FOOD N° 3 1/07

nutri pro®

Nestlé Professional Nutrition Magazine

FAT, OIL AND CHOLESTEROL

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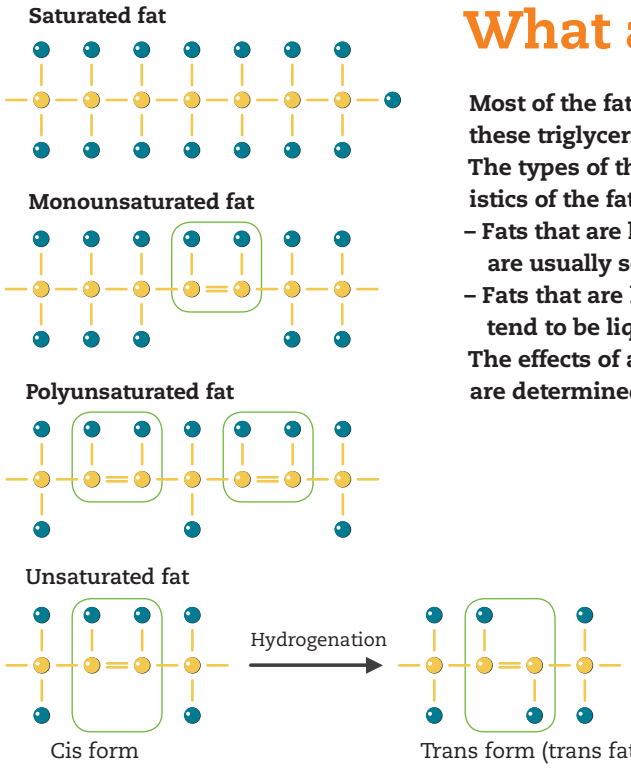
Nestlé PROFESSIONAL



What are fats?

Most of the fat in our food and in our diets is made up of triglycerides. Each of these triglycerides includes three fatty acids attached to a glycerol molecule. The types of the fatty acids determine the texture and the physical characteristics of the fat:

– Fats that are high in saturated fatty acids (so-called saturated fat, see graphic) are usually solid at room temperature.

– Fats that are high in unsaturated fatty acids (so-called unsaturated fat) tend to be liquid (oils) at room temperature.

The effects of a fat or oil on our health, as well as its cooking applications, are determined by its fatty acid composition.

What are fatty acids?

Fatty acids can be classified according to their number of double bonds:

Saturated fatty acids (SFA)

- They have no double bonds
- They are more stable; this means that saturated fat does not combine easily with oxygen in the air to become rancid (oxidation).

Unsaturated fatty acids

They contain one (monounsaturated) or more (polyunsaturated) double bonds

- Monounsaturated fatty acids (MUFA)
  - Monounsaturated oils are liquid at room temperature but start to solidify at refrigerator temperatures.

