

Why does the tail fiber keep breaking when I peel it



Article Overview

Tail fibers are mechanically fragile protein structures, and their breakage during peeling is due to their limited tensile strength and delicate molecular architecture.

Structural Fragility of Tail Fibers

Tail fibers are specialized protein appendages on bacteriophages that extend from the distal end of the viral tail and are responsible for recognizing and attaching to specific bacterial receptors. Each fiber is composed of multiple protein subunits arranged in a trimeric structure, such as gp34, gp35, gp36, and gp37 in T4 phages. The distal tip (gp37) is particularly important for host recognition but is also a mechanically sensitive region.

Mechanical Properties

Experimental studies using Atomic Force Microscopy have measured the mechanical properties of T4 long tail fibers. The fibers exhibit a radial stiffness of ~ 0.08 N/m and a breaking force of ~ 120 pN, with a Young's modulus of approximately 20 MPa. These values indicate that tail fibers are strong enough to maintain attachment to bacteria under normal conditions, but they are susceptible to breakage under external forces, such as peeling or handling outside their natural environment.

Reasons for Breakage During Peeling

- Delicate Protein Architecture: The fibers are long, thin, and composed of interwov...

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More information: Navajit S Baban et al, Biomimetic fracture model of lizard tail autotomy, Science (2022). DOI:

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