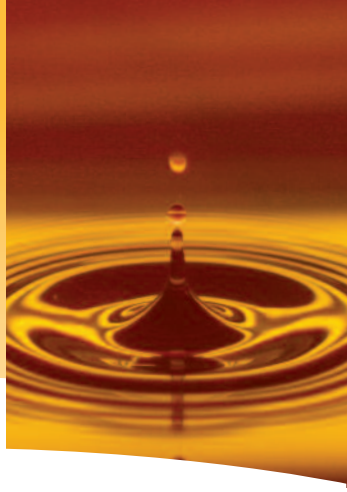
Innovation in processing and reformulation of vegetable oils and fats



Within the global context of health, diet and physical activity, the vegetable oils and fats sector is actively working on healthy solutions for the EU food market.

Despite different national diets in the EU, which present a variety of challenges for reformulating options, the industry has worked over the last 10 years towards achieving the following **goals**:

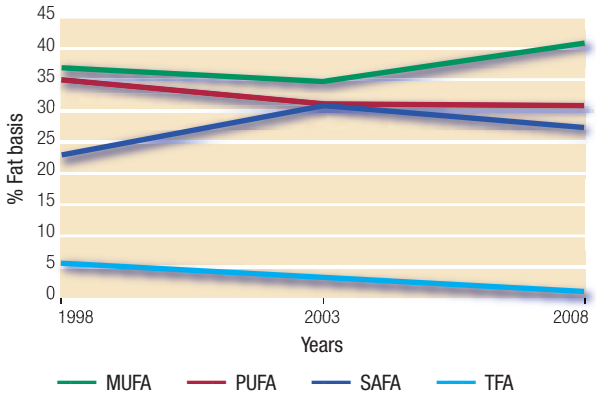
- lowering Trans Fatty Acids (TFA),
- lowering Saturated Fatty Acids (SAFA) and
- increasing Mono- and Polyunsaturated Fatty Acids (MUFA, PUFA)

The vegetable oils and fats industry is committed to deliver formulations with an improved nutritional profile to the food industry

- Significant improvements have been achieved in the last 10 years in reducing TFA and SAFA, and increasing MUFA and PUFA
- The vegetable oils and fats industry and food producers have to overcome technical challenges to deliver food products with the same functionalities and sensory properties
- Raw materials and innovative processes are in constant development with a clear cost impact

The vegetable oils and fats industry will continue working closely with its customers and with regulators to provide 'healthier' solutions in a flexible regulatory framework

Evolution of the vegetable oils and fats content in TFA, SAFA, PUFA and MUFA from 1998-2008



Results

- The average **TFA** content in vegetable oils and fats has decreased over the last 10 years from 5.3 to 1% on fat basis, which corresponds to a relative decrease of 81%.
- A slight increase of **SAFA** can be observed from 1998 to 2003, followed by a decrease from 2003 to 2008 reaching 27.3% of total fat. Further important reformulation efforts have taken place since 2008.
- An increase of the **MUFA** content can be observed in 2008 compared to 2003, which corresponds to a relative increase of 17%.
- The level of **PUFA** has remained relatively steady over the last 10 years. Since 2008, initiatives aiming at increasing PUFA are being implemented.

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REDUCTION OF TFA

- Since the 1990's, the industry has **invested significantly** in reducing TFA levels across all product areas. Reformulations and process innovations could not be achieved easily or without significant investments in equipment, R&D, packaging, product acceptability testing, stability testing, resources, etc. - on the part of both the oil processors and the oil users.
- Consequently, a **substantial reduction of TFA** in most foods has been achieved, bringing the daily average intake of TFA in the diet below the recommended 1%E*.
- However, specific **technical challenges** remain. They concern replacing TFA in certain food applications (such as confectionery coatings and cream, fillings, puff pastry, etc.), where there is a need to increase crystallisation speed, produce a hard structure, ensure oxidative stability, provide other specific technical functions (aeration, melting behaviour), as well as maintaining satisfactory taste and mouthfeel.
- The reductions to date have been achieved **in part by replacing TFA with SAFA** (physical characteristics of TFA and SAFA are similar, both are "structure making fats" that are solid at room temperature) using alternative raw materials with a hard or semi-hard structure and with a higher SAFA content (eg. palm, and coconut oils), by the use of antioxidants in some instances, by the use of new higher stability oils (eg. high oleic sunflower oil and high oleic rapeseed oil), and by innovation in processing (including, for example, full hydrogenation of liquid oils, use of slightly hydrogenated fats with limited TFA content, and optimisation of refining conditions for liquid oils).

Example:

The confectionery application is the most challenging one in terms of technical functionalities (crystallisation and melting) and sensory properties (mouthfeel).

Both vegetable oils & fats and animal fats (dairy and meat), contribute to TFA and SAFA intake levels. As FEDIOL we can only influence the vegetable oils & fats part, meaning that we can only partly impact intake levels. The recent industry initiatives have actually resulted in smaller parts of the TFA and SAFA intake coming from vegetable oils & fats*. The further we reduce TFA and SAFA, the less improvement opportunities there is for us.

