

'Dark matter' discoveries could shine light on new treatments for diseases

November 27 2017



"Treasure trove" of bacteria with the potential to fight disease. Credit: Newcastle University

Soils from one of the highest, driest places on earth harbour microorganisms with the potential to treat HIV and tackle the world's antibiotic time bomb, research from Newcastle University, UK, has revealed.

Analysis of soils from the Cerro Chajnantor mountain landscape of Chile within the Atacama Desert, one of only two coastal deserts in the world, has revealed a treasure trove of bacteria with the potential to fight disease.

Published this month in the academic journal *Extremophiles*, the work was carried out as part of an international project and led by Professors Juan Asenjo (University of Chile), Alan Bull (Kent University), Michael Goodfellow (Newcastle University) and Marcel Jaspars (Aberdeen University).

Professor Michael Goodfellow, Senior Research Investigator, Dr Roy Sanderson, Lecturer in Biological Modelling at Newcastle University and Dr Hamidah Idris, a former PhD student under their supervision, have explained these exciting findings from [soil](#) samples taken from heights of 3,000 to 5,000 metres above sea level.

"The Atacama Desert is the most extreme, non-polar biome on Earth considered to represent the dry limit for life and thought to be similar to soils on Mars," said Professor Michael Goodfellow. "This study focused on actinobacteria as they are keystone species in our ecosystems and are acknowledged as an unrivalled source of bioactive compounds.

"Surprisingly, we found that this landscape is an extraordinary repository for actinobacterial 'dark matter' - which comprises the vast majority of microbes that microbiologists are currently unable to cultivate. It is particularly interesting that there is so much 'dark matter' in Atacama Desert soils, which until recently were thought to be devoid of life.

"After analysis we found that 40 per cent of the actinobacteria captured in samples could not be given ascribed names as they had never before been discovered. This microbial seed bank represents an enormous untapped resource for biotechnology programmes; especially in an era

where resistance to existing antibiotics is rapidly becoming a major threat to global health. The discovery of new bacteria could potentially be used to create new treatments as work continues to tackle the antibiotics time-bomb.

"It is also notable that one strain of bacteria found is proven to be an inhibitor of an enzyme that allows the HIV virus to reproduce itself. This could provide essential clues for the development of anti-HIV drugs."

The Cerro Chajnantor landscape of the Central Andes is a lava dome and part of a large volcanic complex formed on top of a pyroclastic shield - a type of volcano whose broad low-angle slopes are formed by accumulation of fragmental material from powerful explosive eruptions.

It is subject to a combination of extreme environmental conditions including the world's highest levels of surface Ultraviolet (UV) radiation.

UV-B irradiance and a range of unique soil characteristics were found to be very significant in determining the community compositions of bacteria in the area studied.

Since the mid-1970s, when microbiologists recognised that extreme environments are capable of sustaining life, research has developed rapidly; the attraction for microbiologists is that environmental limits to life on earth are defined by the presence of microorganisms. Nevertheless, reports of the microbiology of high altitude mountain soils worldwide are sparse and little information is available relating to those of the Central-Andes.

Dr Roy Sanderson said: "The data in this paper are among the first relating to the microbiology of very dry, very high altitude deserts. They provide important base-line information on the structure of actinobacterial communities in soils. We hope they will be used as a

springboard for further research to benefit landscapes and people around the world."

More information: Alan T. Bull et al, High altitude, hyper-arid soils of the Central-Andes harbor mega-diverse communities of actinobacteria, *Extremophiles* (2017). [DOI: 10.1007/s00792-017-0976-5](https://doi.org/10.1007/s00792-017-0976-5)

Provided by Newcastle University

Citation: 'Dark matter' discoveries could shine light on new treatments for diseases (2017, November 27) retrieved 16 July 2024 from <https://phys.org/news/2017-11-dark-discoveries-treatments-diseases.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.