



Algae as the food of the future

The interview with Prof Dr Susanne Baldermann from the University of Bayreuth is about algae in nutrition. Products made from algae are already being used in food in Europe today, e.g. gelling and thickening agents or colourings. Fresh algae will probably also end up on our plates more in the future, as they are interesting as vegan alternatives and there is already research into fish substitutes. Algae are rich in macronutrients such as proteins and unsaturated fatty acids and micronutrients such as carotenoids and flavonoids. However, some algae also have a high iodine content.

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KUestions is a video podcast format produced by the Akademie für Neue Medien (Bildungswerk) e.V. and the University of Bayreuth for the project Ernährungsradar. Experts are interviewed on various topics in the context of nutrition and report on the current state of research. The interview was conducted by Matthias Will from the Akademie für Neue Medien (Bildungswerk) e.V. and Helen Regina, a Master's student of Food Quality and Safety at the University of Bayreuth.

Recommended literature on the topic

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English translation of the German interview transcript

Matthias Will: Dear audience, it's interview time again for our Ernährungsradar project. We would like to welcome you. The University of Bayreuth and the Akademie für Neue Medien are working closely together on this project and together we are shedding light on trends and facts about nutrition. Today we are looking at algae and similar plants that could end up on our plates in the future. "What, algae as food?" you might be wondering. Yes, that's what the future could actually look like, as we will show you today in our interview. I'm Matthias Will from the Akademie für Neue Medien.

Helen Regina: My name is Helen Regina. I'm studying for a Master's degree in Food Quality and Safety. Today we are guests in the library on the campus of the University of Bayreuth in Kulmbach. Our guest today is Professor Susanne Baldermann. She teaches Food Metabolome at the University of Bayreuth.

Matthias Will: Professor Baldermann, it's great to have you with us today. Food metabolome, that sounds very exotic. What exactly are you researching?

Prof Baldermann: Actually, the working group is researching bioactive ingredients. You are all familiar with bioactive ingredients as food ingredients that can prevent or minimise non-communicable diseases. These include diabetes and cardiovascular diseases, for example. We in the working group want to find out how, for example, biodiversity, climatic changes or preparation and production affect the ingredient profiles. To do this, we use a modern technology called mass spectrometry. This technology has developed considerably over the last 10 to 20 years and this development means that it is now possible not only to look at individual ingredients, but also to qualitatively and quantitatively record the complex metabolome, i.e. the ingredients of a biological system, and thus gain profound insights into the functioning of biological systems.

Matthias Will: You are also researching algae as food. Do we have to prepare ourselves for algae and similar plants becoming a standard part of our diet in the future?

Prof Baldermann: I hope that they will not only be part of our diet in the future, because the German Nutrition Society already says that we should consume 400 grams of vegetables and 250 grams of fruit every day. I therefore hope that they will not only be part of our diet in the future. Algae, although perhaps not visible to us because it is not the algae itself, but actually products made from algae such as thickeners or gelling agents or even colourings, are actually found on our plates every day. What is perhaps new for European cuisine is the consumption of fresh algae. But here, too, I can definitely see a future and a trend, looking at the market, that we might find it in our salads in 10 or 20 years' time.

Helen Regina: How often should algae be consumed?

Prof Baldermann: That is of course a very difficult question. Algae are very different. We know about 6,500 algae. Algae are generally very rich in macro- and micronutrients. In terms of macronutrients, I would perhaps mention proteins or fats. Algae are very rich in unsaturated fatty acids, which are also very relevant in terms of nutritional physiology. And on the other hand, algae are rich in so-called micronutrients, which include carotenoids or flavonoids, i.e. antioxidant substances. All of this would make algae a very valuable food source and you might think you could eat any algae every day. But there are also some algae that accumulate iodine, for example, so you shouldn't have every algae on your plate every day to avoid an oversupply of iodine, for example.

Helen Regina: It is claimed that algae help with weight loss. Is that true?

Prof. Baldermann: This is very exciting and our research work is certainly still in its beginnings, but there are indeed epidemiological studies that suggest that algae or frequent consumption of algae can help to reduce body weight. And there are again special carotenoids present in algae that are being discussed in this context. I would like to mention fucoxanthin and peridinin as examples.

Matthias Will: How many foods are currently available in Germany and Europe that are made from algae or similar protein sources?

Prof Baldermann: Unfortunately, I can't give you an exact number, but what I think everyone has noticed is that products made not only from algae, but also from pulses such as peas or soya or from wheat, perhaps known to some as seitan, are actually more common in supermarkets. In addition to algae, I would also like to mention mushrooms and insect flours. That means we have a variety of products that actually enrich our market. I checked, the German Federal Statistical Office has listed a production volume of 98,000 tonnes per year for Germany for 2021 and we assume that production can actually double by 2027. The products that are particularly in demand from consumers at the moment include classic meat products such as burger patties or minced meat, as well as the classic bratwurst.

