Fat receptors are important at the molecular level to regulate the sensory perception of oils and fats © Nutrswiss AG

Optimising the sensory perception of oils and fats with molecular biology

Nutriswiss AG is at the cutting edge of science and using enhanced production processes to deliver high-quality products

When assessing food, how we respond to sensory stimuli plays a key role. The organoleptic properties of oils and fats comprise a fascinating field of research that sheds light on both the fundamentals of human perception and the molecular mechanisms behind it. Nutriswiss AG, a Swiss specialist in the sourcing and processing of high-quality oils and fats, incorporates these findings into its development processes. This enables the company to offer functional and physiologically optimised lipids that are based on the latest scientific research.

Our sensory system is a complex network of receptors, nerve pathways and regions of the brain. Only with its help can we perceive and interpret our surroundings. As oils and fats have been essential for human nutrition for thousands of years, our sensory perception of them is highly developed. Whether they are perceived as tasty and/or pleasant is based on stimuli such as flavour, aroma, texture and even the acoustic and visual signals we receive from food, which are combined in the brain to form an overall impression.

Odour and taste are closely linked: orthonasally absorbed odours combine with retronasally absorbed ones — via the oral cavity and the pharynx — in the nasal cavity to form the whole olfactory impression. Flavour, perceived simultaneously on the tongue, is often associated with the four types of local papillae and the five basic tastes of sweet, sour, salty, bitter and umami. This was long regarded as being cast in stone. More recently, however, it has been discovered that fats can also be perceived via these receptors.[1] Although only usually considered from a medical point of view, this information provides detailed insights into the underlying mechanisms of sensory perception and helps Nutriswiss to develop and optimise its products and processes.

Important switching point: G protein-coupled receptor 120

Responsible for the perception of fatty acids in our body are, among others, the receptor CD36, which is responsible for fatty acid transport through the cell membrane, and GPR120, a G-protein-coupled receptor also known as FFAR4 (Free Fatty Acid Receptor 4). Studies have shown that GPR120 plays an important role in the regulation of energy metabolism, insulin sensitivity and inflammation.[2,3] GPR120 is also involved in the sensory perception of fats. The newly characterised receptor binds to certain fatty acids of different lengths, which trigger its activation.[4] The fatty acids function as ligands; that is, they form co-ordinate bonds with certain regions of the receptor molecule and influence its orientation for the resulting chemical reaction. Fatty acids are cleaved from triglycerides during lipolysis in the mouth but they can also be found in edible fats and oils. By interacting with the receptor, they directly influence vital metabolic processes and the sensory properties of food. Nutriswiss uses highly developed refining processes to enhance the lipid composition and the concentration of fatty acids. In this way, short-chain fatty acids can be selectively removed so that fats taste more

neutral and the fatty acid composition can be optimised to positively influence the sensory effects of lipolysis. The Nutriswiss team applies this knowledge to develop and produce high-quality, customised products that offer long-term added value to partners in the food industry.

Perception of bitter and fatty flavours

Another important receptor is TAS2R, which is indirectly involved in the sensory perception of oils and fats. TAS2R is a member of the Taste-2 receptor family and plays a role in the recognition of bitter flavours. By activating these receptors, certain substances can trigger a sour taste that relates to the sensory perception of oils and fats. The perception of bitter and fatty flavours thus interacts.[5]

In addition to receptors, inhibitors are also important when it comes to the regulation of sensory perception. These inhibit the activity of sensory receptors and thus modulate taste and smell. The number of taste buds and receptors on the human tongue is variable and differs from person to person. It therefore has a major influence on nutritional physiology and can affect taste preferences as well as the tendency to become overweight.[6]

The receptors respond differently depending on the fatty acid composition. Thanks to highly developed refining processes, Nutriswiss can influence the lipid composition and the concentration of fatty acids so that these flavour perceptions can be reduced. The elucidation of the function of various receptors reveals underlying metabolic processes at the molecular level that improve our understanding of the sensory relationships in fats and oils. Thanks to state-of-the-art analytics and optimised processes, Nutriswiss strives to remove unwanted fat constituents and improve the lipid composition to offer first-class products in terms of sensory and nutritional physiology.

Thanks to highly developed refining processes, Nutriswiss can influence the lipid composition and concentration of fatty acids to reduce undesirable flavour perceptions.

Martin Mäder, Head of Industry Sales at Nutriswiss, sees basic research in sensory perception as an important building block for future product development: "This is an exciting area of research that we are following closely. Our aim is to better understand the complexities involved in the sensory perception of oils and fats and to continuously optimise our processes and products. These findings may also contribute to the development of new flavours and fragrances in the future."

Martin Mäder, Head of Industry Sales at Nutriswiss
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Fat perception by the body's own receptors provide detailed insights into the underlying sensory mechanisms and help Nutriswiss to develop and optimise its products and processes.

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