon applied pressure. Our findings may help to diagnose digestive problems in animals.

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