

7 places that scientists are searching for new drugs

March 22 2016

Many of the drugs we use in hospitals – antibiotics, antifungals and anti-cancer drugs, to name but a few – are produced by bacteria that live in the soil beneath our feet. Most of the antibiotics we use were discovered by scientists in the mid-20th century, but as the threat of drug resistant infections increases, the race is on to find new microbes that make new drugs. Scientists have only identified a tiny fraction of the microbes living on Earth and are looking for useful new ones in wildly different locations, known as 'bioprospecting'.

Here we have listed just a few of the places that researchers have looked for new drug-making microbes.

1. Fungus-farming leafcutter ants

South American leafcutter ants are possibly the oldest farmers on Earth, beating humans by a cool 10 million years. The ants chop down swathes of rainforest canopy, which they carry back to their nest to feed to a fungus called *Leucoagaricus gongylophorus* that the ants themselves eat. The fungus benefits from the deal because the ants feed it and give it a safe, warm and humid place to live. The ants also use antibiotics, made by [bacteria](#) that they grow on their bodies, to protect their fungus against disease. Some of the bacterial strains and the antibiotics they make are new to science and Dr Matt Hutchings and his team at the University of East Anglia hope they might one day be useful in the clinic.

www.uea.ac.uk/leafcutter-ants

2. Marine sediment

In 1989 [www.ncbi.nlm.nih.gov/pubmed/25730728], researchers from the Scripps Institution of Oceanography identified a new species of bacteria living in marine sediment, just off the coast of the Bahamas. Later to be known as *Salinispora*, strains of this genus have been found in tropical and subtropical seas around the world and have been found at depths of over 5,000 metres. These bacteria are well adapted to their environment and only grow in the presence of seawater. *Salinispora* bacteria produce a compound called Salinosporamide A, which shows anticancer properties and is currently being tested in phase I clinical trials to test its effectiveness against two types of cancer cells.

3. Marine sponges

Although they lack any obvious organs or limbs, marine sponges are some of the oldest animals on Earth. Sponges have been the source of anticancer drugs since the 1950s and thousands of other compounds have been derived from them [www.ncbi.nlm.nih.gov/pubmed/19149592]. A great number of these potential drugs appear to be made by bacteria that live in mutually beneficial relationships with sponges across the world, including *Salinispora* and marine *Streptomyces* species. In the absence of an immune system it is thought that these primitive animals use the antibiotic-producing bacteria to protect themselves against disease.

4. The Atacama Desert

The Atacama might be the world's oldest desert and is perhaps the driest place on Earth, with some areas receiving an average of 1mm of rain a year (although when it does rain the results are spectacular [[www.livescience.com/52632-atac ... t-flowers-bloom.html](http://www.livescience.com/52632-atac...t-flowers-bloom.html)]). Although it was believed nothing could survive there, the desert has been shown to

be home to new species of *Streptomyces* bacteria, including *Streptomyces leeuwenhoekii*, which produces new compounds called chaxamycins that have potent antibacterial properties.

5. Soil

Far removed from the deserts of South America, common or garden soil remains an untapped source of potential [new drugs](#). The majority of antibiotics in use today are made by members of the soil-dwelling *Streptomyces* genus of bacteria and many scientists believed there weren't any left to find. However, the discovery in 2015 of the new antibiotic compound teixobactin [[www.theguardian.com/science/20 ... sistance-teixobactin](http://www.theguardian.com/science/2015/sep/22/teixobactin)] – isolated from bacteria living in a grassy field – shows there might be more to find. Lots of projects, including the Microbiology Society's Small World Initiative, are getting the public involved to look for more useful soil microbes; they've taken this search to UK forests, the Blue Peter Garden and even the Prime Minister's garden at 10 Downing Street. www.smallworldinitiative.org/

6. Golf courses

Ivermectin is a drug that is used to treat a number of parasitic worm infections and has saved millions of lives. It cures diseases like river blindness, which disproportionately affect the poorest people on Earth. Ivermectin was derived from another compound called avermectin, produced by the bacterium *Streptomyces avermitilis*. The Japanese scientist Dr Satoshi Ōmura isolated this species on the fringes of a golf course in Kawana, near Tokyo. As a result of his discovery, Ōmura was co-awarded the 2015 Nobel Prize in Physiology or Medicine.

7. The places and things around you right now...

In addition to looking for new antibiotic-producing microbes in exotic places around the world, some are looking closer to home. Dr Adam Roberts from University College London has been running a project called Swab and Send, which sees members of the public swab a surface and send it to him to analyse for the presence of new antibiotic-producing bacteria. People have swabbed a huge range of places, and interesting microbial species have been found living on banknotes, train station ticket machines, a cat's nose, the side of a fridge, and even men's beards. The project is still in its early stages, but Dr Roberts hopes that the next antibiotic could be found right under our noses...

Provided by University of East Anglia

Citation: 7 places that scientists are searching for new drugs (2016, March 22) retrieved 6 May 2024 from <https://phys.org/news/2016-03-scientists-drugs.html>

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