

The force-full fight of immune cells with bacteria

Viola Vogel



*Laboratory of Applied Mechanobiology,
Department of Health Sciences and Technology,
ETH Zurich, Switzerland.
E-mail: viola.vogel@hest.ethz.ch*

How do our immune cells fight bacterial infections, particularly in cases where bacteria hold on tightly to surfaces or tissue fibers? The fight of bacteria with immune cells has many mechanical aspects that have found little attention until recently. Cells exploit mechanical forces to sense the physical aspects of their microenvironments and immune cells exploit sophisticated physical mechanisms to pull on bacteria and rupture them off from surfaces. To clear pathogens from host tissues or biomaterial surfaces, macrophages have to first identify their prey, and then firmly hold on to it while they prepare themselves to phagocytize it. Preceding phagocytosis though, they have to generate sufficient force to break large clusters of adhesive bonds by which bacteria often tightly bind to surfaces or tissue fibers. Even though many strategies have been applied by mankind to fight bacterial infections, primarily designed to either kill bacteria via antibiotics or more recently to prevent their adhesion to surfaces and host tissues, little attention has been given to asking how these pharmaceutical strategies might compromise the efficiency of our own immune cells. Unexpectedly, novel insights into nanomechanical aspects also revealed some adverse and unanticipated side effects how common antibacterial drugs impair the ability of our immune cells to fight infections.