Physics models for how antibiotics kill bacteria

Rebecca Brouwers[1], Sharareh Tavaddod[1], Leonardo Mancini[2], Elizabeth Tatham[1], Pietro Cicuta[2], Waldemar Vollmer[3] and Rosalind J. Allen[1]

[1]School of Physics and Astronomy, University of Edinburgh, Edinburgh, UK; [2]Cavendish Laboratory, University of Cambridge, Cambridge, UK; [3]Biosciences Institute, Newcastle University, Newcastle, UK

Antibiotics cure infections by killing bacteria or preventing them from growing – yet much remains to be understood about how this works. Many of the most widely used antibiotics target bacterial cell wall synthesis. These antibiotics often kill bacteria by causing them to explode, or lyse. We have investigated experimentally the efficacy of the cell wall targeting antibiotic mecillinam, which is used to treat urinary tract infections, for bacteria growing under different conditions. We show that a simple physics model that takes into account the growth of bacterial cell volume and surface area, can explain non-trivial experimental observations.