Dietary supplements containing different types of algae claim to be rich in minerals that help improve mental acuity and concentration. While many of these products are neither useful nor harmful, products containing blue-green algae have raised serious concerns. Consumers have repeatedly complained about pain and discomfort after consumption. A study carried out by toxicologist Prof. Dr. Daniel Dietrich from the University of Konstanz has now tested all algae products available in Germany for contamination with toxic substances and the results have raised serious doubts as to the suitability of such algae products for human consumption.

The dietary supplement industry touts the positive effect of algae products. The majority of commercialised products are based on blue-green algae such as Spirulina and Aphanizomenon flos-aquae or green algae such as Chlorella. Algae food supplement manufacturers often advertise their products as "blue-green algae". However, the term blue-green algae is misleading as the organisms used in such products are cyanobacteria rather than algae, i.e. plants.

The claimed effects often sound downright fantastic and range from improving general well-being and nervous system function to optimising brain function. However, the German Federal Agency of Risk Assessment warns that there is no scientific evidence for the propagated effect of cyanobacterial products (1). With regard to product ingredients, manufacturers’ advertisements are also misleading as the products tend to contain a relatively low quantity of nutrients.

Manufacturers also vaunt the natural origin of their products, something that rarely stands up to close scrutiny. "While Chlorella and Spirulina are usually grown in huge artificial tanks, most Aphanizomenon flos-aquae algae (known as "blue-green algae") are produced in a large artificial freshwater lake (Klamath Lake) in Oregon, which is used as drinking water for cattle as well as bathing and consequently has a high bacteria count and a high degree of eutrophication,” says Prof. Dr. Daniel Dietrich, environmental toxicologist at the University of Konstanz. Prof. Dietrich and his team of researchers at the University of Konstanz have conducted a study in which they examined blue-green algae products for the presence of potentially harmful substances.

Microcystin contaminations
Certain types of cyanobacteria produce toxins (microcystins) that cause liver damage. Dietary supplements made with blue-green algae that grow in the wild are likely to be produced from toxic and non-toxic types of algae that tend to exist side by side. Microcystins have a similar effect to death cap toxins in that they can cause serious liver damage and are therefore highly dangerous. The researchers used common laboratory methods such as ELISA and protein-phosphatase-inhibition assays for determining the microcystin concentration in the algae products. They also used cell culture cytotoxicity tests and mass spectrometry to carry out a general analysis of the algal extracts. "We identified toxic substances in all products investigated," Dietrich says.

In addition, the scientists found that some of the cyanobacterial products were contaminated with components that cause irritation leading to diarrhoea and nausea. "We know that these substances are not microcystins, but little else is yet known about them," Dietrich explains. While the components that cause irritation usually only have a temporary effect, regular consumption of products containing microcystin can have a permanent effect on health. "Amongst other things, the products may lead to progressive damage of the liver, kidneys and even the brain," Prof. Dietrich explains. However, the adverse and undesired effects on human health of food supplements made from cyanobacteria are poorly documented. "All we currently know about the toxic effect of microcystins is that they may lead to liver damage, diarrhoea, nausea and dizziness," Prof. Dietrich says. The German consumer organisation Stiftung Warentest has classified these products as risky (2) and the World Health Organisation has rated cyanobacterial peptide toxins as potentially carcinogenic (3).

Lack of thorough testing

The reason why many cyanobacterial dietary supplements are available for purchase is down to the fact that they are not subject to the same strict requirements as drugs before they are placed on the market. Although manufacturers are liable for product safety, direct sale of the products makes comprehensive monitoring by food authorities virtually impossible. "Dietary supplements, if they are tested at all, only undergo rudimentary testing, which often involves the use of tests that are fairly unsuitable for detecting the potential presence of toxins and contaminants," Dietrich says. The tests used do not often
detect the damaging effect of products with the result that increasing numbers of people are experiencing problems after buying and consuming algae products.

Industry reactions on the study results

It goes without saying that the producers of cyanobacterial dietary supplements are far from overjoyed with the researchers’ findings, but this is quite understandable. They are taking all necessary steps to defend themselves against the accusations. "The food supplement producers are taking legal action to try to prevent the publication of our data and are closely scrutinising our results. However, they have not yet met with any success," Dietrich says. The publication of the study would be a major setback for the companies involved and possibly cause a decline in revenues.

Is there an alternative to dietary supplements?

Prof. Dietrich does not believe that there is an alternative to algal dietary supplements. "We do not need any alternatives. These dietary supplements are, apart from generating a healthy balance sheet for manufacturers, completely unnecessary for the human metabolism and the extra intake of vitamins and trace substances is not required," Dietrich says explaining that following a healthy and balanced diet provides the body with all the nutrients it needs. "We can easily cover our weekly vitamin and mineral requirements with fruit, fruit juice, mushrooms, vegetables and fish," Dietrich says.

Sources:

   Joint press release of the German Federal Institute of Drugs and Medical Devices (BfArM) and the German Federal Institute for Health Protection of Consumers and Veterinary Medicine (BgVV)


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