

**COMPONENTS OF THE HUMAN  
DIET**

# “YOU ARE WHAT YOU EAT

What are some of the biggest nutrition-related health threats the world faces today?

In what way can we help people make sensible, sustainable choices?



**JAMIE OLIVER**

TEACH ALL CHILDREN ABOUT FOOD

# NUTRIENTS

Nutrients are chemical substances found in food that are used in the body

Nutrients are absorbed to give energy, help strengthen bones and prevent disease



# NUTRIENTS

**Food energy** comes from carbohydrates, proteins, and fats  
Units for food calories (kcal) or **kilojoules (1kcal-4.18kJ)**

Fats (lipids) are polymers of fatty acids and glycerol. They can be saturated or unsaturated

- Trans fats are particularly unhealthy

**Sodium (salt)**

- Keep it low

**Carbohydrates** are polymers of glucose (an energy source)

- Sugars are absorbed easily into the blood
- Dietary fibre (cellulose) can't be digested (healthy)

**Proteins** are polymers and sources of amino acids

- They are used to build new proteins in cells

**Vitamins** are organic compounds that are essential in small amounts

**Minerals** are minerals ions (elements) that are also essential

Average nutrition facts:

serving size 1 Big Mac (214 g)	
<b>total calories</b> 520	
	% daily value*
<b>total fat</b> 27 g	<b>41%</b>
saturated fat 9 g	<b>47%</b>
trans fat 1 g	
<b>cholesterol</b> 75 mg	<b>25%</b>
<b>sodium</b> 1 g	<b>42%</b>
<b>total carbohydrates</b> 45 g	<b>15%</b>
dietary fiber 3 g	<b>13%</b>
sugar 8 g	
<b>protein</b> 26 g	<b>52%</b>
vitamin A 8%	vitamin C 1%
calcium 26%	iron 25%
thiamin 26%	riboflavin 27%
niacin 38%	vitamin B12 32%
folate 26%	phosphorus 27%
magnesium 11%	zinc 28%

\*percent daily values are based on a 2000 calorie diet

(averaged over different types of McDonald's Big Mac)

**Nutrient:** a chemical substance found in foods that used in the body.

### Essential Nutrients

Cannot be replaced or synthesised by the body, so must be taken in the diet.

- Water
- Minerals
- Some vitamins
- Some unsaturated fatty acids
- Some amino acids

*Dietary fibre* is also necessary, though as it is not absorbed it is technically not a nutrient.

### Non-essential Nutrients

Can be replaced or synthesised by the body, so are not necessary in the diet.

- Carbohydrates/ sugars (energy could come from proteins or fats)
- Other minerals and some vitamins
- Saturated fatty acids
- Some amino acids.

*Dietary fibre* is also necessary, though as it is not absorbed it is technically not a nutrient.

# AMINO ACIDS

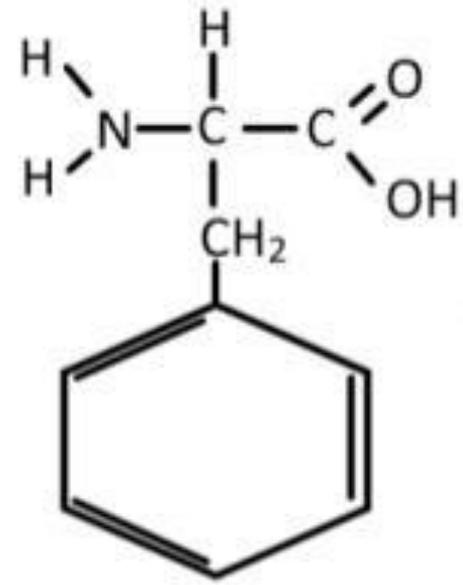
# AMINO ACIDS

20 essential amino acids

nine can't be synthesized

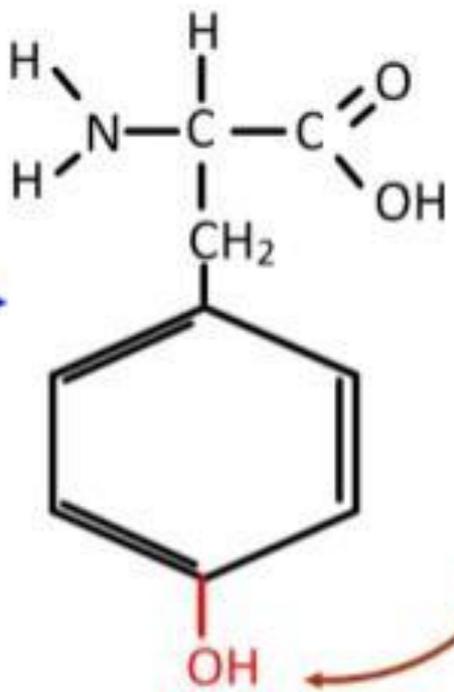


Non-essential amino acids can be produced from others, using enzymes\*.



**phenylalanine**  
(essential - must be taken in the diet)

phenylalanine hydroxylase



**tyrosine**  
(non-essential - used in building proteins and signaling in cells)

\* All reactions in living things (metabolic reactions) are mediated (controlled) by enzymes. Remember that metabolic pathways are chains or cycles of enzyme-controlled reactions.

# NUTRIENT DEFICIENCY

Deficiency is the term used to describe a situation in which

- a person is not getting enough of a certain nutrient
- causes a health problem.



# PROTEIN-DEFICIENCY MALNUTRITION

**Kwashiorkor: “The disease of the first child when the second is born”.**

**Lack of essential amino acids as a result of low protein intake (such as when breastfeeding ceases)**

**Reduction in enzymes, pumps and antibodies**



# PROTEIN-DEFICIENCY MALNUTRITION

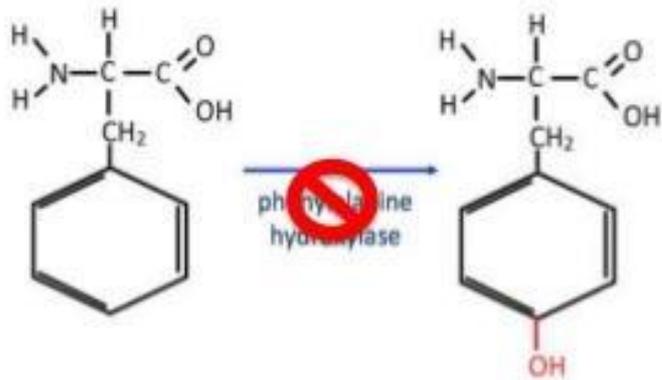
Edema (severe swelling) results as fluids gather in tissue. Growth is severely stunted and mental development impaired

## Risk factors

- Extreme poverty, overpopulation, large families
- Drought, war, poor infrastructure

