

Grabbing a Molecular Import Machine with Double Beam Tweezers

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The importation of genetic material into cells is a common and fundamental mechanism occurring in bacterial conjugation, DNA uptake, and *Agrobacterium* plant infection and is, for instance, responsible for antibiotic resistance spread. Previous studies suggested that this process relied only on the activity of complex molecular machines pumping the single-stranded DNA (ssDNA) into the recipient cell.

Here, we show that proteins provided by the pathogenic organism and translocated prior to the arrival of ssDNA into the recipient cell also play a fundamental role. These proteins not only bind to ssDNA to protect it but also rearrange ssDNA into a compact helix, thus generating a contractile force that pulls the DNA into the host.

Interestingly, the production of mechanical energy occurs solely through the free-energy gain during the binding of VirE2 to ssDNA without the need for an external source of energy, such as nucleotide hydrolysis.