

Fats and Lipids



Lec -4



Lipids form a broad category comprising fats, oils, waxes and various other compounds like lipoproteins, phospholipids and cholesterol.

They are all water-insoluble and very useful for living organisms.

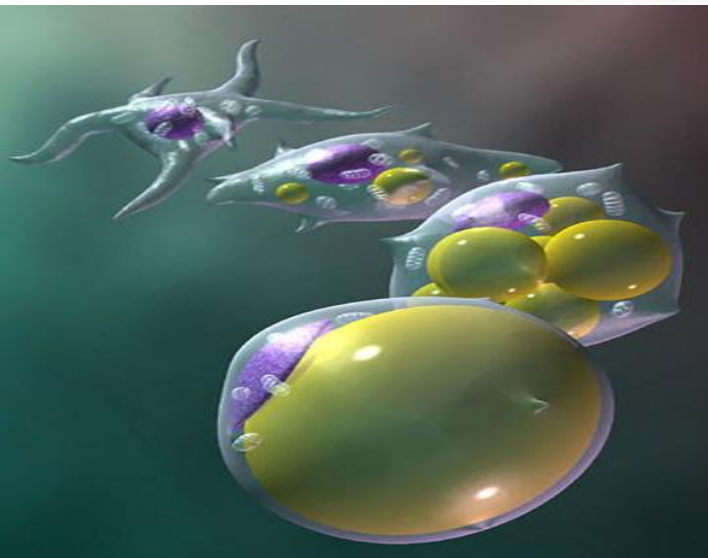
Fats are food components insoluble in water that represent a condensed source of energy.



FAT IN CELLS = ADIPOCYTES

- **After eating, the body stores some fat as an energy reserve**
- **The body has unlimited potential to store fat**
- **Excess carbohydrate and protein can be converted to fat, but they cannot be made from fat**
- **One pound of body fat, 3,500 calories**

1gm of fat yields 9 Kcal.



Lipids: a family of compounds that includes:

- **Triglycerides (fats and oils)**
 - **Phospholipids (lecithin)**
 - **Sterols (cholesterol)**
-
- **Obvious sources of fat are oil, butter, margarine and shortening**
 - **Other foods contributing fat include meat, nuts, mayonnaise, salad dressings, eggs, cheese, ice cream and whole milk**

Fatty acids of varying chain length occur naturally.

Saturated, Monounsaturated, and Polyunsaturated



The relative proportion and intake levels of these FAs are of primary importance in determining their significance in nutrition and health.

Saturated Fatty Acids

Saturated fats are generally solid at room temperature and tend to be animal fats.

- **meat, poultry, and full-fat dairy products**
- **tropical oils such as palm and coconut.**



Saturated fats

Saturated fats are found in animal products such as butter, cheese, whole milk, ice cream, cream, and fatty meats, and oils such as coconut, palm, and palm kernel oil.



Unsaturated Fatty Acids

Are liquid at room temperature.

- **Found in foods from both plant and animal sources**
- **Further divided into monounsaturated fatty acids and polyunsaturated fatty acids**

Monounsaturated fats are those mostly from plant sources [olive oil].



The polyunsaturated fats are also from plant sources, like margarine, sun flower, soybean and corn oil.



Trans Fatty Acids a problem with unsaturated fats in the foods is that the oxygen attacks (oxidation), causing damage that makes them rancid; rancid fats have an odor, bad flavor, and may cause illness.

One way to reduce vulnerability to oxidation is to artificially saturate the FAs by adding hydrogen at the double bonds.

This process makes the fat solid & more stable.