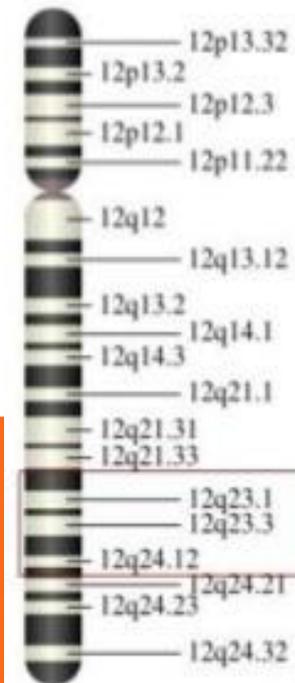
# PHENYLKETONURIA (PKU)

*INHERITED, PROGRESSIVE, DEGENERATIVE*



## Genetics Review

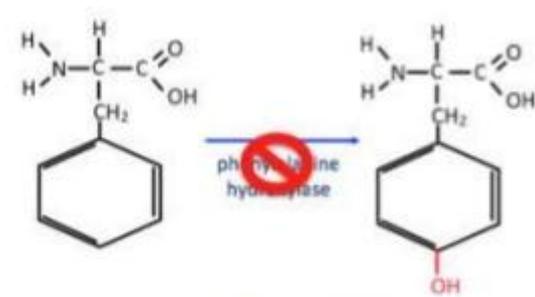
1. Is this disorder autosomal or sex linked?
2. What is a mis-sense base substitution mutation?
3. What is the chance of a child having PKU if both parents are asymptomatic carries?



Chromosome 12

[http://commons.wikimedia.org/wiki/File:Chromosome\\_12.svg](http://commons.wikimedia.org/wiki/File:Chromosome_12.svg)

# PHENYLKETONURIA (PKU)



## Genetics Review

1. Is this disorder autosomal or sex-linked

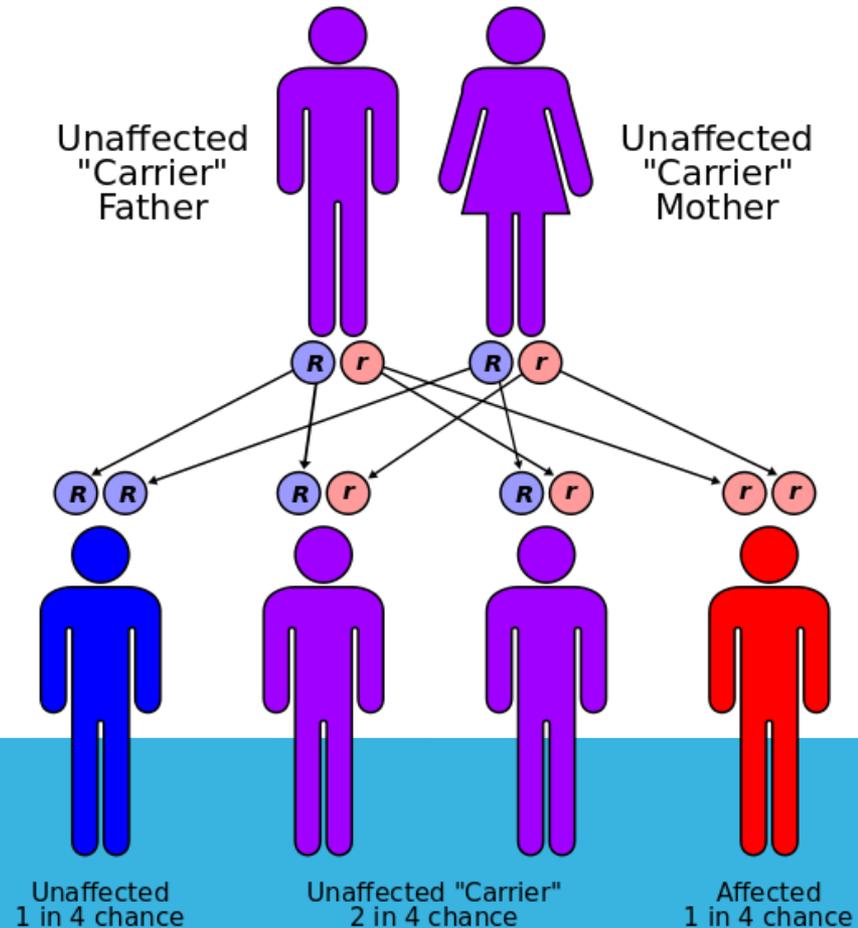
- Autosomal (chromosome 12)

2. What is a mis-sense base-substitution mutation

- One base in the allele has been replaced by another

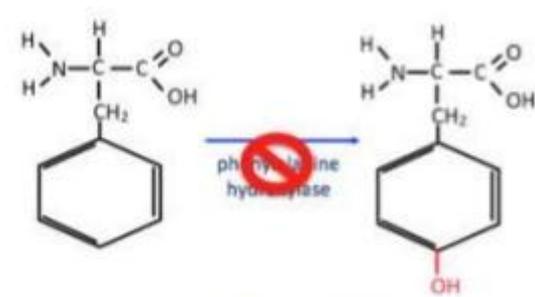
3. What is the chance of a child having PKU if both parents are asymptomatic carriers?

1 in 4



# PHENYLKETONURIA (PKU)

*INHERITED, PROGRESSIVE, DEGENERATIVE*



## Cause

- Autosomal recessive, disease-causing allele; mis-sense base-substitution mutation on the gene for the enzyme phenylalanine hydroxylase

