

Coping With the Trans Fat Exodus

Hydrogenated oil will be put under the magnifying glass now that the US FDA has announced the elimination of trans fat from formulated food and meat products.

by Henk Hoogenkamp

Interestified fats have been an ingredient in Europe since the 1920s, but presently “enjoy” widespread use throughout the world. Interestification hardens fat, very much the same as partially hydrogenated oils (trans fats), though without producing oils that contain trans fats. These chemically-altered oils are technically not the same as partially hydrogenated oils, though they have the same alarming health concerns. There are studies that show interestified fat raises blood glucose and suppresses insulin production, besides damaging heart health. The main technological advantage of the use of interestified and/or hydrogenated fats is that these oils are much less likely to go rancid when used for industrially further processed fried food and meat products. While food processors and restaurants will tout the removal of trans fats from their products, they

might remain coy about the fats that are used instead. While fried food enjoyment is cross-generational, the processing mediums used for frying gives a lot of room for debate. Frying oils to satisfy the needs of health-conscious people will especially see major changes in the years to come.

This is specifically true for trans fat such as hydrogenated oil, which will be put under the magnifying glass now that the US FDA has announced (November 2013) the elimination of trans fat from formulated food and meat products. The world’s largest retailer – WalMart (Asda in the UK) – has announced the removal of all industrially-produced trans fat in packaged food by 2015. In addition, the US National School Breakfast and Lunch programs require trans fat at 0g per serving and to limit saturated fat to less than 10 percent of all calories calculated on a weekly average.

Hydrogenated fat has been around for many years as the reliable workhorse for the fast food industry in preparing fried coated chicken and doughnuts alike. Hydrogenated fat used for frying has a longer shelf life, while it allows the fried food to obtain a crispy texture and clean flavor.

The modern trend is to utilize oil blends that are free of trans fats and moderate levels of saturated oil. The relationship between saturated fats and cholesterol remains a topic of intense debate. However, according to a study published in the American Journal of Clinical Nutrition (2010, 91 (3):535-546), scientists found no correlation between saturated fat and the risk of heart disease.

Shelf Life Concerns

While oil stability and shelf life might be of less concern in the family kitchen, oil shelf life is highly essential for food service operations. Industrial tunnel fryers expose oil to air which increases oxidative stress. In addition, the high frying temperatures accelerate the breakdown

of the oil, something that is further complicated by the release and accumulation of bread crumbs from the coated food and meat products. It is a fact that polyunsaturated fat such as soy oil, corn oil, and cottonseed oil break down quickly when exposed to air.

In comparison to polyunsaturated fat, the monounsaturated fats like canola oil, rice oil, peanut and sunflower oils, are more stable when used in industrial processing conditions. However, both mono- and polyunsaturated fats are significantly less stable than saturated fat.

The road to improve the stability of fat or oil is very important. Actually, there are currently only two options:

1. Use of saturated fat or solid fat
2. Use of high-oleic, low-linolenic oil

The latter group can be based on GM selectively-bred soybean or canola (rapeseed) oils or blends thereof. These oils are a healthier alternative to traditional frying oils. Besides the health aspects, high-oleic soy oil has a very long fryer shelf life and subsequently less changeover and cleanup downtime. In addition, there is less polymer build-up in the frying tunnel that improves maintenance efficiency.

Solid Fat Challenges

Oils without solid fat can be used in cooking coated foods and potato fries, while doughnuts – for example – typically need a solid fat composition, so as not to interfere with sugar and glazing adhesion.

Solid fats do not necessarily need to contain trans fats. Fully hydrogenated oil does not create trans fats, as there are no double bonds. On the other hand, standard partial-hydrogenation creates many unhealthy trans bonds. Another known method to produce solid fats is fractionation. This technique, with subsequent heating and cooking, creates different fat melting points and different functional properties. For example, palm stearin can be isolated from palm oil, with a melting point of 55°C. Like rice oil, palm oil contains high levels of tocotrienols – natural antioxidants – that add another barrier of protection to oxidation.

In the mind of the consumer, polyunsaturated fats are generally seen as healthy oils. However, that is only true as long as the oil is not heated. When heated to fry foods, polyunsaturated oil degrades and thus creates more reactive substances than monounsaturated or saturated fat. Yet, the industry continues to favor polyunsaturated fat, because it is a cheap processing source.