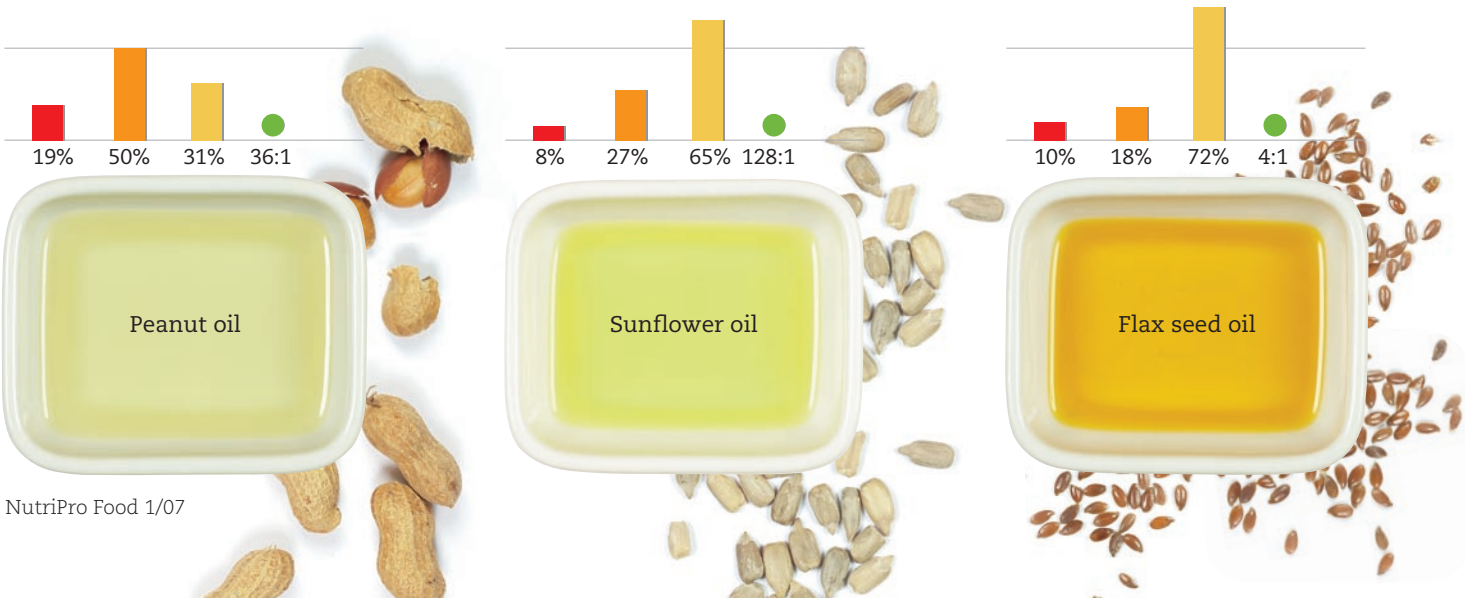
GOOD TO KNOW

Type of fatty acids and their effects on blood cholesterol levels

Type of fatty acid	Main source	Effect of cholesterol levels
Saturated fatty acids	Animal food, i.e. whole milk, butter, cheese, ice cream; chocolate; coconut-, palm- and palm kernel oil	LDL ↑ HDL ↑
Monounsaturated fatty acids	Olive-, rapeseed-, peanut oil; nuts, e.g. cashews, almonds, peanuts; avocados	LDL ↓ HDL ↑
Polyunsaturated fatty acids	Corn-, sunflower-, soybean-, safflower-, rapeseed oils; fish (e.g. salmon and tuna)	LDL ↓ HDL ↑
Trans fatty acids	Most margarines; vegetable shortening; partially hydrogenated vegetable oils; chips; industrialised food; natural milk products	LDL ↑ HDL ↓

LDL = Low Density Lipoprotein (bad) HDL = High Density Lipoprotein (good)

Average percentage of fatty acids in fats and oils SFA MUFA PUFA Ω6/Ω3 ratio



- Polyunsaturated fatty acids (PUFA)
  - Some of these fatty acids are essential
  - They easily oxidize, so that polyunsaturated fats become rancid easily.

The number and location of double bonds in fatty acids determine their health effects.

Omega(w)-3- and Omega(w)-6 fatty acids

Alpha-linolenic acid (polyunsaturated omega-3 fatty acids) and linoleic acid (polyunsaturated omega-6 fatty acids) are the two essential fatty acids for humans. They cannot be produced by the body and therefore they have to be supplied by our diets. In the body they are important for several functions such as for the structure/function of the cell membrane and for the development of the central nervous system (brain and retina). They are also necessary for producing hormone-like molecules.

A diet high in omega-3 fatty acids may reduce the risk of heart disease. Omega-3- and omega-6 fatty acids are found in plant oils (i.e. sunflower-, soybean-, rapeseed-, walnut-, grape seed- and corn oils), meat, eggs and fish. For a healthy diet, the balance between the omega-3- and the omega-6 families is important. A ratio of Ω6:Ω3 of 5:1 is recommended. You can get this right if your diet is rich in fish, leafy green vegetables and rapeseed oil. Currently the average ratio is 10:1.