## Results

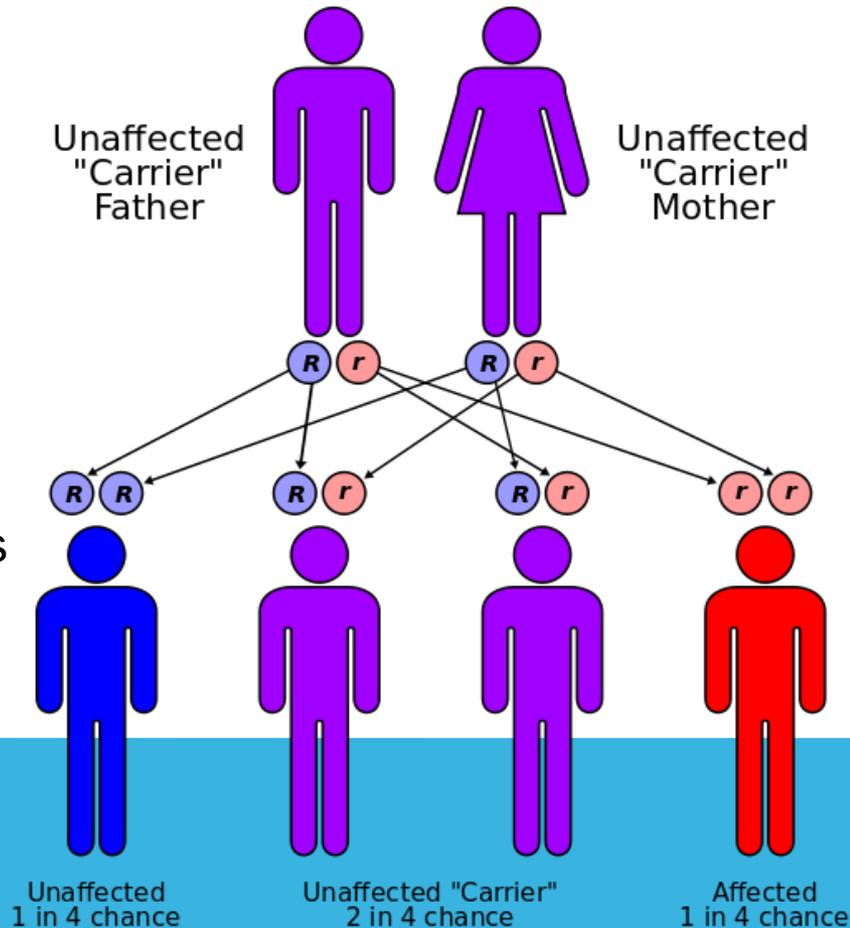
- Phe can't be metabolised into tyrosine and builds up in the brain and competes with other amino acids related to transport

## Effect

Mental development is retarded

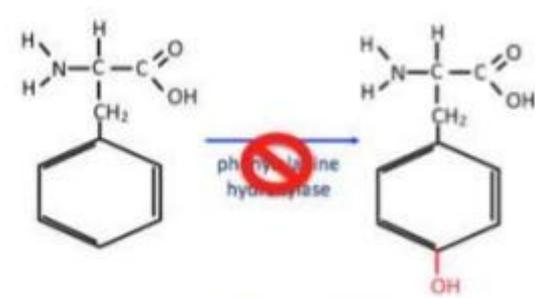
## Detection

Heel-prick (Guthrie test) of new-borns to test concentration of Phe and Phe:Tyr ratio



# PHENYLKETONURIA (PKU)

*INHERITED, PROGRESSIVE, DEGENERATIVE*

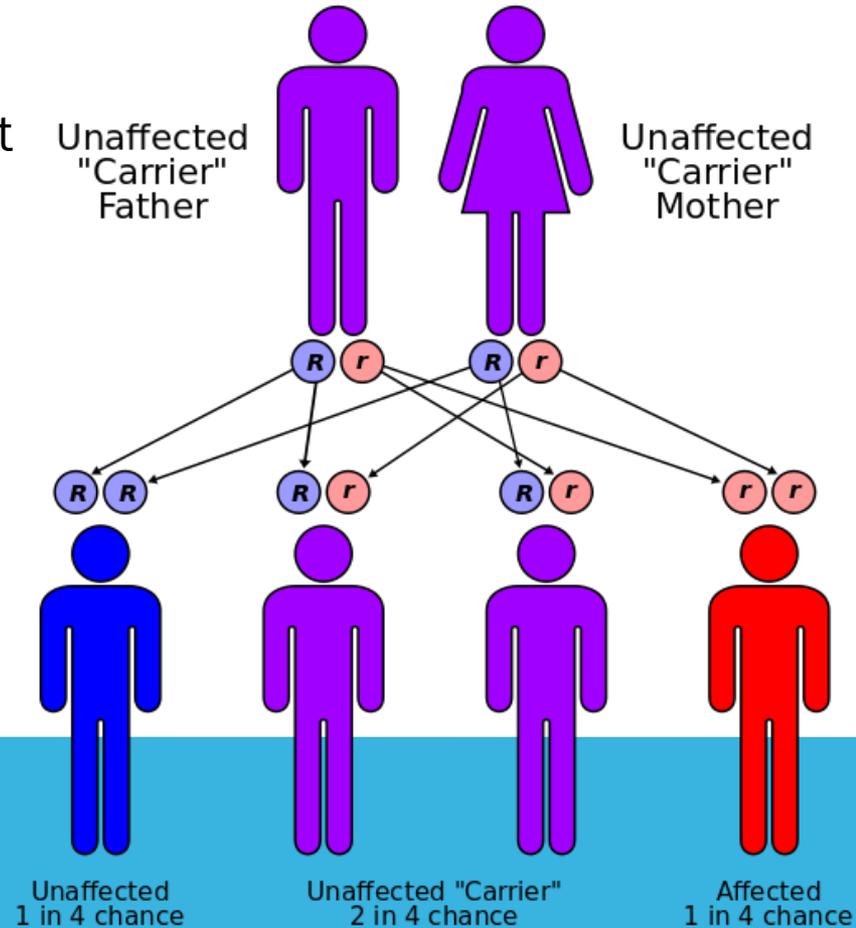


## Treatment

- Strict low-Phe diet: no dairy, meat, breast milk, nuts or aspartame (artificial sweetener)
- Lots of medication

## No cure

- Genetic counselling would be sought by prospective parents who suffer from or are suspected carriers



**FATTY ACIDS**

# FATTY ACIDS

Metabolism of lipids

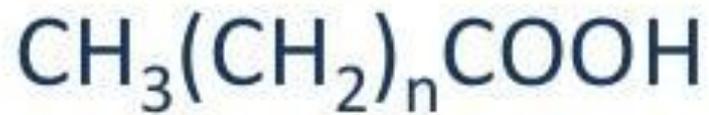
Not all fats are equal

Both have a carboxyl group (-COOH) at one end and a methyl group (CH<sub>3</sub>-) at the other