All fats and oils contain a mixture of fatty acids, some saturated and other unsaturated. Of the latter group, some with one double bond are referred to as “monounsaturated,” while two or more bonds are called “polyunsaturated fatty acids” or PUFAs. The distinct mixture of all these different fatty acids greatly confuses the consumer, interpreting the perception of “good

SOURCE: INNOVA MARKET INSIGHTS



► Krema Crunchy Natural Peanut Butter (US) features a “0g trans fat per serving” claim.

versus bad” fat sources. Hopefully, soon the shift away from the “bad trans fat” will soon allow a refocus on the nutritional spotlight on the oils and fats used in healthy food options.

Carcinogenic Concerns

Aldehydes are the breakdown compounds from polyunsaturated fat and these are more reactive which might have consequences to human health. Toxic aldehydes in foods and meat products that have been subjected to prolonged frying heating have been linked to neurodegenerative diseases and certain cancers.

When it comes to cancer, acrylamide should also be mentioned. Food scientists have known for at least 10 years that acrylamide is formed when cereal grains, potatoes and other plant foods turn brown through frying or roasting. Although no direct scientific link between cancer in humans and acrylamide ingestion has been established (yet), the US FDA has drafted guidelines in November 2013 urging to favor low sugar potatoes and cereals as well as increase frying temperatures in order to decrease acrylamide formation. It is estimated that in a typical American diet, up to 40 percent of calories contain acrylamide, with crispy French fries and crunchy potato chips the leader of the pack.

Rice Bran Oil Advantages

Rice bran oil, considered the world’s healthiest oil, also has the uniqueness of remaining unaffected at high heating temperatures. As such, rice bran oil is heart-healthy with an ideal fat composition (see table 1).

The American Heart Association considers rice bran oil as the most versatile and balanced, with its cholesterol-reducing properties attributed to gamma oryzanol that is beneficial in management of high-fat induced hyperlipidemia.

The crude rice bran oil is composed of 88 percent neutral lipids, 4 percent unsaponifiables, and 2-4 percent free fatty acids. The essential fatty acids contain both omega 3 (<1%) and 6. The unsaponifiable fraction is of great interest since this includes a mixture of naturally-occurring antioxidant

compounds, such as vitamin E and gamma oryzanol.

Rice bran oil has hypocholesterolemic influence with decreased Low Density Lipoprotein (LDL). This effect is due to the presence of high concentrations of unsaponifiables, including phytosterols, oryzanols and tocotrienols. The potent antioxidative properties of gamma oryzanol also act as a protective agent against UV light. The ferulic acid present in oryzanol prevents or slows down skin damage or aging. Also, the

presence of tocotrienols has a very positive effect on skin and can be considered a first line of defense as they neutralize or stabilize the free radicals generated in the skin when exposed to UV rays. Because these compounds can penetrate the skin quickly and get absorbed rapidly, they can help in skin repair. Gamma oryzanol, which contains ferulic acid esters, is not only very effective as antioxidant even at high temperatures, but also four times as effective as vitamin E in inhibiting cellular oxidation.

The golden colored rice bran oil – commercially available for almost a decade – has only gained popularity recently as cooking oil for stir-fry foods and is now widely available in North America, Oceania, West Europe, and Asia. Its clean, neutral taste and specific make-up signifies that it generally doesn’t burn. Rice oil holds up really well so there is no need to change it as often as other types of oil like soy or peanut oil. Free from trans fat with moderate levels of saturated fatty acids and high

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› The Supplier View: Maarten Goos, Loders Croklaan

How do you expect the natural and clean label trends to impact development and which ingredients are helping to drive this?

Hydrogenated fats and oils are not accepted anymore by consumers and manufacturers. For processing and shelf-life reasons, some products are still made with hydrogenated fats. The challenge for manufacturers is to replace these fats. This is now possible with ingredients like Cristal-Green the innovative non-hydrogenated crystallization starter that enables production of clean



› Maarten Goos,
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label confectionery products at high production speeds.

Tracing ingredients does not directly influence the development of new products but has a serious impact on the supply chain of raw

materials and the buying process of food manufacturers.

For 2014 we expect that many manufacturers will start investigating and implementing the use of traced materials in their fats and oils portfolio. IOI Loders Croklaan has anticipated this development and has started mapping the origin of its palm oil. By June 2014, IOI Loders Croklaan will be able to trace 90% of its palm oil back to a list of mills from which the oil sourced originated.