Trans fatty acids

Trans fatty acids (TFA) are special forms of unsaturated fatty acids. In our diet they originate from three sources:

- TFA are naturally present in small amounts in dairy products, beef, lamb and mutton (ruminant animals)
- The major part comes from products that include hydrogenated or partially hydrogenated fats, such as hard margarine or manufactured products including hydrogenated fats (bakery products [rusks, crackers, cookies, biscuits etc.], snacks, instant soups etc.)
- From products which are heated and fried in oil at high temperatures, i.e. french fries.

Evidence from many studies indicate that TFA increased serum LDL ("bad") cholesterol and decreased serum HDL ("good") cholesterol. Thus, higher intakes of TFA may increase the risk of coronary heart disease.

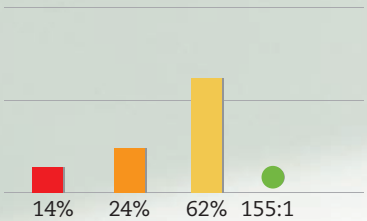
In the USA: the amount of trans fat has to be labeled on the nutrition facts panel of all packaged foods. This labeling is not necessary for foods served in restaurants.

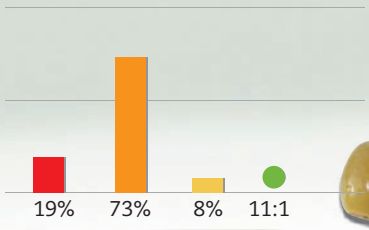
GOOD TO REMEMBER

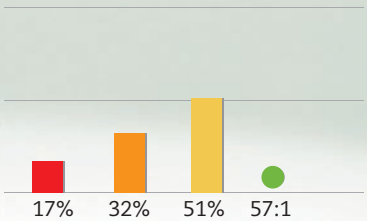
Recommended Consumption Fat (WHO 2003):
Total fat: 15–30% of daily energy (33–66 g per day for a 2000 kcal diet)

Fatty acids

- **SFA:** maximum 10% of daily energy (<22 g/day for a 2000 kcal diet)
- **PUFA:** 6–10% of daily energy (12–22 g/day for a 2000 kcal diet)
- **Ω–6 PUFAs:** 5–8% (10–16 g per day for a 2000 kcal diet)
- **Ω–3 PUFAs:** 1–2% (2–4 g per day for a 2000 kcal diet)
- **Trans fatty acids:** < 1% of daily energy i.e. <2 g/day for a 2000 kcal diet
- **Cholesterol:** < 300 mg/day







GOOD TO REMEMBER

Cholesterol

Lipids and cholesterol can't dissolve in the blood, so they need a special transportation system, called lipoprotein. The most important are:

- LDL: low density lipoprotein is often referred to as the "bad cholesterol". It transports cholesterol to the cells and contains a high proportion of cholesterol. A high level of LDL is associated with an increased risk of heart disease.
- HDL: high density lipoprotein is often referred to as the "good cholesterol". This carrier picks up cholesterol from the cells and transports them to the liver, where it is passed out from the body. A high level of HDL is associated with a decreased risk of heart disease.

What is cholesterol?

Cholesterol is a sterol, which is necessary in the body for producing cell membranes, some hormones and vitamin D. Our bodies would not normally be dependent on food for cholesterol, as the liver produces its own. However, cholesterol in the blood must be transported from cells and to cells by special carriers called lipoproteins. The two most important kinds of lipoprotein are LDL and HDL. Too much cholesterol in the blood (hypercholesterolemia) is a major cause of coronary heart disease and strokes. The effect of dietary cholesterol on blood cholesterol is individual and normally it is low in comparison to the effect of saturated fatty acids.

