



Impact Objectives

- Reduce salt, fat and sugar levels in cheeses, meats, bakery products and ready-to-eat foods, whilst at the same time maintaining their nutritional and sensory qualities
- Preserve the products' nutritional and sensorial qualities, safety and affordability to ensure wide adoption of the project technology at a European scale

Tasty business

By creating new formulations for food products that can be developed by industry and then embraced by the consumer, the TeRiFiQ consortium are playing an important part in improving global health

With global levels of diet-related obesity and diseases on the rise, there is increasing focus on how to improve the nutritional value of the food people are consuming. The World Health Organization recognises the importance of a healthy diet as protection against non-communicable diseases such as diabetes and heart disease. As a key part of this, WHO Member States have agreed to 'reduce the global population's intake of salt by 30 per cent and halt the rise in diabetes and obesity in adults and adolescents as well as in childhood overweight by 2025'. In order to achieve this significant reduction in Europe, the European Commission is identifying preventive policies that deliberately target high salt, sugar and fat content in foods. The big challenge is to


retain the taste and texture qualities of those food groups that people enjoy.

To provide the scientific and technological background to support this type of policy development a project called TeRiFiQ (Combining Technologies to achieve significant binary Reductions in salt Fat and sugar in everyday foods whilst optimising their nutritional Quality) is attempting to identify the balance between maintaining what people love about food, the taste and texture, whilst reducing its salt, sugar and fat content. The TeRiFiQ consortium is attempting to reduce salt, fat and sugar levels in cheeses, meats, bakery products and ready-to-eat foods as some of the key food groups people consume that tend to have higher contents of these ingredients.

The targets are audacious, especially when you consider that they are endeavouring to decrease the levels of saturated fats and sodium by up to 50 per cent in cooked and dried cured sausages, decrease the sodium content by up to 30 per cent in different types of cheese, and reduce the fat levels by up to 50 per cent in sauces that are used in processed foods.

TASTE TEST

With so many countries across Europe having such a close relationship with their food, attempting to achieve these kinds of reductions is a major undertaking. Maintaining the nutritional and sensory qualities of the food is one of the keys



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to achieving successful uptake by the consumer, so this is a focus for the TeRiFiQ team. The project is broken down into eight distinct work packages, including four research work packages looking at reducing sodium content and improving fat composition in different products, and one work package that is focused on the transfer of technology, dissemination and outreach.

Applying this to ready-made sauces and meals is particularly challenging in regard to the aspects of food, such as taste and smell, which are highly dependent upon individual experiences but impact the sensory characteristics of the original product. The team are delving into the macro- and micro-structure of the foods, and estimating the nutritional value of reformulated foods versus traditional products. For this part of the project the researchers are using multiple emulsions and cryo-crystallisation methods, as well as encapsulated or microcrystalline salt to achieve sodium reduction. This includes laboratory and pilot scale studies to identify the fat and salt reduction strategies with the most potential. From these findings it is hoped that the reformulations and cooking processes can then be refined.

INDUSTRY SUPPORT

Part of this work has involved the formulation and production costs of real food, which then feeds directly into the work package group tasked with building a body of knowledge about how the in-mouth perception of food changes when faced with lower fat, sodium or sugar content in foods. The objective of this component

is to help understand how combinations of taste and aroma impact on stimulation of taste. Transferring this knowledge and demonstrating it at an industrial scale is fundamental to the outcomes of TeRiFiQ. Understanding the applicability of the technologies that the R&D work packages have developed in an industrial production process requires the team to identify requirements for technical adaptation of existing processing methods. They also need to evaluate how the outcomes for reformulated products compares to the existing product in terms of quality and production volume.

There are 16 European partners involved in TeRiFiQ, all of whom bring important scientific experience across a number of fields of value to the research, as well as several industrial partners, who are critical to ensuring the successful transfer of technologies to industry. Working closely with industry is an important part of this project as this enables the team to make sure that the outcomes are practical and ready to be used at an industrial scale for the European market. To achieve this, demonstration activities have been carried out by several SMEs from different European countries, where the production of reformulated foods by industry and consumer studies have been completed.

