

# NOT drinking water

Toxin-producing microbes are on the increase in our lakes. **Liz Sheffield** explains why this matters

DAIZUOXIN/FOTOLIA

**H**ave you ever given any thought to where your drinking water comes from? Many of us take it for granted that the water delivered to our houses is safe and wholesome to drink. I come from London, where it is said that a drop of rain falling into the Thames at its source in Gloucestershire will have been drunk by eight people before it reaches the sea. That never bothered me, because I know that the folks responsible for London's water are bound by the European Union Water Framework Directive. This means that measures are in place to ensure that what comes out of European taps is good to drink. But last month the results of a study were published which show that this quality of water is becoming increasingly difficult to achieve.

## The Anthropocene

The Anthropocene is the (currently informal) name for the age we are living in. It denotes the period since the Industrial Revolution, during which land use has intensified, sewage discharge has increased, and our climate has been changed by human impact. All of these changes have had an effect on microbes found naturally in waterways. Some of these tiny organisms

— the **cyanobacteria** (also called blue-green algae) are thought to be those responsible for oxygenating the Earth's atmosphere, over 3 billion years ago. They are bacteria capable of harvesting the sun's energy via photosynthesis, so when they originally arose, they were probably the first organisms to release oxygen into the atmosphere.

We have much to thank cyanobacteria for. Without them we would probably not be here, breathing oxygenated air. The problem is, some of them don't just make sugars and oxygen, they also generate toxins. These compounds have been associated with liver disease and neurological disorders such as Alzheimer's and Parkinson's disease.

## Research results

The research published last month showed that cyanobacteria in lakes have increased significantly over the past 100 years (see Figure 1). The increase has been greatest in lakes which have additional nutrients, such as those where the runoff from agricultural land brings water laden with fertilisers. The research also revealed that cyanobacteria have increased more than other



Light microscope image of cyanobacteria

microbes and algae. The media have been quick to pick up on the concerns of the scientists that the amount of toxins in the lakes from which we extract drinking water may be on the increase. The research paper states:

Given that agricultural fertilisation is expected to increase two-fold over the next 30 years to meet the nutritional demands of an additional billion humans, particularly in urban centres, we anticipate that water quality degradation associated with cyanobacterial outbreaks will continue to intensify.

## What can we do?

We know that water bodies can recover from **eutrophication** (additional nutrient load). So before you start buying bottled alpine spring water, be reassured that governments around the world are taking steps to protect and improve the quality of tap water. Legislation such as the EU Water Framework

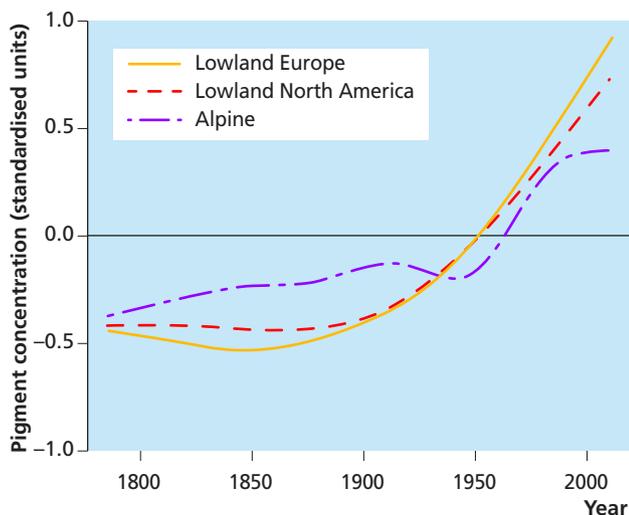


Figure 1 Concentration of cyanobacterial pigments in lake sediments over time.

Directive, which, as mentioned above, limits nutrient input to European water catchments, is important to the safety of our water supplies.

And have another look at Figure 1. Did you notice that cyanobacteria have also increased in alpine lakes during the Anthropocene? Most of these lakes are not subject to industrial or sewage effluent, or to agricultural runoff, so why are cyanobacteria in their waters on the increase? When you have answered the question, ask yourself what you, your friends and family can do to get that purple line nosing downwards.

## Activities

Take a virtual tour explaining how water reaches homes in the UK: <http://tinyurl.com/cvcww6g>

Find out how the pink colouration of flamingos is related to this article: <http://tinyurl.com/o3mevcc>

## Weblinks to follow up

The original research paper: Taranu et al. (2015): <http://tinyurl.com/qfby9cc>

*Daily Telegraph* article based on the above paper: <http://tinyurl.com/mbh344p>

Introduction to the new EU Water Framework Directive <http://tinyurl.com/6h8xw29> including a great summary movie from Bo Jacobsen, European Environment Agency water expert, who explains the 'true value of tap water': <http://tinyurl.com/oztvsum>

Welcome to the Anthropocene:

<http://www.anthropocene.info/en/home>

'Toxic blue-green algae closes Cambridgeshire sporting lake': <http://tinyurl.com/lp8eott>

Ancient soils provide early whiff of oxygen: <http://tinyurl.com/o37gq84>

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