The structure of the chain of hydrocarbons in between will be the difference



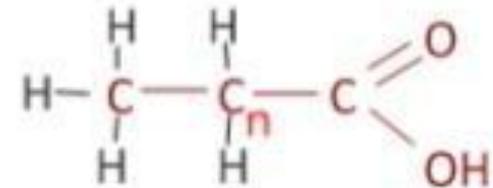
# Fatty Acids



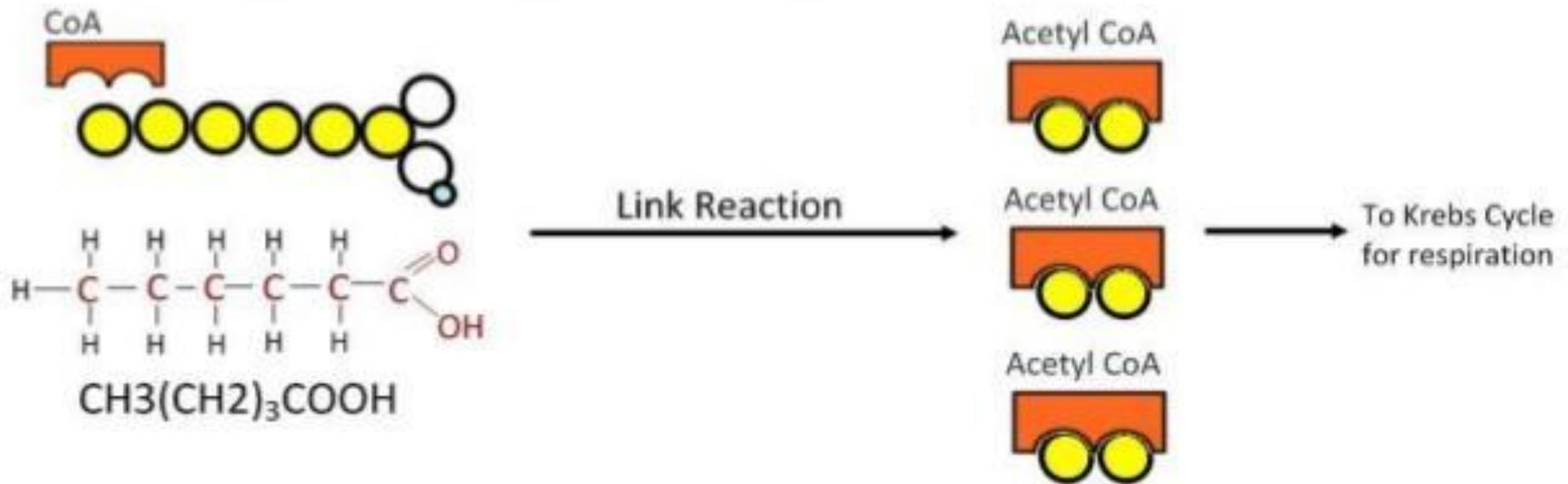
*High-density (efficient) energy storage*

*Metabolism of fatty acids in cell respiration skips glycolysis.*

**Coenzyme A\*** cuts off carbon atoms from the fatty acid in the link reaction and carries them to the Krebs cycle.

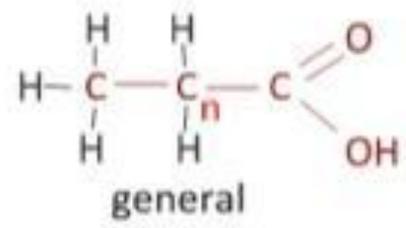
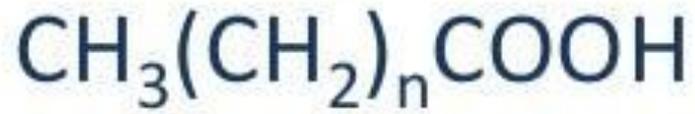


Therefore: longer chains are a greater store of potential energy.

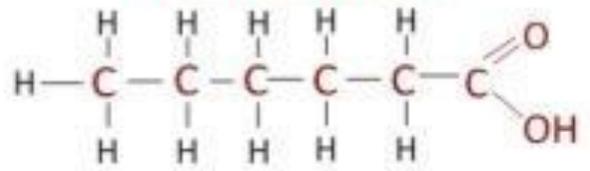


\***Coenzymes** assist enzymes and are made using vitamins. It's all connected!

# Fatty Acids

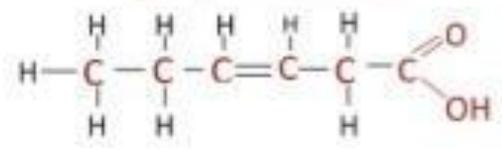


**Saturated**  
no double bonds

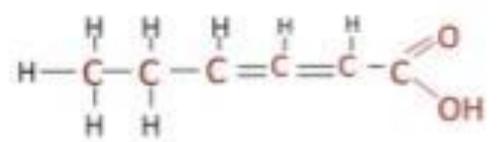


**Unsaturated**  
some double bonds

**Mono-unsaturated**  
one double-bond



**Poly-unsaturated**  
multiple double-bonds



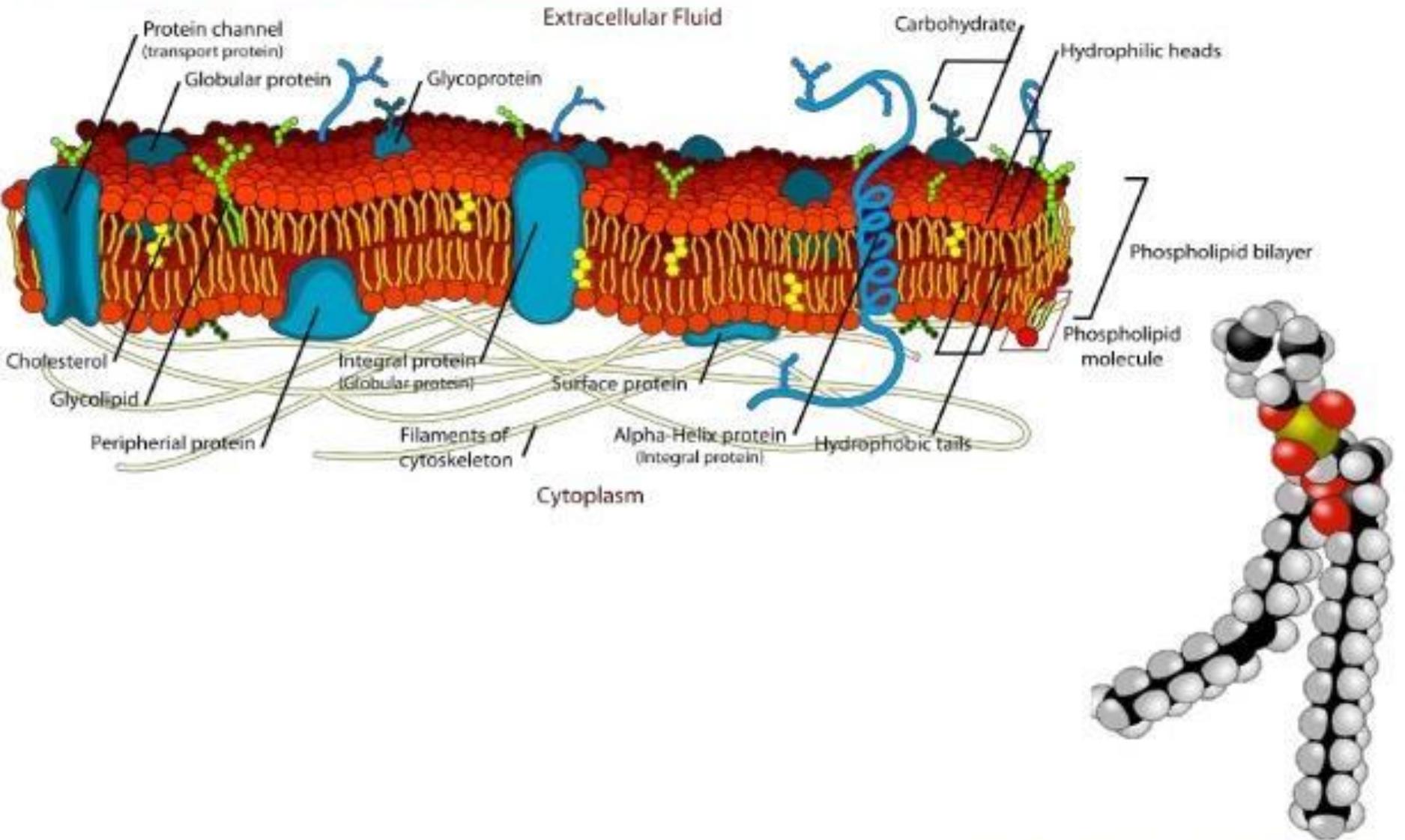
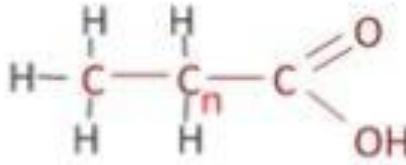
- High-density energy storage
- Usually solid at room temp
- Animal products, palm and coconut oil
- High contribution to coronary heart disease (CHD)