MARKET READY

The results speak for themselves. The team have been able to show a reduction in the salt levels of cheeses and a decrease in the fat content of cooked meat products, all without major impacts on the product

quality. The trials on baking goods have been more challenging – whilst fat-sugar contents reductions have been significant, this resulted in an increased textural hardness and chewiness. In addition, sensory evaluations of dry sausages with a 26 per cent reduction in salt were successful. One of their best results has been seen in the experiments on fat and sodium in ready-made sauces, where there was a reduction of up to 50 per cent, which was then applied to real products for testing.

The selection of products to be advanced towards market readiness was based on passing a number of criteria, including successful testing in a pilot processing line, acceptance at a consumer level, nutritional quality and safety testing and control, optimisation of sensory perspectives, and acceptability through the cost-benefit analysis. The close involvement of SME partners in advancing this component of the project has been essential to developing reformulated products at a commercial scale. One of the areas requiring assessment is how foods or constituents of food are defined and characterised and how the claimed effects can be substantiated. It is now hoped the new technologies advanced through TeRiFiQ can be widely applied to the food manufacturing industry. By showing how food products can be made with reduced salt, sugar and fat levels whilst retaining nutritional and sensorial qualities that are important to the consumer, the overall health of Europe can be improved.

Impact case studies

IT'S ALL IN THE TASTE

One of the problems with attempting to decrease salt in foods, according to TeRiFiQ Project Coordinator Dr Christian Salles, is the drastic changes in the matrix structure or composition of the food, which is what the TeRiFiQ partners are investigating through the flavour release and perception in reformulated foods part of this work. At the project's final conference Salles observed that the basis of their hypothesis is how interactions between aroma, taste and texture shape the overall food flavour: 'These complex sensory interactions can be used as a lever to compensate the loss of flavour in reformulated foods with a low content in fat, sodium or sugar.' They are particularly keen to improve understanding of how aroma and taste compound release during eating add to the perception of flavour.

The researchers worked with three academic institutes to study perceptual interactions, in vivo flavour release and temporal perception, and in vitro flavour release using a number of techniques, including sensory evaluation and chewing methods. It was concluded that aromas can be used to enhance taste perception, but this is highly dependent on the quality of the odourants and the composition and texture of the food. Salles explained that it is hard to draw general conclusions about flavour release and perception: 'In general, fat affects aroma release pulsation upon swallowing. However, in most cases, it is dependent on the food structure and composition.' Essentially, he is saying that food composition should be considered to optimise taste and aroma release and the overall flavour of food. This is helpful to further studies into how food composition impacts flavour release, and ultimately development of healthy reformulated products.

PRODUCING GOOD QUALITY LOW SALT CHEESE

Many of the European countries are known for their love of cheese but unfortunately this equates to a high consumption of salt. In fact, 5 per cent of the total salt intake in Europe comes from cheese, but in France, Greece and Italy this increases to 7 per cent. For the TeRiFiQ work package looking at cheese, four partners were involved, including INRA, ACTALIA and two Belgian cheese manufacturing companies. Given the large range of cheese types available, it is important that the effect of lowering salt is studied by type and not by cheese generally, so two were chosen: a semi-hard cheese and a soft brie cheese, both produced using pasteurised cow milk. The scientists started by identifying the main mechanisms that are modified by salt reduction and what is the acceptable level to the consumer of the intensity of changes as a result of this. They then looked at how to combine the salt reduction and the improvement of fat by increasing unsaturated fatty acids.

It was found that cheese ripening is 'not deeply modified by 30 per cent salt reduction' and that the general qualities of aroma, texture and functionalities seem to either be improved or not affected. A market study of consumers from the Bruxelles region was carried out. This discovered that 70 per cent of consumers are not concerned by low salt cheeses and also that the difference seen in taste preference is perceived. The findings from this part of the TeRiFiQ study have been disseminated through scientific and technical journals, and attendance at a number of conferences. In his presentation at the project's final conference late last year, Researcher Dr Jean-René Kerjean noted that it is possible to make good quality low salt soft, semi-hard and hard cheeses, and fat improved cheeses, but questioned whether consumers are really ready to buy the more expensive low salt cheese proposed by companies.

Project Insights

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