

WELLFORD TILLER/ADOBE STOCK

Resistome reservoirs

Antimicrobial resistance is on the increase.

Liz Sheffield explains why, and what is being done to make the situation both worse and better

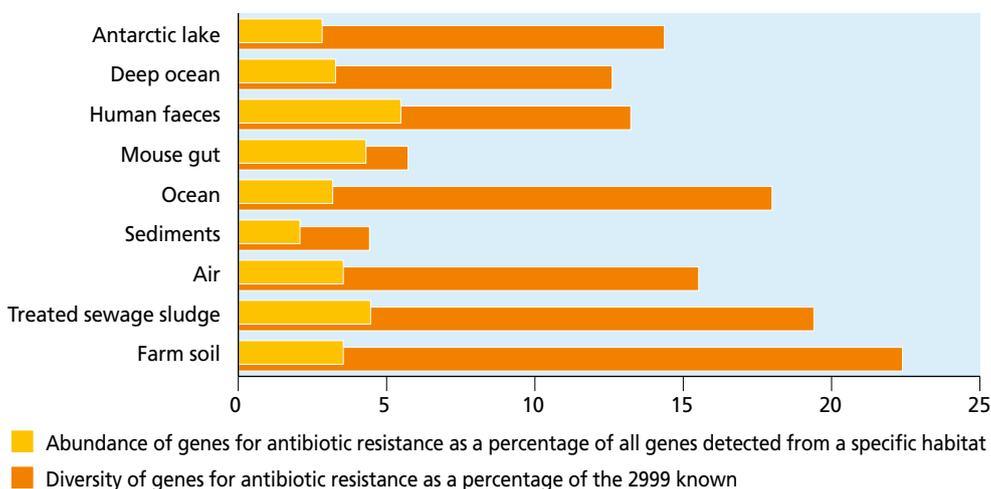


Figure 1 Resistome reservoirs – habitats of bacteria

The idyllic scene above shows reindeer grazing on plants growing in Svalbard. The soil in this remote Arctic location has recently been shown to contain superbugs. Bacteria resistant to one or more antibiotics are everywhere, including in Arctic snow, Antarctic lakes and salad in our supermarkets.

We know they are there from DNA analysis. Antibiotic resistance genes can be detected by DNA

sequencing, even if the microorganisms that contain them are difficult to grow in culture, which is often the case. The collective term for these genes is the **resistome**, and the risk posed by ever more widespread antibiotic-resistant microbes has been recognised as a global challenge (see Figure 1). Authorities in the UK rank the risk alongside that posed to the public by terrorism and pandemic flu.

Why is resistance on the increase?

As we have seen in previous *Updates* ('Bugs be gone', April 2018: www.hoddereducation.co.uk/bioreviewextras) the two main drivers behind the upsurge of superbugs are environmental use (e.g. in animal-based food production) and inappropriate use in human health. While some parts of the world have taken action to curb the environmental use of antibiotics, others are doing quite the opposite. For example, the Environmental Protection Agency in the USA has recently agreed that up to 195 000 hectares of citrus trees in Florida can be treated with 176 000 kg of the antibiotic tetracycline per year, to combat citrus canker and citrus greening disease. It is estimated that over 9000 citrus hectares are also treated each year in California.

In most of Europe the supply of antibiotics without prescription is prohibited, but in many European countries and elsewhere in the world they are nevertheless freely available for purchase. While some infections merit the use of antibiotics, many do not, and public understanding of how antibiotics work, how antimicrobial resistance arises, and the risks it poses, leaves much to be desired. It has often been said that physicians prescribe antibiotics inappropriately due to pressure from patients whose poor health is not the result of microbial infection. Numbers of antibiotic prescriptions being issued in England are being monitored, and it was found that simply sending a letter informing GPs that they were in the top 25% of prescribers reduced their antibiotic prescriptions by an average of 3%.

A recent study revealed that many patients felt that obtaining a prescription validated their ill health. Being able to tell the boss, or your school, that you have been prescribed with medication was perceived to lend credibility to the condition. However, many patients are just as happy to leave the healthcare centre without antibiotics but with an official National Health Service form entitled 'Treating your infection'. These steps are part of the Public Health England campaign to 'Keep antibiotics working', to which we should all lend our support.

Activities

- 1 Become an antibiotic guardian: <http://tinyurl.com/yb7u67td>
- 2 Send the above link to all your friends and family on social media and suggest they watch the video on the site and sign up too.
- 3 Take the antibiotic quiz: <http://tinyurl.com/y3e5bwgg> and circulate that link (includes simple explanations as well as the quiz).
- 4 If you live in the UK, compare the prescription of antibiotics by your GP or in your area to the national picture: <http://tinyurl.com/yxet5eob>

Further reading

'Study reveals unsettling multidrug antibiotic resistance in remote Arctic soil microbes'. *ScienceDaily*, 5 Feb 2019:

<https://tinyurl.com/ya8pdcch>

'How a supermarket salad can transfer antibiotic resistance genes'. *SciTech Europa*:

<http://tinyurl.com/yyngg7ah>

'Keep Antibiotics Working' campaign: www.youtube.com/watch?v=ef4QHUS5760

'Take your doctor's advice on antibiotics', NHS, 16 Nov 2018: <https://tinyurl.com/y2brbjb8>

'Antibiotic use on oranges gets Trump administration's approval', Center for Biological Diversity, 10 Dec 2018:

<http://tinyurl.com/y9uynxq8>

'The truth about antibiotics', BBC, 30 Jan 2019:

<http://tinyurl.com/ycjkarfq>

'Antibiotics frequently supplied without prescription, global review finds', *Telegraph*, 10 July 2018:

<http://tinyurl.com/y7clk4zy>

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