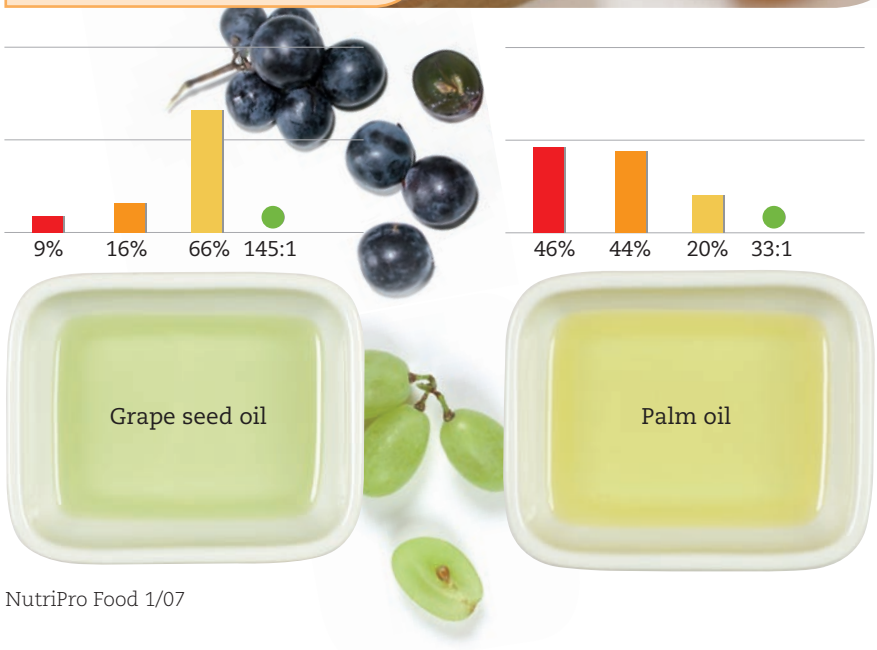
Where is cholesterol found?

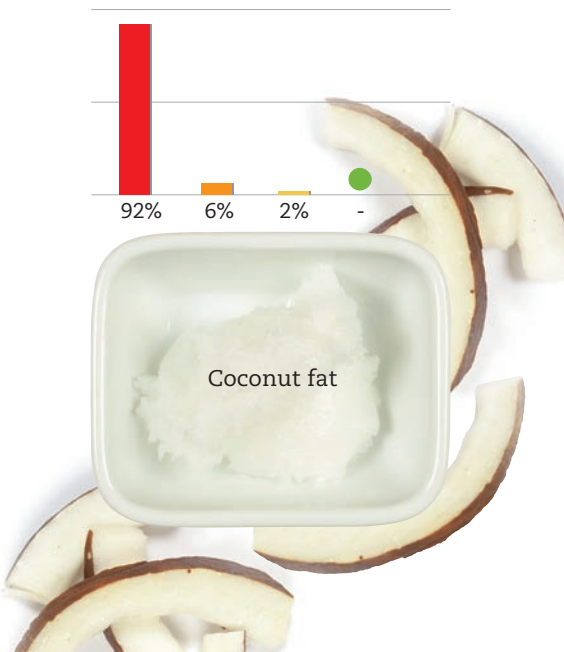
Cholesterol is naturally only found in animal foods. Plant foods, like fruits, vegetables or cereals, don't have any cholesterol. Foods high in cholesterol are for example egg yolks, organ meats (i.e. liver and kidney), butter, mayonnaise, cheese, and whole milk dairy products.

GOOD TO KNOW

Cholesterol content in foods

Food	Cholesterol (mg/100g)
Whole milk (3.5%)	12
Low-fat milk (1.5%)	5
Buttermilk	4
Cheese (cheddar)	100
Cream cheese (60% fat)	103
Cottage cheese (20% fat)	14
Egg (one)	314
Butter	230
Chicken wings	70
Beef (liver)	265
Beef (filet)	60





Application in the kitchen

Oils and fats have very different qualities related to their fatty acid properties and their applications in the kitchen.

Native vs. refined oil

Most important differences: flavor, aroma, and smoke point

- Refined oils:
  A pale, sometimes just a little bit yellow oil, with a neutral aroma and flavor, with defined and constant characteristics, heat-resistant with a high smoke point (temperature to which an oil can be heated before it smokes and discolors – indications of decomposition) and a longer shelf life.
- Native (unrefined) oils:
  Sometimes called salad oils or cold pressed oil
  – Characteristics: intensive coloring, a strong/full-bodied flavor and aroma depending on the raw material (i.e. olives, sesame seeds, peanuts), limited shelf life; the quality depends only on the quality of the raw material.
  – Application: normally used for salads, dressings, marinades, and sauces, or in low-heat cooking methods. Differences between the mixture of fatty acids and the health benefits hardly exist (exception: native oils have more vitamin E), and refined oils contain a marginally higher content of TFA.