- Usually oils at room temp
- Usually plant sources, e.g. olive oil
- Lower contribution to CHD



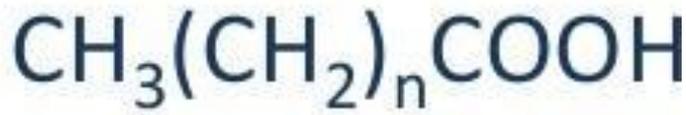
# Fatty Acids

Important components of the *plasma membrane*

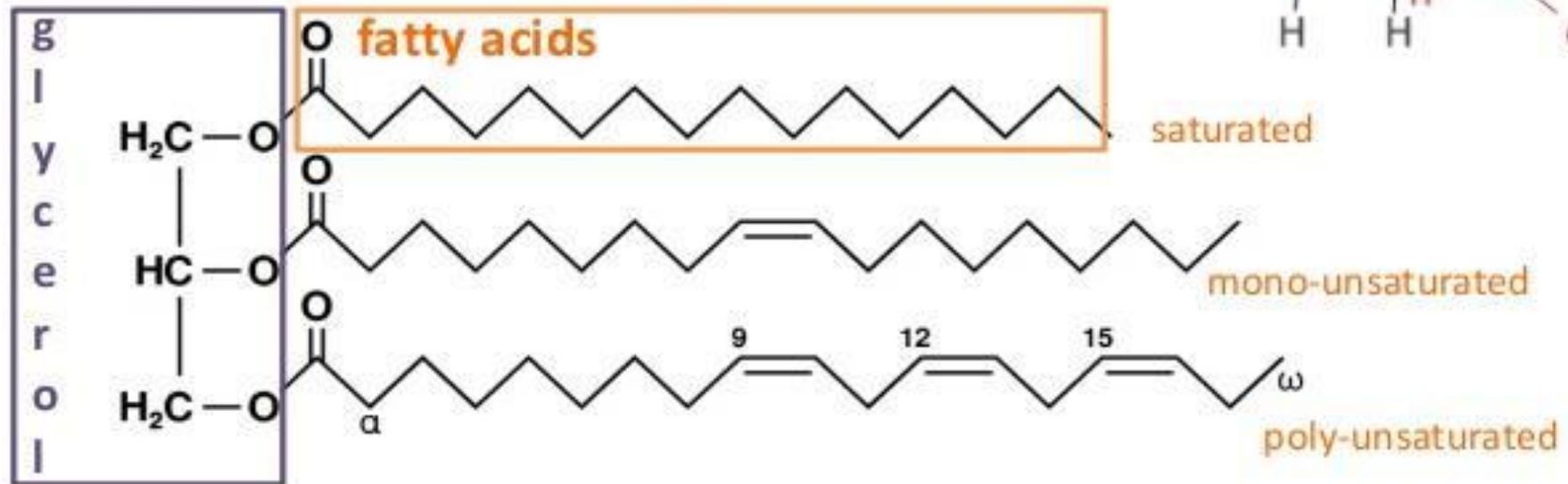
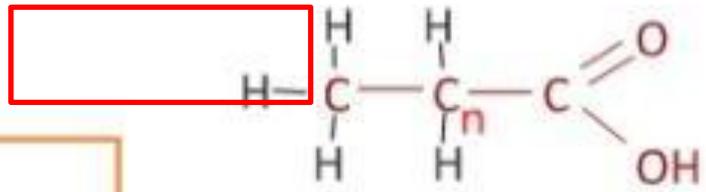


# Fatty Acids

Have other *diverse functions*.



Triglycerides are efficient energy stores.



- “Good Cholesterol”: High Density Lipoproteins**
- Transport triglycerides out of the blood and so reduce the risk of CHD.
- “Bad Cholesterol”: Low Density Lipoproteins**
- Raise blood triglyceride levels and blood pressure, increasing risk of CHD.

- Lipid Hormones**
- Steroid hormones, such as testosterone and cortisol, are made using lipids.
  - Hormones are chemical messengers.