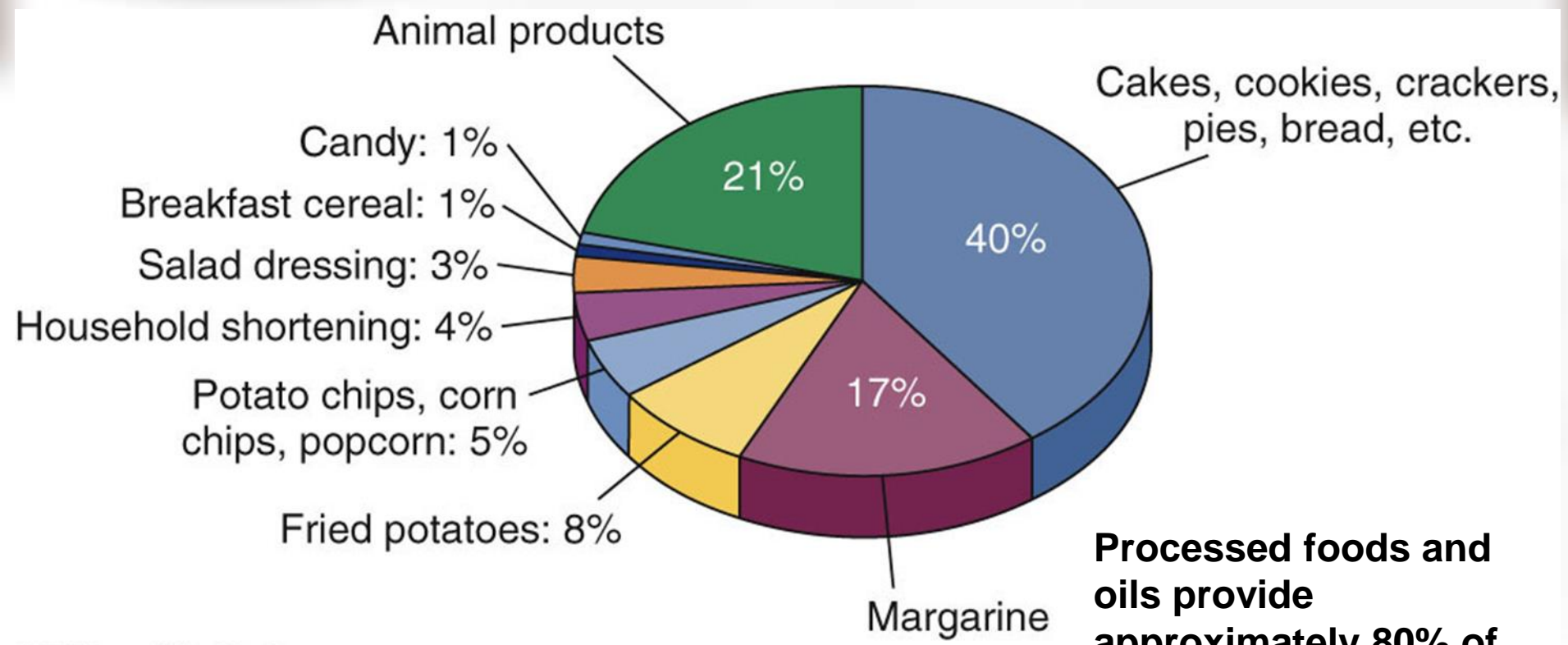


When vegetable oil, which is polyunsaturated, is completely hydrogenated, it becomes a white, waxy substance called [vegetable shortening].

Because it is saturated with hydrogen; the body processes it as if it were a saturated fat.



Trans Fat in Diet



Processed foods and oils provide approximately 80% of trans fats in the diet, compared to 20% that occur naturally in food from animal sources.

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Fats are a more concentrated fuel, providing [9Cal] for each gram consumed; therefore the fuel factor of fat is 9.

Fat should supply no more than 25- 30% of the total calories of a healthy person well balanced diet.

Maximum total fat intakes for adults

□ 30–35%E for most individuals

The majority of these calories, approximately 2/3 should consist of vegetable oil products (unsaturated fat) rather than animal food products or Trans- fat (saturated fat).



Minimum total fat intakes for adults

- **15%E to ensure adequate consumption of total energy, essential fatty acids, and fat soluble vitamins for most individuals.**
- **20%E for women of reproductive age and adults with BMI <18.5, especially in developing countries in which dietary fat may be important to achieve adequate energy intake in malnourished populations**



FATS IN FOODS

1. Source of energy

2. Palatability- fat makes food smell and taste good



3-Satiety and satiation- fat helps prevent hunger between meals, fat slow down digestion because of the hormones released in response to its presence in the GIT tract, causing us to feel full and satisfied, we call this feeling [satiety].

While [satiety] is another different aspect of fat consumption that occurs during , not after eating .

In contrast to satiety, satiation tends to increase our desire to eat additional fatty foods, not less.



Physiological Functions

1. Stored energy

2. Organ protection

3. Temperature regulator

4. Insulation



Essential Fatty Acids (EFAs)

Are those that cannot biosynthesized in adequate amounts by animals & humans which are required for growth, maintenance, and proper function of many physiological processes, are [PUFAs]. Linoleic, Linolenic, and Arachidonic acid are generally considered to be essential, although Linoleic acid can be converted by mammals to Arachidonic acid.