GOOD TO REMEMBER

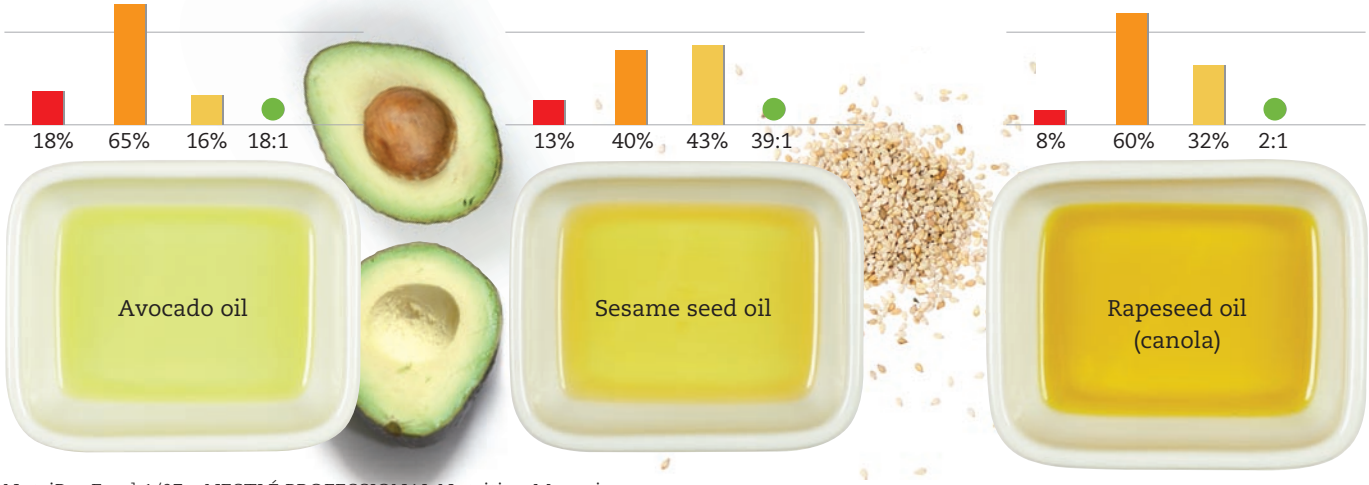
Hydrogenated fat

A chemical process transforms the unsaturated fatty acids of a liquid oil into saturated fatty acid and so to a more solid fat. This process is normally used for producing margarine and shortening. The greater the degree of hydrogenation the harder the oil/fat will be at room temperature and much more TFA are included. For example, a spreadable tub of margarine is less hydrogenated and has fewer TFA than a brick of margarine. The problem: TFA raise "bad" LDL and lower "good" HDL. The advantage of these fats: they are more stable and less likely to turn rancid. In the kitchen they are often chosen for deep-frying. Meanwhile, there are specific industrial processes which can reduce or even eliminate the amount of TFA in processed products.

GOOD TO KNOW

Tips for fat/oil application

- Generally: do not heat fat/oil above the smoke point – noxious substances will be produced.
- Never use butter at high temperatures – its smoke point is low and because of its water content it spatters; it can be used for sautéing.
- Low-fat products should not be used for roasting as they contain even more water (spattering).
- For salads use native oils – they contain more vitamin E, have a full-bodied flavor, and give a great taste. But they can dominate whatever dish is made using them.
- Vegetable oils are not normally suitable for baking, it is better to use them to treat baking tins and cake pans.
- Do not heat native oil too much – normally their smoke point is low (130°–190° C/265° F–375° F).
- During cooking above 150° C (305° F) TFA (from 0.02%–1.5% to max. 2%) will develop in the oil, but in comparison to the content of shortenings this is very low. This process occurs in particular in oils with a high ratio of PUFA.