# FATTY ACIDS

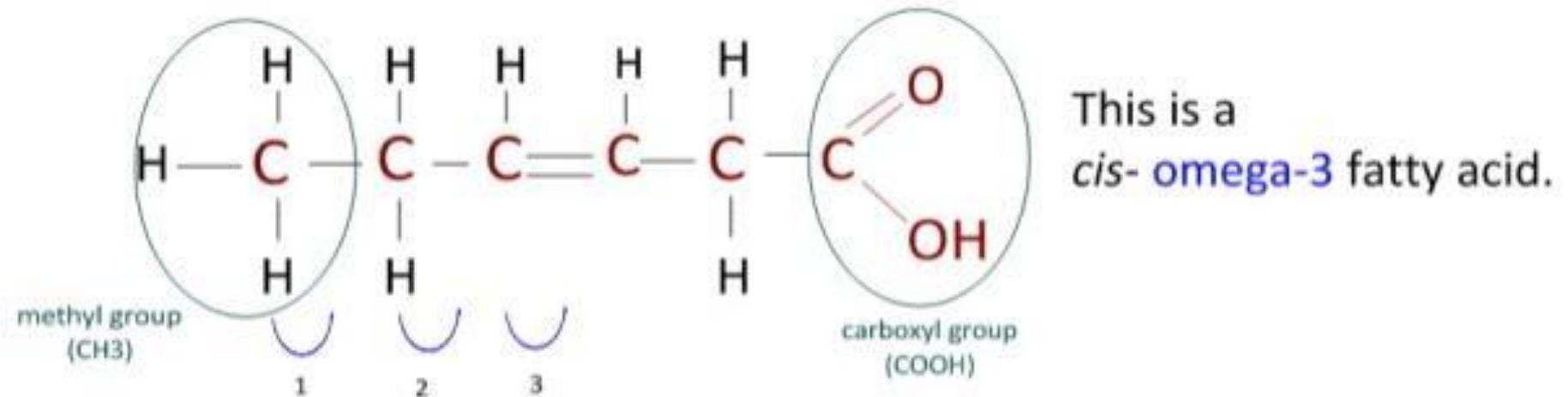
The left side is the carboxyl group

The middle zone is the hydrocarbon chain

Green zone is the methyl group

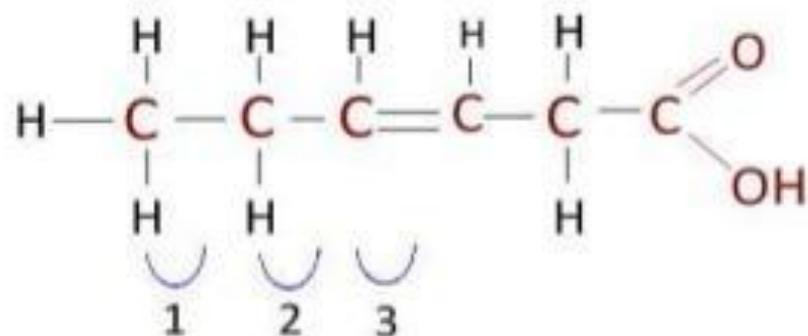
- Also called the omega end

The *omega*- number tells us the location of the first double-bond from the methyl group

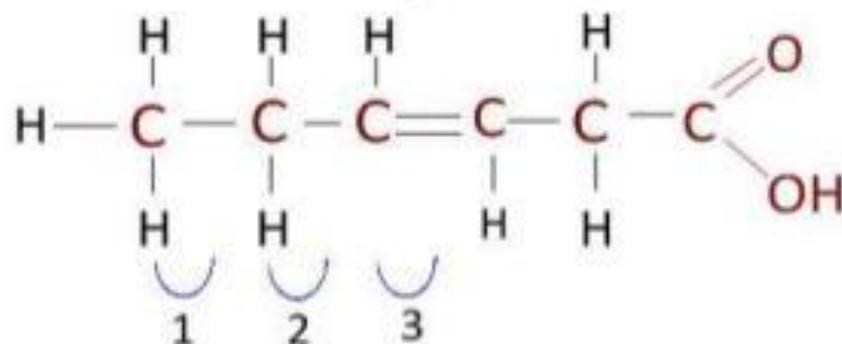


# Unsaturated fatty acids can have *cis*- or *trans*- double bonds:

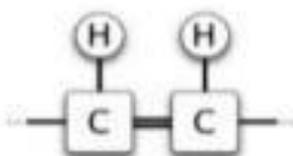
a *cis*- omega 3 fatty acid



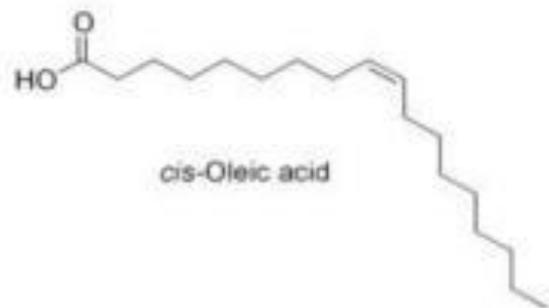
a *trans*- omega 3 fatty acid



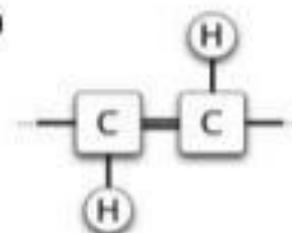
A *cis*- double bond gives a bent fatty acid: often an oil at room temperature



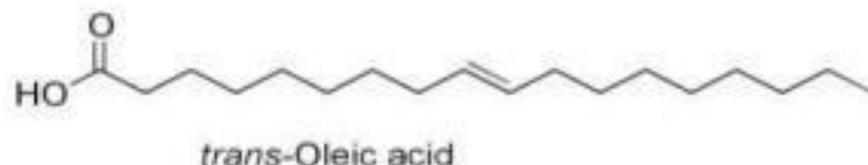
e.g. olive oil



A *trans*- double bond gives a straight fatty acid: often a solid at room temperature (similar to saturated fats)



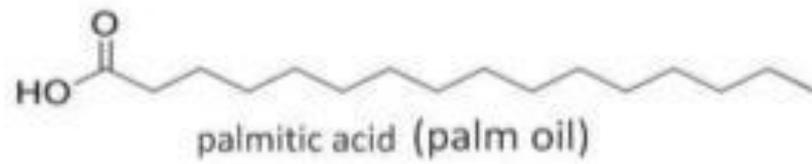
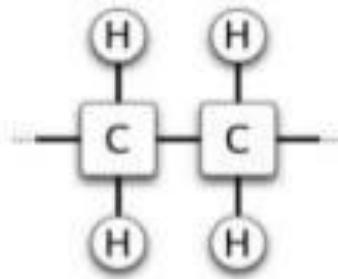
e.g. margarine (hydrogenated vegetable oil)



# What are the different types of fatty acids?

## Saturated: no double bonds

- high-density energy store
- Solid at room temp
- animal products, palm and coconut oil
- high risk of CHD

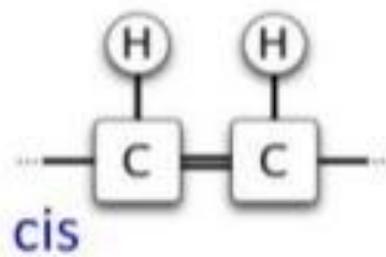


palmitic acid (palm oil)

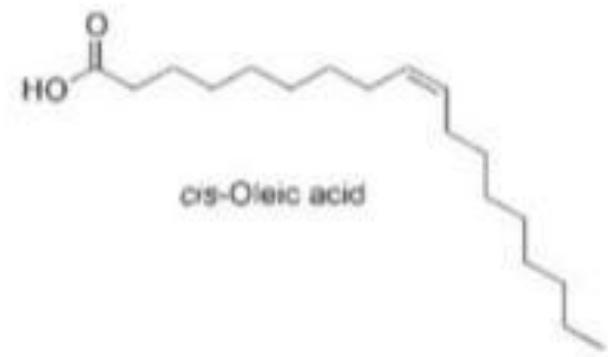
## Unsaturated: double bonds

mono = one      poly = many

- ### cis
- oils at room temp
  - usually from plant sources
  - less risk of CHD

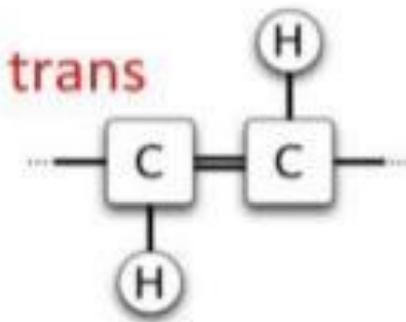


cis



cis-Oleic acid

- ### trans
- oils or solids
  - artificially produced
  - very high CHD risk: they 'mimic' saturated fats



trans



trans-Oleic acid

# TRANS FATS

Artificially produced by hydrogenating vegetable oils.