These EFAs serve important functions: membrane structure, cholesterol transport, and blood clotting and local hormone like effects.



High Risk Groups for EFAs Deficiencies:

Deficiencies have been noted in elderly patients with peripheral vascular disease (a potential complication of DM); in patients with fat malabsorption, and /or in patients receiving treatment for protein malnutrition with diets low in fat and high in protein.

Individuals recovering from serious accidents and burns are also at risk.

It is possible that individuals striving to achieve extremely low dietary fat intake could develop EFAs deficiencies.



The deficiencies of EFFAs associated with dermatitis, dryness, and desquamation and thicken of the skin, unsatisfactory growth, fatty liver, and impaired water balance, since Linoleic acid is vital for skin maintain the integrity of epidermal water barrier.

Also an increased susceptibility to infection is a common clinical problem for EFAs deficiency.

Linoleic acid is found in most vegetable oils, such as corn oil, cotton seed oil and Soya bean oil.

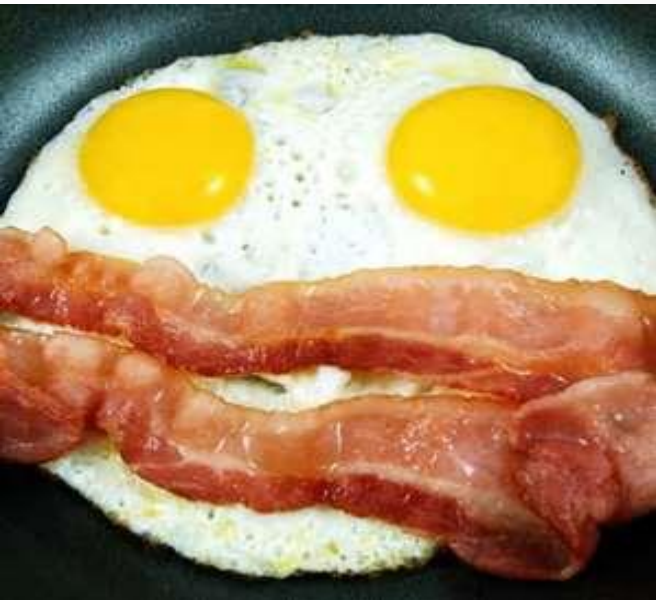


Toad skin



CHOLESTEROL

is a waxy substance found in all tissues in humans and other animals, all foods from animal sources, such as meat, egg, fish, poultry, and dairy products, contain cholesterol.



The highest sources of cholesterol are egg yolks and organ meats; no plant- derived food contains cholesterol.

A 70-kg male has about [140- 145g] of cholesterol, most of which in brain, nervous system, connective tissue, and muscle.

Blood contain about 8% of body cholesterol.



Lipoproteins

LDL levels reflect the amount of cholesterol being brought to cells that has the potential to be dropped off along the way to clog vessels and arteries, while HDL is removing cholesterol from the circulation; this is a positive action reducing the risk.



Good Fats/Bad Fats

Think Blood and Brain

GOOD

- lower total cholesterol
- lower LDL “bad” cholesterol

Monounsaturated

Sources: Nuts, canola, olive oil

Polyunsaturated

Sources: Seafood (Animal), Corn, soy, sunflower (Plant)

Omega 3's = polyunsaturates

BAD

- raise LDL
- lower HDL “good” cholesterol

Saturated

Sources: Meat, dairy, eggs and seafood (Animal); coconut, palm oil (Plant)

Trans

Sources: Fried foods, processed foods with hydrogenated oils

Blood Cholesterol Levels

Risk Classification	Total Cholesterol	LDL-cholesterol
Desirable	<200mg/ dl	<130mg/ dl
Border-line-high	200- 239mg/ dl	130-159mg/ dl
High	≥240 mg/ dl	≥160mg/ dl



Cholesterol can usually be decreased by doing the following:

- 1. Decreasing total fat intake ($\leq 30\%$ of the total calories).**
- 2. Decreasing saturated fat intake ($< 7\%$ of the total calories).**
- 3. Using unsaturated fats in recommended amounts. Poly-unsaturated fats $\leq 10\%$ of the total calories; monounsaturated fats $\leq 15\%$ of the total calories.**



4-Decreasing high- cholesterol food intake (< 200mg/day).