Frying:

- In principle, the refined versions of oils can be used (e.g. safflower-, sunflower-, peanut-oil) for frying, but shouldn't be used too often at too high temperatures – the reason: they will break down too fast
- Too high temperatures reduce the shelf life of frying oil: free fatty acids are formed which reduce the smoke point and the shelf life. On the other hand, at high temperatures a lot of acrylamide will be formed (see NutriPro 2/06)
- Best practice: start heating at 60°–80° C (140°–175° F) for 10 minutes to melt the fat, then heat to 170° C (340° F) for frying for the best result
- Mix virgin olive oil, canola oil (low erucic acid rapeseed oil) and sunflower in a ratio of 1:1:1 – this oil has a very good flavor and a high level of stability
- Oils should be well filtered after each service period and changed on a regular basis.

Tips for some special oils/fats

Rapeseed oil (canola)

- It is highly recommended because its ratio of omega-6- to omega-3 fatty acids is 2.4:1 which is good for our health
- High oleic canola oil is an excellent frying oil.

Olive oil

- Oil labeled "virgin" or "extra virgin" is cold pressed; a process using no heat or chemicals; it can be used especially for salads and marinades
- For oil labeled "pure", heat and chemicals are used to press the olives; it can be used for stewing, sautéing and short roasting if the temperature is not too high

- Oil labeled "olive oil" may be a combination of cold-pressed and refined oil; it can be used for salads/marinades and for all cooking methods.

Shortenings

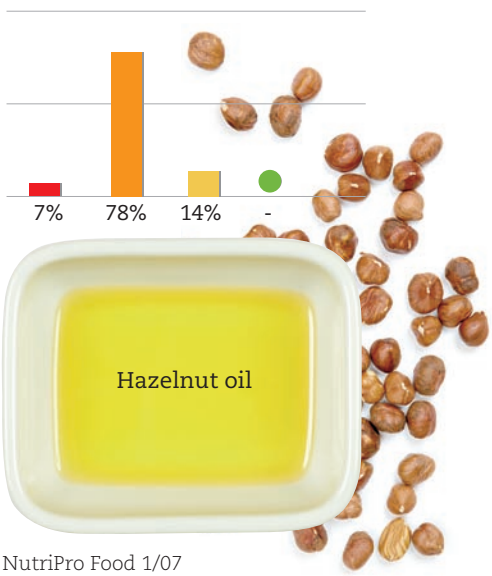
- They have a higher smoke point than butter and margarine and will not burn as fast
- They contain 100% fat, compared to 80% for butter and margarine – they do not spatter during heating
- Normally they are used for roasting, frying and baking
- Note: they may contain a lot of trans fatty acids.

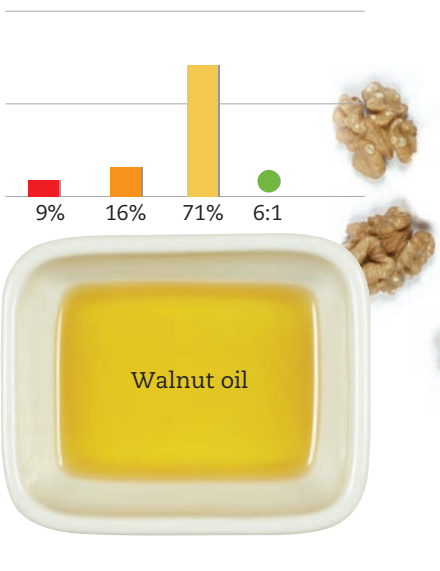
GOOD TO KNOW

The right fat/oil for every cooking method

Fat/oil	Roasting	Stewing/Braising	Sautéing	Grilling	Frying
Rapeseed (canola)	+	+++	+++	–	–
High oleic canola	+++	+++	+++	+++	+++
Olive	++	++	+++	+++	+
Sunflower	+++	+++	+++	+++	+
Safflower	–	+	+	–	–
Soybean	++	++	–	++	–
Butter	+	+++	+++	–	–
Shortening	+++	++	++	++	+++
Lard	+++	++	++	–	+++

