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Poster abstract submission

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Poster title

A Nanolitre Microdroplet Array Platform for High-Throughput Antibiotic Discovery from Streptomyces

Poster abstract

Streptomycetes are renowned for their ability to produce a wide variety of natural products, accounting for over half of all known clinical antibiotics as well as a plethora of other bioactive compounds. The large number of biosynthetic gene clusters (BGCs) encoding the biosynthesis of these metabolites highlights a vast, largely unexplored biosynthetic potential. The key challenge, therefore, lies in understanding which growth conditions enable activation of this hidden chemical space and prioritise these compounds for the development of future medicines. Here, we present a miniaturised high-throughput platform that simultaneously monitors growth, morphology, antimicrobial activity, and metabolite production of Streptomyces at the nanolitre scale.
By using a microdroplet array of 10,450 independent cultivation chambers, strains were grown across diverse media conditions. Morphological development was assessed by brightfield imaging, and antimicrobial activity was detected via nano-injection of Bacillus subtilis GFP reporter cells, enabling real-time monitoring of growth inhibition. Metabolite production was analysed directly from droplets using MALDI-TOF MS, allowing chemical profiling without sample extraction.
Streptomyces strains displayed distinct, strain-specific morphologies and bioactivity profiles depending on medium composition, demonstrating that the droplet environment preserves general Streptomyces biology. Functional screening identified clear antimicrobial activity against B. subtilis, and MALDI-TOF MS confirmed the production of the antibiotic actinomycin X2 at the nanolitre scale. Across all analyses, the platform provided reproducible, quantitative measurements suitable for high-throughput parallel screening.
These results demonstrate that nanolitre-scale droplet cultivation resembles the biological and biosynthetic complexity of Streptomyces rather well while enabling simultaneous testing of thousands of conditions in parallel. The integration of morphological assessment, functional antimicrobial screening,

and metabolite profiling within a single high-throughput platform offers a powerful approach for advancing natural product discovery and combating the AMR crisis.

Research topic

Microbiology