

Cheese-based magic taste for the green transition

Cheese is a key solution to improve our green eating behaviour due to its contents of umami and kokumi compounds.

Green eating and its obstacles

Sustainable and healthy eating has become a global concern, with a focus on a green transition towards eating more plant-based foods. However, there is a question about the palatability of these foods for humans who have evolved with a preference for the taste of meat. While the consumption of plant-based foods needs to increase for environmental sustainability and health reasons, not everyone needs to become vegetarian or vegan. Savouring the taste of food is fundamental for overall well-being, balancing enjoyment with moderation. Therefore, a plant-forward flexitarian diet with a certain component of animal-based food to impart deliciousness is the need of the hour. This can also provide a nutritious, healthy, and sustainable planetary diet without compromising taste.

Do Japanese scientists have the solution?

Almost a century ago, a Japanese scientist Ikeda identified a distinct taste in foods like tomatoes, cheese, and meat. This taste was different from the classical sweet, salty, sour, and bitter, which led him to term it 'umami' or 'palatable taste' and proposed it to be a new, fifth basic taste. But later, Japanese scientists found out that our understanding of the taste was more complicated. For example, simmering a stew can enrich the taste and make the flavour deeper and more pleasant, and aged cheese has a more complex flavour with a longer after-

taste compared to fresh cheese. Then what is the reason for this enhanced palatability? The presence of certain free amino acids, peptides, nucleotides, and free fatty acids is now known to be associated with umami or kokumi sensations in food. While umami is recognized as a basic taste, kokumi is elicited by certain kokumi compounds that lack a characteristic taste of their own. However, these kokumi compounds can increase sweetness and umami, decrease bitterness, and create a lingering and more savoury experience.

Cheese and palatable plant-based dishes

Greens typically lack umami and kokumi, which raises the question of whether they are delicious enough to be consumed in larger quantities. There are two main approaches to making greens more palatable. First, umami and kokumi-rich condiments such as soy sauce, fish sauce, mature cheese, etc. can be directly added to greens. Second, the fermentation of greens can hydrolyse proteins and produce umami and kokumi compounds. It is well known that mature cheese contains a high content of free amino acids, peptides, nucleotides, and free fatty acids that can increase the



ASSOCIATE PROFESSOR, KARSTEN OLSEN¹; PROFESSOR, OLE G. MOURITSEN¹; HEAD OF STRATEGIC INNOVATION PROJECTS, INGER HANSEN²; ASSOCIATE PROFESSOR, MICHAEL BOM FRØST¹; ASSOCIATE PROFESSOR, MIKAEL AGERLIN PETERSEN¹; SENIOR RESEARCH SCIENTIST, VALENTIN RAUH³; RESEARCH SCIENTIST, JANA SPÄTH³; POSTDOC, HUSNAIN RAZA¹; INDUSTRIAL POSTDOC, SHAGHAYEGH KESHANIDOKHT²

¹DEPARTMENT OF FOOD SCIENCE, DESIGN AND CONSUMER BEHAVIOUR, UNIVERSITY OF COPENHAGEN, COPENHAGEN, DENMARK

²LACTOSAN A/S, RINGE, DENMARK

³ARLA FOODS, ARLA INNOVATION CENTRE, AARHUS N, DENMARK

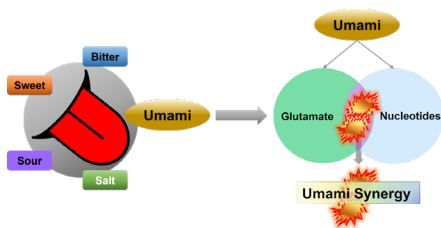


Fig. 1. Illustration of umami and umami taste synergy

Project info:

Title: How cheese can promote a green eating behaviour

Project manager: Karsten Olsen, Department of Food Science, University of Copenhagen.

Participants: University of Copenhagen, Lactosan A/S, Arla Foods,

Project period: January 2023-December 2025

Objective: The project aims to focus on the urgent need for global changes in food production systems to mitigate anthropogenic impacts on Earth's ecosystems. Emphasize the significance of promoting sustainable and healthy eating through a green transition, particularly by incorporating more palatable plant-based options, while considering the evolutionary aspects of human preferences for meat, umami, and kokumi tastes.

MEJERIBRUGETS
FORSKNINGSFOND

umami and kokumi perception. As shown in Fig. 1, the umami taste is elicited by the presence of glutamic acid in its free ion form (glutamate). The glutamate in the presence of certain nucleotides further amplifies the umami taste. The research project funded by the Danish Dairy Research Foundation and Innovation Fund Denmark, was launched as a collaboration between the University of Copenhagen (Department of Food Science), Arla Foods, and Lactosan aimed at investigating how cheese can promote a green eating behaviour. A wide range of different types of mature cheeses have been selected for analysis and mapping of the flavour compounds responsible for the umami/kokumi sensation. The resulting data will be compared and evaluated by using experienced panellists at Lactosan to correlate the measured chemical compounds with the sensory perception of the cheeses (Fig. 2).