+++ recommended – not recommended





GOOD TO KNOW

Tips to reduce fat in the kitchen

- Use cooking methods that need little or no fat like steaming, stewing/braising, sautéing and grilling
- Use an unsaturated oil spray to brown or sauté foods
- Use a rack to drain off fat when broiling, roasting or baking
- Juice/gravy from meat or vegetables should be thickened with mashed potato or vegetables instead of cream, eggs and flour
- Substitute half of the cream in sauces and baked goods with milk
- Frying fats that have been used too often provide up to double the intake of fat by the food – change the fat regularly
- Try to avoid deep-frying cooking methods
- Try to use lean meat and limited high-fat processed meats like sausage, bologna and salami
- Serve chicken or turkey rather than duck or goose – their content and balance of fatty acids is better
- Chicken and turkey are also healthier than fatty red meat
- Remove the skin before cooking poultry (except roasting) – a lot of fat is stored under the skin
- If possible, serve the chicken without the skin
- Use olives, nuts (e.g. walnuts, almonds, pecans) or seeds as toppings for salads rather than cheese – their balance of "good" fatty acids is better than that of cheese. But be careful: these toppings are high in calories, use them in moderation
- Look for hidden fats in the food used – try to reduce food with hidden fats like whole milk, fatty cheeses, cream, pork
- Avocado dips are better than mayonnaise. They also contain fat but the balance of fatty acids is better

QUIZ

1. **Saturated fatty acids have:**
   - O No double bond
   - S One double bond
   - C More than three double bonds

2. **At room temperature, polyunsaturated fat is:**
   - U Solid
   - L Liquid

3. **We should eat more fat/oil that includes omega-3 fatty acids because:**
   - O The taste is better
   - I It reduces the risk of heart disease
   - E It does not increase the risk of obesity

4. **Trans fatty acids may:**
   - I Increase LDL and HDL
   - T Reduce LDL and increase HDL
   - V Increase LDL and reduce HDL

5. **Cholesterol cannot be found in:**
   - M Meat
   - A Whole milk
   - E Fruits

6. **The LDL lipoproteins (transportation system for cholesterol) are called:**
   - I The good cholesterol?
   - O The bad cholesterol?

7. **Rapeseed oil is high in:**
   - N SFA
   - I MUFA
   - R PUFA

8. **Shortenings have a lower smoke point than butter.**
   - R Right
   - L Wrong

1	2	3	4	5	6	7	8

Answer: OLIVEOIL

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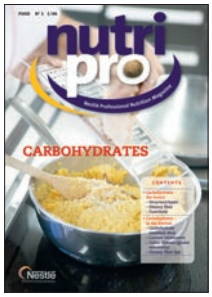

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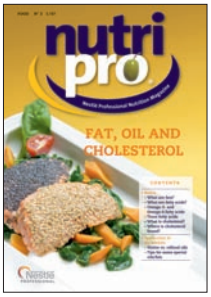

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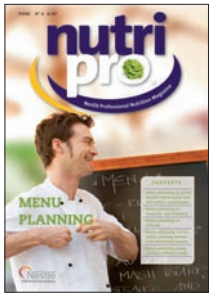
Fat, Oil and Cholesterols



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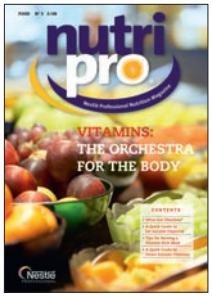
Menu Planning



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The Orchestra
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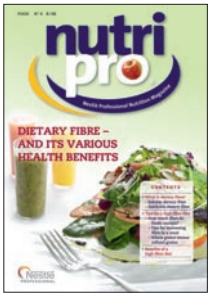

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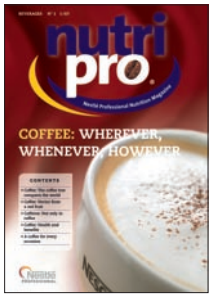

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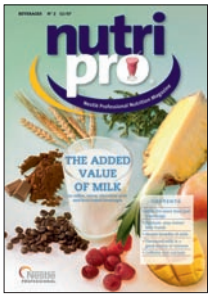
Coffee: Wherever,
Whenever, However



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