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Opinion Article

Streptomyces Uses in Nanotechnology to Produce Pharmaceutical Medicines

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DESCRIPTION

Nanotechnology, or simply "nanotech," is the use of materials at the atomic, molecular, and supramolecular scales for industrial applications. The original and most well-known definition of nanotechnology, now referred to as molecular nanotechnology, concentrated on the particular technological goal of precisely manipulating atoms and molecules for the development of macroscale objects. The study of materials with unique properties due to their nanoscale dimensions is a branch within the area of nanomaterials. Several materials that may be beneficial in nanotechnology, including carbon nanotubes and other fullerenes, as well as other nanoparticles and nanorods, have been developed. Nano-ionics and Nano electronics are also connected to nanomaterials with rapid ion transport. The majority of current commercial applications of nanotechnology are of this type, although nanoscale materials can also be used for bulk applications.

Streptomyces uses in nanotechnology

One of the most important genera in biotechnology is *Streptomyces*, and this organism's robust secondary metabolism is responsible for the manufacture of a wide range of bioactive substances, including several medicines with potential for use in medicine. Although the use of *Streptomyces* species for the production of natural products has been well established for more than 50 years, recent breakthroughs in genetic engineering and molecular biology have fundamentally changed how these bacteria are optimized as cell factories and greatly increased their biotechnological potential.

Gram-positive bacteria of the *Streptomyces* genus have important biotechnological uses. The genus is responsible for the biosynthesis of a huge variety of secondary metabolites, including several highly relevant pharmaceuticals such as antibiotics, anticancer, and anti-obesity drugs. Since *S. griseus* was first used to manufacture the antibiotic streptomycin in industrial settings, the use of *Streptomyces* strains for the industrial-scale production of important chemicals has been well-established.

The genus presents a number of obstacles for biotechnological applications, and production strains frequently go through multiple rounds of strain development to attain acceptable titers of the target chemicals. In the past, fortunate methods like random mutagenesis were frequently used to optimize the producer strains.

Multiomics investigations of the metabolism of *Streptomyces* species allow for the rational optimization of this genus by rewiring the metabolism. Consider merging metabolomics and transcriptomics in a multiomics strategy. Another effective tactic utilized recently in *Streptomyces* to increase secondary metabolite titre is fine-tuning the expression of sugar-uptake systems.

The identification of two sugar-uptake systems called Transition Protein-2 (TP2) and Transition Protein-5 (TP5) in *S. bingchenggensis*, whose expression is connected with the generation of milbemycin, was made possible by the analysis of genomes and transcriptomics data. The same study made it possible to identify a number of native temporal promoters in this species, each with a distinct strength.

The genus *Streptomyces* has been a vital source of important therapeutic medicines and other bioactive compounds ever since the discovery of antibiotics. Despite ongoing efforts to identify and characterize new compounds with potential as pharmaceuticals, *Streptomyces* species' complex life cycles, multicellular makeup, and problematic genetics make large-scale biotechnological production of these compounds tough.

Streptomyces is the largest antibiotic-producing genus, producing antibacterial, antifungal, and anti-parasitic medicines, and also a wide range of other bioactive chemicals, such as immunosuppressants. Virtually all of *Streptomyces*' bioactive substances are started at the same time that the aerial hyphal development from the substrate mycelium is taking place.

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