Mining bacterial genomes reveals valuable 'hidden' drugs

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After changing their regulatory mechanisms, Streptomyces bacteria produce colorful new molecules. Credit: Marco Gottelt

A new tool to excavate bacterial genomes that potentially hide a rich array of pharmaceutical treasures has led to the discovery of a novel antibiotic. The study, reported in the August issue of *Microbiology*, could lead to new treatments for serious diseases that are rapidly acquiring multi-drug resistance.

Scientists from the University of Groningen in The Netherlands successfully used a 'genome mining' approach to find and activate a group of genes in the bacterium *Streptomyces coelicolor*. This resulted in the production of a new antibacterial compound that was effective against several bacterial strains, including *Escherichia coli.*

Streptomyces is a common soil bacterium that is well-known for its antibiotic-producing capabilities. In 2002, genomic sequencing of one Streptomyces species, *S. coelicolor*, revealed several groups of genes whose function was unknown. By digging deeper and removing a molecule that specifically inactivates one of the mystery gene groups, known as cpk, the researchers in this study were able to 'awaken' the genes, to find that they produced the new antibiotic, in addition to a bright yellow pigment.

This is the first time a genome mining approach to drug discovery has been successfully used in Streptomyces. "The strategy is a powerful and innovative way of searching for new antibiotic production capabilities in bacteria," said Dr Eriko Takano who led the study. "As bacterial infections previously considered as mild and easily curable are suddenly becoming lethal and completely unresponsive to all existing medication, it is crucial that new antibiotics are discovered at a sufficiently rapid rate," she said.

The same approach for 'awakening' new antibiotic production pathways could also be used to tap other micro-organisms, such as filamentous fungi, for sources of biologically active compounds. Aside from antibiotics, these compounds may include other antimicrobials or antitumour agents. "There are several thousand other uncharacterized groups of genes that have been found recently in microbial genome sequences. This opens up a rich treasure trove of new potential drugs for clinical use," explained Dr Takano.

More information: “Deletion of a regulatory gene within the cpk gene cluster reveals novel antibacterial activity in Streptomyces coelicolor”, DOI:10.1099/mic.0.038281-0