Source for margarine, vegetable oil and fast foods.

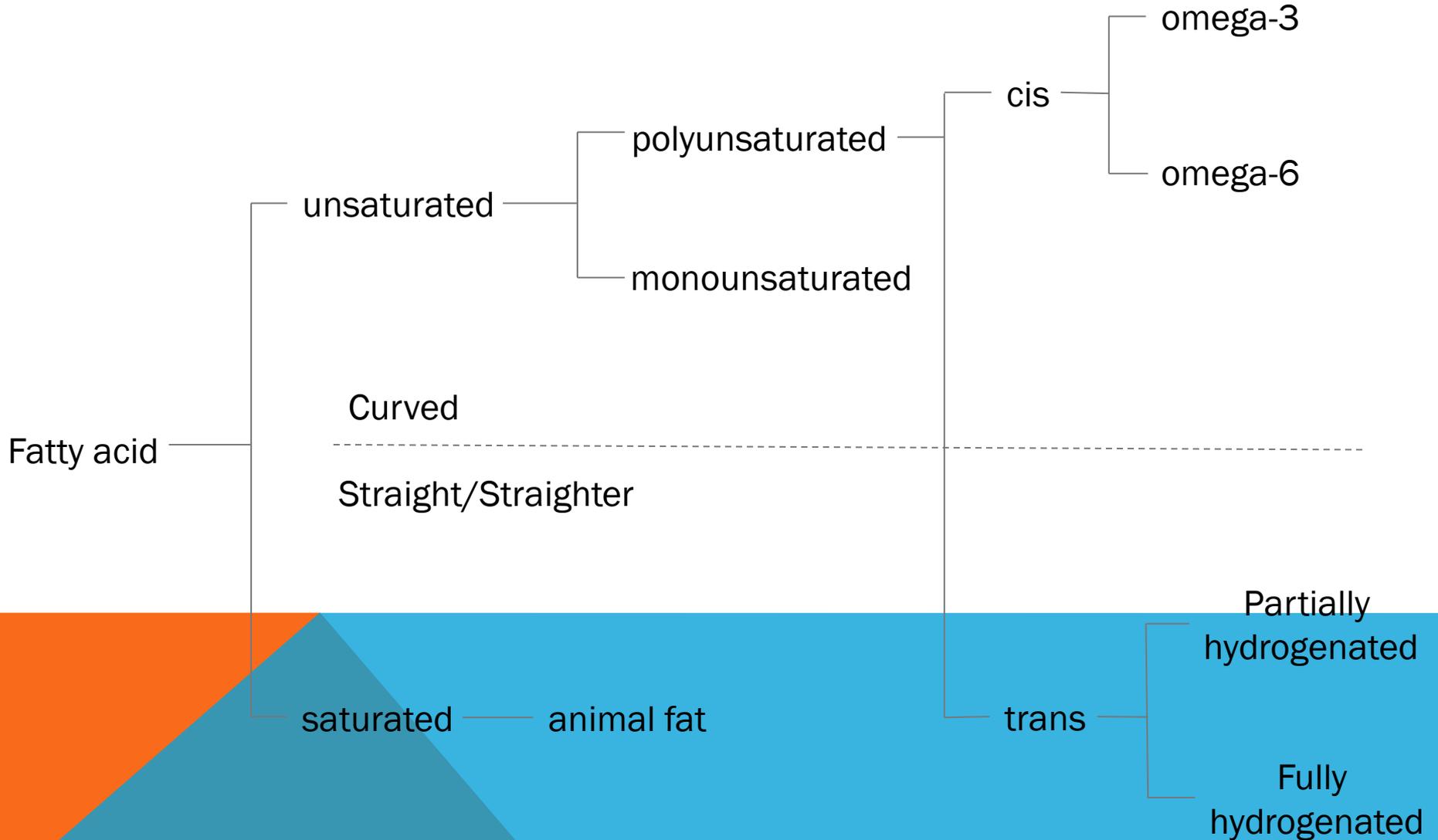
- Easily absorbed by the body as saturated fats, but may build up as the body doesn't know what to do with them
- Increase LDL and decrease HDL



