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MICROBIAL ENGINEERING OF NEW STREPTOMYCES SP. FROM EXTREME ENVIRONMENTS FOR NOVEL ANTIBIOTICS, ANTICANCER AND ANTIFUNGAL DRUGS

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Today there is an urgent need for new antibiotics and novel cytotoxic compounds against cancer cells to develop efficient alternative treatment to chemotherapy. We have searched for highly active Streptomyces strains in the driest desert in the world, the Atacama desert in northern Chile. We have identified several new strains and found many novel antibiotics, anticancer and antifungal agents from these strains.

A genome scale model of the metabolism of Streptomyces leeuwenhoekii C34 has been developed from its genome sequence. The model, iVR1007, has 1726 reactions including 239 for transport, reactions for secondary metabolite biosynthesis, 1463 metabolites and 1007 genes (1, 2). The validated model is presently being used to increase and optimize the synthesis of Chaxamycins and Chaxalactins and the halogenase cluster by recognizing overexpression targets and useful knock-out sites. Our latest overexpression results will be presented.

In parallel, we have isolated new Streptomyces strains from Lupin rhizosphere soil from the Atacama desert. Several strains were selected for their antifungal activity against Botrytis cinerea and Fusarium oxysporum, of great agroindustrial importance. Mass spectrometry studies revealed at least 5 new molecules and one strain was shown to produce more that 20 new desferrioxamines iron chelating molecules which act as fungal inhibitors by iron deprivation. Currently DNA sequencing for the identification of gene clusters and in vitro studies of fruit models are under way.

One of our latest strains Streptomyces asenjonii produces a range of Asenjonamides (A-C) and also Spicamycins (A-E) which are potent antioxidant molecules with a beneficial effect on cell ageing.

Our latest work, in addition to the microbes from the Atacama desert, includes the Atacama Trench, which is 8,000 mts. deep and has never before been explored for microbial activity. Presently we are carrying out detailed metagenomic analysis of the sediment samples taken at different depths. Initial results include the isolation of Streptomyces, Salinispora and fungal strains which show antimicrobial activity against B. subtilis.

Our recent results concerned with overproduction and also findings of these novel potentially important secondary metabolites will be presented and discussed in this presentation.

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