Confectionary coating fats were traditionally partially hydrogenated fats high in TFA, to obtain best melting behaviour. In the past years, TFA levels have been drastically reduced, sometimes with increasing SAFA levels to come to an acceptable functionality. These types of fats are used in the biscuits and confectionary industry. Slower crystallization and slower melting, less optimal mouthfeel are existing challenges.

Conclusions:

- At present, large amounts of TFA can be successfully removed from most foods. However, it is critical to keep the flexibility in production processes, where hydrogenation and even (slightly) partially hydrogenated products have clear technological and sensory benefits and at the same time remain a satisfactory option from a nutritional perspective.
- A complete ban on TFA may have counter-productive effects because achieving the same functionalities may require using higher SAFA solutions.

(*) EFSA opinion on TFA (2004) and EFSA opinion on dietary reference values for fats (2010)

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REDUCTION OF SAFA

- Reducing SAFA while simultaneously retaining low levels of TFA is in certain cases very challenging.
- Also, because of the **different diets** across the EU-27, SAFA intakes are widely variable, with intakes in some Member States already below the WHO recommended intake of 10%E.
- However, against this background, the industry itself has engaged in **substantial R&D activity** to reduce SAFA levels in recent years. In a number of product launches and reformulations, SAFA-levels have been reduced, sometimes by as much as 30%- and even in some cases, by more than 50%, depending on the application. Examples exist in the areas of deep frying oils, biscuits, confectionery creams & caramel. Some products however, cannot be reformulated without losing their protected regulatory status: eg. chocolate, ice cream, ...
- The **technical challenges** are similar to the replacement of TFA and vary depending on the food category (for both functional and organoleptic properties). SAFA-rich products have a hard structure, better oxidative stability, increased crystallisation speed, specific melting profiles and better aeration properties.
- The **current approaches** to SAFA reduction include full or partial replacement of raw materials with high SAFA content by low SAFA ingredients (eg. palm kernel by palm, palm by liquid oils).

We cannot solve the TFA or SAFA issue alone. Other relevant dietary contributors need to be considered as well.

- **Potential solutions** may also include the use of structuring agents (can be hard fats), use of anti-oxidants, use of higher stability oils (e.g. high oleic sunflower oil), new focus on processes and adaptation in production for oil producers, as well as adaptation at the application level by the oil users.
- Further substantial **investments** are needed in oils and fats processing (new and adapted processes) and reformulation (R&D, raw material, etc.). The change to low SAFA vegetable oils and fats also requires investments by the oil users.

Examples:

In the past, the oils used for deep frying contained many hard fats, mostly partially hydrogenated vegetable or animal fats. To reduce TFA levels, many of these fats were replaced by non-hydrogenated palm based products. With TFA virtually removed, lowering SAFA is next in line, through increasing use of liquid oils. However, challenges concerning reduced oxidative stability and in some cases reduced crystallization speed challenges remain to be managed.

Conclusions:

- Some major challenges still remain for which solutions are needed, but a number of successful examples show the potential for SAFA reduction.
- Notwithstanding, potentially significant **challenges** faced in attempting further SAFA reductions include: functionality, product flavour and texture, product stability, cost. Some of these factors may limit the scale of SAFA reduction.
- There is a considerable need to maintain the **flexibility** of production processes both for the vegetable oils and fats industry as well as the end users.
- The reduction of SAFA presents a **bigger cost impact** on product reformulation than in the case of TFA-reduction (higher raw material cost and/or adaptations needed in production).

INCREASE OF MUFA AND PUFA – IMPROVING THE FATTY ACID COMPOSITION

Current trends to increase MUFA and PUFA include:

- Blending different types of vegetable oils to improve their nutritional profile, especially in terms of omega-3 fatty acids, considered as the most deficient fatty acid in Western diets.
- Replacing, partially or totally, fats by liquid oils, resulting in an increase of unsaturated fatty acids in foods.
- Using new types of oils such as high oleic sunflower oil or high oleic rapeseed oil both rich in MUFA and bringing, in addition, new functionalities such as oxidative stability.

Example:

In bottled oils many different oil blends are used today as opposed to single oils (sunflower, rapeseed) in the past.

FEDIOL, the EU Vegetable Oil and Proteinmeal Industry, is the Federation representing the interests of the European oilseed crushers, vegetable oils producers/processors and protein meals producers. With more than 35 companies in 16 EU countries, FEDIOL members crush 36 million tonnes of oilseeds a year, and refine 17.5 million tonnes of oilseed/soybean oils and tropical oils, which amounts to 90% of the European food market for vegetable oils and fats (excluding olive oil). There are more than 150 vegetable oils and fats production facilities across Europe, employing approximately 20 000 people.

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Avenue de Tervuren, 168 (Bte 12)
B-1150 Bruxelles
Tel: +32 (0)2 771 53 30
Fax: +32 (0)2 771 38 17
www.fediol.eu