Is there still a role for functional confectionery and which health ingredients could be utilized here?

We expect that functional confectionery will remain a niche category. The average consumer is purchasing confectionery products for enjoyment and is therefore looking for the best possible eating experience, health benefits are of secondary importance.

We do believe in indulgent products with an improved nutritional profile via, for example, an aerated filling. In such a product the aeration serves both as an instrument to give the product an indulgent eating experience and a lower calorie count.

levels of antioxidants, rice bran oil resists breaking down at high temperatures.

Its smoke point – the temperature at which oil begins to smoke and degrade – is almost 260°C, compared to those of peanut oil 237°C, canola oil and olive oil at 226°C and 182°C, respectively. Rice bran oil, which has a slightly nutty aroma, provides a lighter and crispier texture for battered and breaded or coated foods.

Road to Microwavable Foods

There is little doubt that the trend is to minimally processed foods containing 100 percent natural ingredients. Furthermore, gluten-free foods are now trending in the arena of breaded or coated meat products.

Yet, gluten-free coated foods need to withstand the same rigid conditions as traditional coated foods: bind moisture inside the substrate, manage water migration, adhere the coating to the substrate, and create the desired texturizing properties. Gluten-free

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coating formulations usually contain tapioca, rice flour, and rice bran. These composition formulas apparently change browning and texture properties; though these changes are manageable.

When moisture inside the substrate is not properly immobilized or bound during the primary or secondary (re)constitution, the substrate can become soft or soggy (as opposed to juicy). Sogginess is excess moisture captured inside the substrate that is perceived by the consumer as a major quality flaw. This is specifically true for coated and formulated chicken products such as nuggets, patties, and Kiev's.

A proven way to reduce fat contribution to fried coated foods – total calorie load – is to reduce fat absorption by the coating system. Stabilized rice bran is especially now en vogue as a functional ingredient of up to 20 percent of the pre-dust and/or batter mix.

There is a delicate balancing act between reducing fat absorp-

tion during fry thermalization and achieving optimum sensory performance. Rice bran has contributed benefits to achieve these objectives.

The use of high-amylose starches, dextrans and hydrocolloids in batter systems is another way forward.

Hydrocolloids like hydroxypropyl-methylcellulose (HPMC) form an active barrier against moisture loss and oil absorption when fried.

HPMC has distinct thermal gelation properties that not only assist in batter functionality but also strengthens the batter coating when the product is thermalized in cooking oil, while reducing breaching cracking or blow-off.

The unique properties of stabilized rice bran and hydrocolloid gums, such as HPMC and carboxymethylcellulose (CMC) and tara gum, allow food formulators to create processing flexibility across all stages with final reconstitution and optimum consumer satisfaction.

Structured Plant Oil

A very recent innovation technology now allows the successful transformation of refined vegetable or plant oils to a semisolid trans fat-free structured oil by using low calorie sugars. In particular sugar alcohol-based structuring gelators like mannitol dioctanoate and sorbitol dioctanoate are the building blocks to accomplish these properties.

The sugar alcohol-based gelators can be successfully used to structure oils such as olive oil, rice oil, canola oil and soy oil. These octanoic-based compounds are amphiphiles or molecules that are

attracted to both water and fats. The gelation properties remain stable over a prolonged storage time, when mixed at a concentration of about 3-5 percent and thus forming into a three-dimensional crystalline network that encapsulate the vegetable oils in the liquid stage. By differentiating the type of alcohol-based structuring agents, both translucent and opaque appearances can be created while gel-strength can be varied as well. ▼

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Table 1: Fat Composition of Rice Bran Oil

Approximate fatty acid percentage by weight*	
Saturated Fat	24.0%
Mono-unsaturated fat (MUFA)	34.0%
Poly-unsaturated fat (PUFA)	42.0%

*It should be noted that the fatty acid composition (FAC) will vary and is slightly different depending on the geography of where rice is grown.



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These more stable clean label starches can be used in foods that need a heating process during production and are then for example stored under cold or refrigerated conditions. Furthermore they fulfill following requirements:

- short, creamy and glossy texture
- neutral taste
- add body to the mouthfeel
- excellent viscosity and storage stability in acidic or salty solutions
- reduced tendency to retrograde or syneresis under cool conditions



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