Cheese powder, a magical condiment

With the knowledge of the high potential of mature cheese in making food taste more palatable, we plan to mix different types of cheese to enrich our experience even more or for-

mulate cheese-based ingredients with special functional effects such as reducing the content of salt in a tomato soup or sugar in a chocolate spread. NCB (Natural Culinary Boosters®) is a cheese powder range developed by Lactosan that can be used in low dosages to enhance the flavour of food products without giving any cheese taste.

How can the industry benefit from this research?

Facilitating the green eating behaviour of consumers by using dairy products as a condiment can clearly benefit both industry and consumers. The research can provide substantial knowledge about the flavour compounds and their correlation with our sensory perception of mature cheese, especially Danish cheeses. This means that the results can benefit the local and large-scale cheese producers by making it possible for them to take part in promoting a more sustainable eating behaviour as well as produce dairy products in a smarter way geared towards a more sustainable food system.

Summary

Sustainable eating emphasizes increasing plant-based foods for health and environmental benefits, but the preference for meat's taste is a challenge. A flexitarian diet, which includes some animal-based foods for flavor, is recommended. Japanese scientists discovered umami and kokumi tastes, enhancing food palatability. Cheese, rich in these tastes, can make plant-based dishes more appealing. Research funded by Danish organizations explores how cheese can promote green eating. This research benefits both consumers and the food industry by enhancing flavor without compromising sustainability, making it easier to adopt a more plant-forward diet.

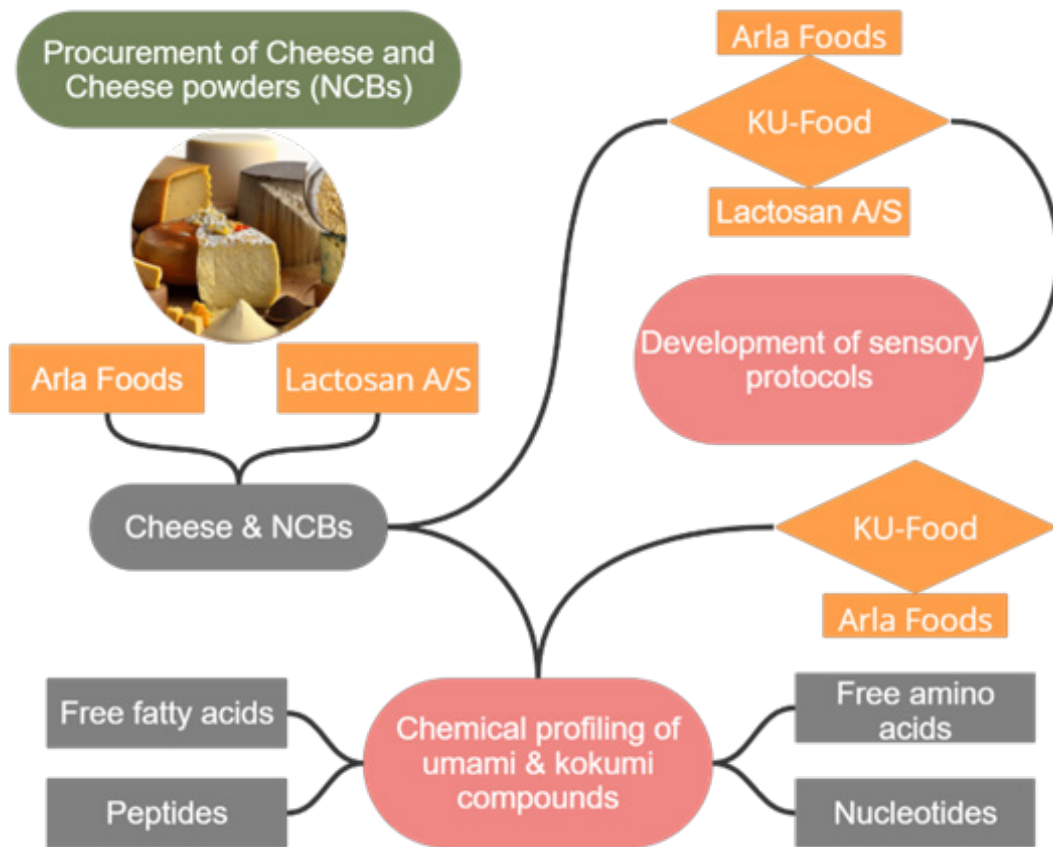


Fig. 2. Project flow chart of the chemical profiling of umami/kokumi compounds and sensory evaluation