Helen Regina: In Israel, scientists are conducting intensive research into algae-based fish and alternative marine fish. Do you believe that this development will also come to Germany and that consumers will be open to these new foods?

Prof Baldermann: I am quite sure that it will come to Germany. I myself have already eaten fish fingers made from pea protein and I believe that when these algae protein substitute products get into the area where we remember traditional foods, they will be just as popular on the German market as soya or pea products.

Matthias Will: So are we in Germany keen enough to experiment or would you like to see more impetus?

Prof Baldermann: I would like to see more impetus, but I have actually noticed increasing interest in the transformation of cultivation systems and new product categories in recent years. And I think anyone who goes to the supermarket will see the growing shelves of such alternative foods. So I think we are keen to experiment and I would be delighted if this curiosity could be maintained and perhaps transferred to other groups of people, so that we can perhaps persuade even the last person to leave meat off their plate or replace it for once.

Helen Regina: Do you also collaborate with other research institutions or companies in your research activities?

Prof Baldermann: Yes, that is of course very important and I am personally convinced that we can only solve the major global challenges if we carry out interdisciplinary and transdisciplinary research and work. In the large collaborative projects in which we are involved, we work together with very different disciplines. These can range from agricultural sciences to nutritional sciences, materials sciences, economics and indeed futurology. And, of course, industrial companies that are active in the field of innovative food are also involved.

Matthias Will: Why is the exploration of new plant-based food sources so important?

Prof Baldermann: Simply on the basis of the global challenge. We have an increasing or growing world population and at the same time we have a limit to our natural resources. I have just read figures according to which, taking climate change into account, around 60% of crop production needs to be increased. We can only achieve this 60% if we look for alternative foods. Firstly, this means utilising biodiversity. At the moment, we use very few plants at all for our human diet. Secondly, we need plants that can actually grow under changing climatic conditions such as increased drought, increased heat periods and salinised soils. And last but not least, there is the change in dietary behaviour. We are seeing a strong trend, we are seeing an increase in the number of population groups that are eating a vegan and vegetarian diet and we are currently at around 10% in Germany.

Helen Regina: On which areas are algae and other saltwater foodstuffs cultivated?

Prof Baldermann: It varies greatly depending on the geographical conditions. If we traditionally look at where algae were first consumed and cultivated, these are countries where agricultural land was scarce but more water was available. Later, aquacultures in coastal regions were added and nowadays food is actually increasingly produced inland in order to supply the urban population with fresh and regional food.

Helen Regina: Unfortunately, algae from the wild are often contaminated with toxins and heavy metals. Would cultivation in tanks completely prevent this contamination?

Prof Baldermann: I think we have great potential to influence the ingredient profiles of our algae and one area is contamination and heavy metals. This can be specifically prevented by testing the materials for such systems for heavy metals or by ensuring that the nutrient solutions do not contain minerals or heavy metals that you do not want in your product.

Matthias Will: The problem with these indoor cultivation systems is that they are very energy-intensive because there is no natural sunlight; the light has to be generated artificially. Are there any solutions for producing more energy-efficiently in future?

Prof Baldermann: Exactly, there are initial solutions. One very simple approach is actually to think about locations. New production facilities are actually being built in areas where renewable energies are available, be it solar energy or waste heat from industry, for example. In addition, if you look at the technological developments, the area of light is particularly worth mentioning. The classic greenhouse lamps were very energy-intensive. And now we have LED technologies available which, on the one hand, have the potential to save energy, but on the other hand also offer the possibility of actually influencing the intensity and quality of light in a targeted manner and thus specifically responding to the growth phase of the respective plant or algae or also specifically modulating ingredient profiles, for example, when selecting the appropriate light regime.

Helen Regina: You spent several years teaching and researching in Japan. What experiences did you have and what can we learn from the Japanese way of life?

Prof Baldermann: Perhaps in relation to today's topic, I would like to mention two aspects, one of which is regionality. The regional production and consumption of foods such as fruit and vegetables, but also milk and dairy products. And the second thing I would like to mention is the deep understanding or appreciation that the Japanese have for food. This has a very long tradition. You realise this when you sit down at the table and eat together. You usually start with "Itadakimasu", which is the first thanks. You end the meal with "Gochisosama desu". This is something that doesn't occur at all in European culture and, again, in a simplified sense it's a thank you, but in a philosophical sense you're actually thanking the masterpiece you've just eaten.

Matthias Will: So we Europeans can learn a lot from the Japanese when it comes to nutrition. That was a nice closing statement, Professor Baldermann, thank you very much for being with us today. Thank you very much for the interview.

Prof Baldermann: Thank you very much.