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Osmotic pressure: resisting or promoting DNA ejection from phage? Internal capsid-pressure dependence of viral infection ALEX EVILEVITCH, MEERIM JEEMBAEVA, Department of Biochemistry, Lund University, Sweden, SARAH KOESTER, Department of Physics, Harvard University, Cambridge, MA, MARTIN CASTELNOVO, Laboratoire de Physique, Ecole Normale Superieure de Lyon, France, DAVID WEITZ, Department of Physics, Harvard University, Cambridge, MA — Recent *in vitro* experiments have shown that DNA ejection from phage can be partially stopped by surrounding osmotic pressure when ejected DNA is digested by DNase I on the course of ejection. We argue in this work by combination of experimental techniques (UV absorbance, pulse-field electrophoresis, and cryo-EM) that intact genome (*i.e. undigested*) ejection in a crowded environment is, on the contrary, enhanced or eventually complete with the help of a pulling force resulting from DNA condensation induced by the osmotic stress itself. This demonstrates that in vivo, the osmotically stressed cell cytoplasm will promote phage DNA ejection rather than resisting it. While, in vitro, the ejection depends sensitively on internal pressure within the virus capsid, the effect of internal pressure on infection of bacteria is unknown. We use microfluidics to monitor individual cells and determine the distribution of lysis due to infection as the capsid pressure is varied. The lysis probability decreases markedly with decreased capsid pressure.

Alex Evilevitch
Lund University, Dept of Biochemistry

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