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Introduction to Tail Fiber Flanges



Overview

The longitudinal breaking force of an individual long tail fiber (~150 pN) is about twice the force induced by DNA translocation.

Key Takeaways

Tail fiber flanges are structural domains of bacteriophage tail fibers that facilitate host recognition, attachment, and modular assembly of the fiber complex.Overview of Tail Fibers

Tail fibers are a major class of receptor-binding proteins (RBPs) in bacteriophages, responsible for recognizing and binding to specific bacterial surface receptors such as outer membrane proteins, exopolysaccharides, and flagella . They are typically elongated, flexible, and trimeric, forming long homo-trimeric complexes that attach to the phage tail, often at the baseplate, neck, or other fiber-like adaptors . Tail fibers differ from tail spikes primarily in their mode of action, with spikes often exhibiting depolymerase activity .

Structure and Function of Flanges

Flanges are modular domains within tail fibers that contribute to the stability, flexibility, and host-specific binding of the fiber. They act as structural connectors, linking the fiber to the baseplate or other tail components while maintaining the correct orientation for receptor engagement . Flanges often exhibit pseudo-symmetry, allowing the fiber to assemble into trimeric or higher-order structures, which is critical for the mechanical function of the tail during host attachment and genome delivery .

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Classification and Modularity

Recent studies using RBPseg, a computational pipeline combining ESMFold and AlphaFold2-multimer (AF2M), have identified 16 distinct tail fiber classes and 89 domains, highlighting the modular nature of these proteins . Flanges are part of this modular architecture, often conserved across different phages, and can undergo domain swapping, convergence, or divergence, reflecting evolutionary adaptation to diverse bacterial hosts . This modularity allows phages to exchange tail fiber components via horizontal gene transfer, enhancing host range flexibility .

Advances in Structural Modeling

Experimental determination of full-length tail fiber structures is challenging due to their length and flexibility. Computational approaches like RBPseg segment the fiber sequence into manageable fractions using a sigmoid distance pair (sDp) function, predict each segment with AF2M, and assemble them into a complete model . This approach improves model confidence, reduces computational load, and provides insights into the structural organization of flanges and their role in fiber assembly and host interaction .

Functional Implications

Understanding tail fiber flanges is crucial for phage therapy and synthetic biology, as these domains determine host specificity and binding efficiency. By mapping flange structures and their interactions, researchers can engineer phages with tailored host ranges or enhanced stability, expanding their therapeutic potential . In summary, tail fiber flanges are essential structural modules that stabilize the fiber, mediate host attachment, and contribute to the modular evolution of bacteriophage tail fibers, with recent computational tools enabling detailed structural and functional characterization .

Article Content

Tail Fiber: Types, Functions, and Common Interfaces

A tail fiber, also known as a fiber optic patch cord, consists of a connector on one end and a cut end of the fiber optic

RBPseg: Toward a complete phage tail fiber structure atlas

Here, we introduce RBPseg, a method that combines monomeric ESMFold predictions with a

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Designed for corrosive and demanding environments, fiberglass flanges offer a superior alternative to

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Chapter 20965

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13 Different Types of Flanges and Their Applications

In this article, you will learn the different types of flanges and how they work. Their

Fiber tail fiber characteristics

The ST-type pigtail is usually used for wiring equipment, such as fiber distribution frames,

Tail Fiber Fibbets

With a wide range of color options, this is one of the most comprehensive fibbet ranges on the market. And

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A tail fiber recognizes the correct bacterial target and attaches the phage to the cell surface. That attachment can trigger later steps

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1. Classification of Tail Fibers Similar to fiber optic jumpers, tail fibers are classified into single-mode and multimode

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Bacteriophages use receptor-binding proteins (RBPs) to adhere to bacterial hosts. Understanding the structure of

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Complete Guide to Piping Flanges: Types, Applications

Comprehensive guide to piping flanges covering all 6 major types: slip-on, weld neck, socket

Fiber tail fiber characteristics

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Pigtail, also known as pigtail, has only one end with a connector, and the other end is a

2 Tail fiber function and structure

Hyman, P, & Harrah, T. "Tail fiber function and structure." Bacteriophage T4 Tail Fibers as a Basis for Structured Assemblies. Ed.

Bacteriophage T4 long tail fiber domains

Bacteriophage T4 initially recognizes its host cells using its long tail fibers. Long tail fibers consist of a phage-proximal

What is a Fiber Optic Pigtail, and What Is It Used For?

A fiber optic pigtail is a type of fiber optic cable with only one end that has a factory-terminated connector and the

Introduction to the tail threading process, efficiency and audits

Achieving and maintaining tail threading efficiency is exceedingly important for safety and bottom line performance on

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We would like to show you a description here but the site won''t allow us.

Targeting mechanisms of tailed bacteriophages

The tail structures are key determinants of the host specificity and infection process of the respective phages 4, 5, 6.

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Fiber Optic Adapters Function Introduction

The two fiber optic connectors are installed into the tail ends of the two optical fibers; the coupler plays the role of

Comprehensive Guide to Fiber Optic Pigtails:

Introduction The advent of fiber optic technology has been a cornerstone in the evolution of

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An Introduction to Pipe Flanges This white paper is provided as a general overview in understanding the most commonly used pipe

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