5-Reducing weight or maintaining a desirable body weight [CHO ≥ 55% of total calories, protein approximately 15% of total calories].

101HealthyRecipes.com

5 FOODS TO LOWER CHOLESTEROL



OATMEAL



FISH



NUTS



BLUEBERRIES



GREEN TEA



HIGH CHOLESTEROL TREATMENT OPTIONS

Lipid levels can be lowered with lifestyle changes, medications, or a combination of these approaches.

In certain cases, a healthcare provider will recommend a trial of lifestyle changes before recommending a medication.

The best approach will depend on individual situation, including lipid levels, health conditions, risk factors, medications, and lifestyle.



Lifestyle changes

— All patients with high low-density lipoprotein (LDL) cholesterol should try to make some changes in their day-to-day habits, by reducing total and saturated fat in the diet, losing weight (if overweight or obese), performing exercise, and eating a diet rich in fruits and vegetables.

The benefits of such lifestyle modifications usually become evident within 6 to 12 months



Medications

Statins

some foods, such as grapefruit or grapefruit juice, can increase the risk of side effects of statins. Most manufacturers recommend that people who take lovastatin, simvastatin, or atorvastatin consume no more than one-half of a grapefruit or 8 ounces of grapefruit juice per day.



Nutritional supplements

Fish oil — Oily fish, such as anchovies and tuna, contain two important fatty acids, called DHA and EPA. Eating a diet that includes one to two servings of oily fish per week can reduce triglyceride levels and reduce the risk of death from coronary heart disease. Fish oil supplements are believed to have the same benefit. A daily 1 gram fish oil supplement may be recommended if do not eat enough fish.

Garlic — A large trial showed that garlic is not effective in lowering cholesterol



Omega-3 fatty acids



There is considerable evidence for a preventive effect of dietary omega-3 fatty acids in the prevention of heart disease especially in a high – risk population .

Omega- 3 fatty acids improve dyslipidemia, vascular, platelet function and heart rate . They lower BP in hypertensive patients and can reduce the risk of sudden cardiac death.

In addition , insulin sensitivity has been positively correlated with the concentration of omega-3 FA in skeletal muscle. Therefore ,an increased intake may be of particular benefit to type-2 diabetes patients.



Also aids in the maintenance of joint health and relief of inflammation.

GOOD SOURCES OF OMEGA -3, include:

tuna, sardines, eating fish twice a week can provide omega-3 fatty acids.

Plant source include the walnut & Soybean.



Omega -3 preparations are now available in pharmacy , as soft gelatin capsule contain marine fish oil (1000mg [Cod, anchovy ,sardine and /or tuna] . Dose 1-3 /day before meal.



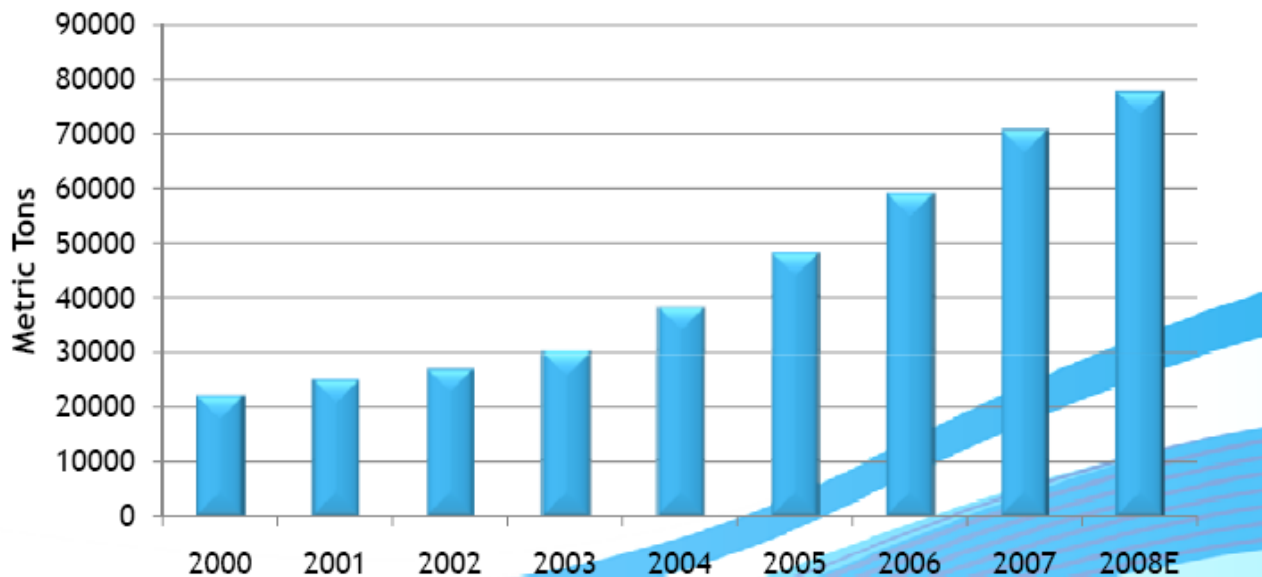
The National Academy of Sciences recommends a daily intake of 1.6g (men) and 1.1 (women)

