Scientists monitor with phosphorus the algal blooms in European lakes

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Cyanobacteria bloom in a lake. Credit: CEDEX

An international research team has analysed the relationship between the amount of phosphorus recorded in 1,500 European lakes and reservoirs, and the growth of cyanobacteria, a toxin-producing microorganism. The results show that 23% of these water masses in Spain exceed the level established by the World Health Organisation (WHO). This percentage is closer to 50% for Germany and the Netherlands.

"Toxins produced by cyanobacteria represent a significant health risk both in water used for consumption and for recreation. However, levels of said toxins are not usually measured in recreational water, so the WHO has provided risk levels related to the quantity of these microorganisms in water," Caridad De Hoyos, researcher from the Centre for Studies and Experimentation in Public Works (CEDEX), explained to SINC.

Specifically, the WHO established two cyanobacteria concentrations (2 mm3/l and 10 mm3/l) which should not be surpassed in recreational waters as they could be harmful to human health representing low and moderate probabilities respectively. The potential effects identified range from skin irritation to allergic reactions and serious digestive problems.

Now, a study carried out by scientists from the Joint Research Centre (JRC) and other European centres - including CEDEX - reveals that 23% of lakes and reservoirs in Spain exceed the first level established by the WHO, which could lead to cyanobacteria blooms in some of them. The data is published in the *Journal of Applied Ecology*.

In general, the lakes in central Europe present the most significant health risk. In some countries, over half have exceeded the level 1 - 53% in the Netherlands and 47% in Germany. The situation is better in the Nordic countries such as Norway and Sweden, where this problem affects barely 5% of their water masses.

To obtain this data, the researchers have compared the amount of cyanobacteria with recorded levels of phosphorus in 1,506 European lakes. "The increase of cyanobacteria detected in the last few decades is due to the increase of nutrients in water masses, especially phosphorus," De Hoyos explains.

Phosphorus from agriculture and industry

Scientists have developed a model which gives the maximum potential capacity of water masses to produce cyanobacteria at different phosphorus concentrations reaching lakes and reservoirs from agricultural or industrial activities.

The results show that the probability of exceeding the WHO's level 1 for recreational waters increases from around 5% when there are 16 micrograms per litre (µg/l) of phosphorus present, to over 40% if there are 54 µg/l of the nutrient.

It has also been observed that approximately 50% of lakes studied do not exceed the cyanobacteria levels given by the WHO even though they have high concentrations of phosphorus. According to De Hoyos, "this shows the importance of other factors, such as the water renewal rate, in cyanobacteria growth".

The researcher highlights that the model "can be used to identify nutrient levels which allow us to keep water masses used for recreational purposes, in accordance with required risk levels and the service they provide".

[www.agenciasinc.es/var/ezwebin … balses_image488_.jpg]
Cyanobacteria bloom in a lake. / CEDEX

More information: Laurence Carvalho, Claire McDonald, Caridad de Hoyos, Ute Mischke, Geoff Phillips, G_abor Borics, Sandra Poikane, Birger Skjelbred, Anne Lyche Solheim, Jeroen Van Wichelen, Ana Cristina Cardoso. "Sustaining recreational quality of European lakes: minimizing the health risks from algal blooms through phosphorus control". *Journal of Applied Ecology* 50: 315-323, 2013.

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