The omega-3 market has grown rapidly during the past decade



The First Infant Formula With DHA and ARA – Nutrients Important To Babies' Mental And Visual Development

Global Omega-3 Fish Oil Market Volume



Health Problems with Fats



Health problems associated with fat due to both the type & the amount of fat eaten.

Saturated fat in the diet can raise bl.

Cholesterol level usually more so than dietary cholesterol.

High bl. Cholesterol levels increase the risk of atherosclerotic vascular disease & heart diseases.



There are indications that high fat – intake may be associated with higher risks of prostate, renal cell, colorectal, and breast cancer.

Fat sources particularly implicated with these higher risks are from animal sources, such as red meat, eggs, and dairy products.





PowerPlugs

Templates for PowerPoint

Type- 2 DM and HT are indirectly related to dietary fat intake.



Polyunsaturated fatty acids [PUFAs], appear to help prevent coronary artery diseases, some of PUFAs may be effective in moderating disease severity, including inflammatory diseases as rheumatoid arthritis & a topic dermatitis, as well as multiple sclerosis.



Many studies suggest that the consumption of monounsaturated fat, particularly olive oil, may reduce the risk of breast cancer.

Fish oil consumption may protect against the promotion of cancer by animal fat in colorectal and breast cancer.



How Can Excessive Fat and Cholesterol be avoided?

The reduction of serum cholesterol is more complicated than simply limiting dietary intake of cholesterol, it is important to limit the intake of saturated fat in the diet.



Choose foods in their most natural forms- for example, whole grains and fresh fruits & vegetables.

Limit use of fats such as butter, margarine, sauces. Use low -fat cooking methods such as broiling, baking or roasting, avoids fried foods.

Choose leaner cuts of meat, remove skin from poultry.

Substitute dried beans for meat with some meals. Choose low- fat dairy products such as skim milk, non-fat yogurt. Limit eggs to 2-3 /week.



Examples of fat in food

servings

fat

**cholesterol/
mg**

Examples of fat in food	servings	fat	cholesterol/ mg
Butter/ margarine	1Tbs	11g	31
Mayonnaise	1Tbs	11g	8
Cream cheese	1Tbs	10g	28
Carrots	1/2 cup	trace	----
French fries	10	8g	29
Apple	1	trace	----
Rice	1/2 cup	trace	----
Whole milk	1cup	8 g	4
Low fat milk	1 cup	5g	4
Lean beef, poultry, fish	85g	6g	70-85
Egg	1	5g	213/ egg yolk



قائمة غذائية لتخفيض معدل الكوليسترول بالدم

الفطور: كوب عصير طبيعي غير محلى او كوب حليب منزوع الدهن + قهوة او شاي بدون سكر + قطعة توست .

الغداء: قطعة لحم خالية من الدسم او سمك او لحم طيور مشوي او مسلوق او مقلي بزيت الذرة + خضروات بأنواعها الطرية والمطبوخة (**بأستثناء مرق البطاطا والفاصوليا اليابسة**) .

العشاء: قطعة جبن منزوع الدسم + قطعة توست + سلطة خضروات بدون زيت وحسب الرغبة + كوب عصير طبيعي غير محلى او كوب شاي حليب بدون سكر .

ملاحظة: تستخدم هذه القائمة للمرضى الذين لديهم زيادة في الوزن, اما المرضى قليلي الوزن فيجب اعطائهم مع هذه

القائمة السعرات التي يحتاجونها من الاغذية الخالية من الكوليسترول