# CORRELATION

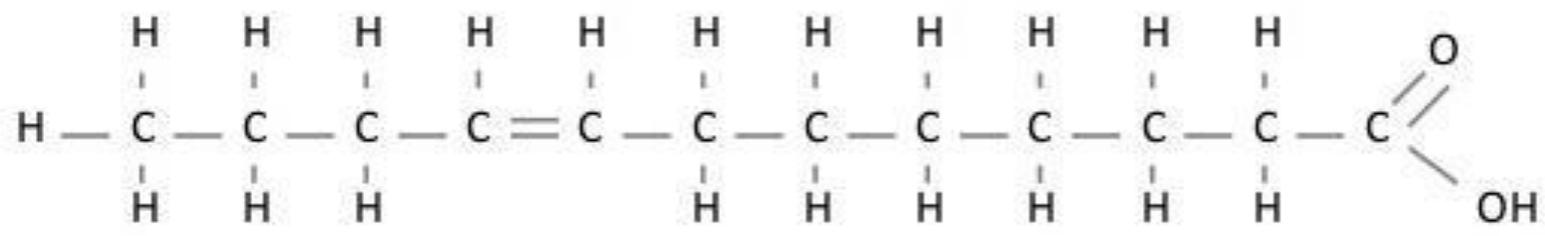
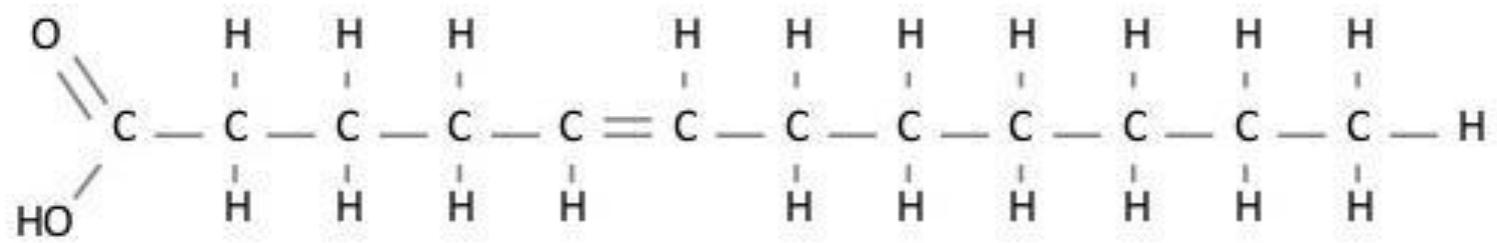
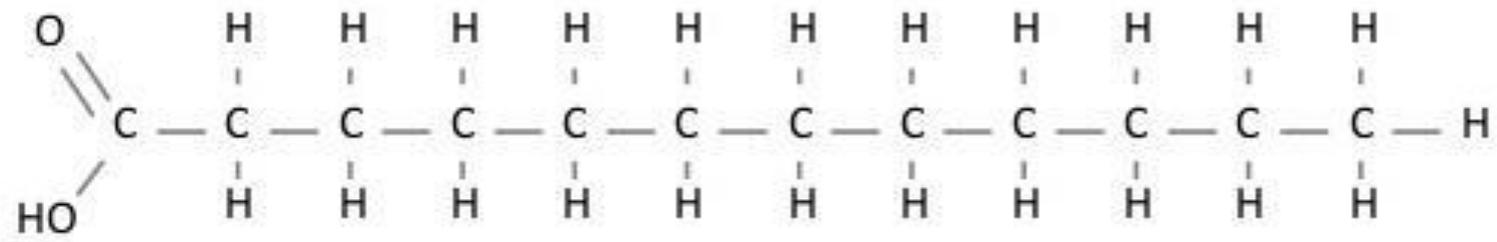
- There is a positive correlation between saturated fatty acid intake and rates of coronary heart disease (CHD). However, it could be another factor correlated with saturated acid intake, such as low amounts of dietary fibre that actually causes CHD.
- Diets rich in olive oil, which contains cis-monosaturated fatty acids, are traditionally eaten in countries around the Mediterranean. The population of these countries typically has low rates of CHD and it has been claimed this is due to the intake cis-monounsaturated fatty acids. However, genetic factors in these populations, or other aspects of the diets such as the use of tomatoes in many dishes, could explain the CHD rates.
- There is a positive correlation between intake of trans fatty acids and CHD. Other risk factors have been tested, to see if they can account for the correlation, but none did. Fatty deposits in the diseased arteries have been found to contain high concentrations of trans fats.

# KEY TO THE FAT



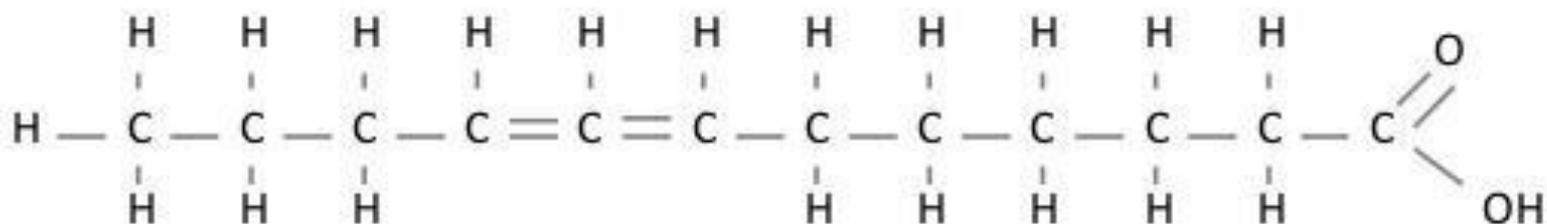
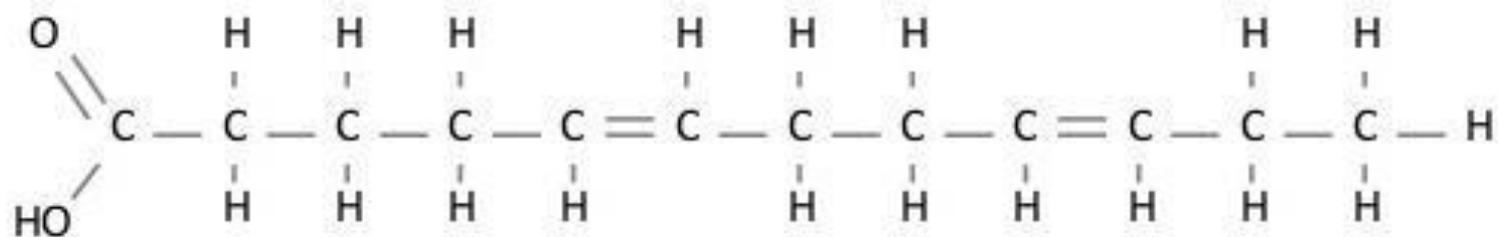
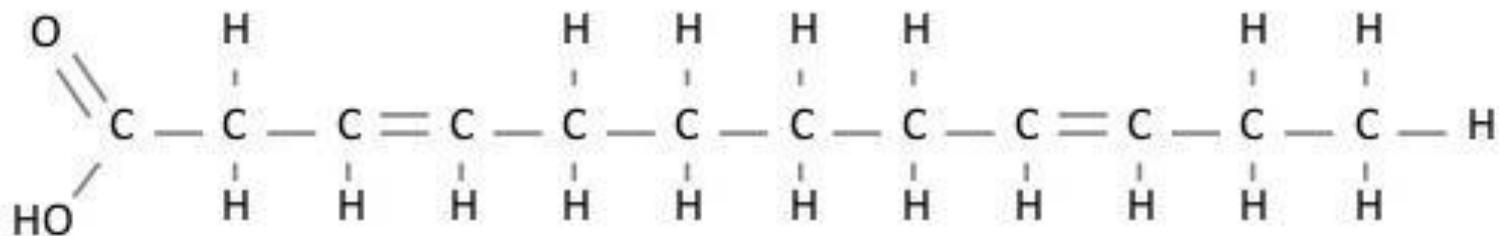
# Describe these fatty acids

Saturated, mono-unsaturated or poly-unsaturated?  
If they're unsaturated, what's their omega-number?  
Are the unsaturated fatty acids *cis*- or *trans*-fats?



# Describe these fatty acids

Saturated, mono-unsaturated or poly-unsaturated?  
If they're unsaturated, what's their omega-number?  
Are the unsaturated fatty acids *cis*- or *trans*-fats?



**FIBRE**

# Dietary fibre

Fibre itself is not absorbed into the blood, as it is not digested.

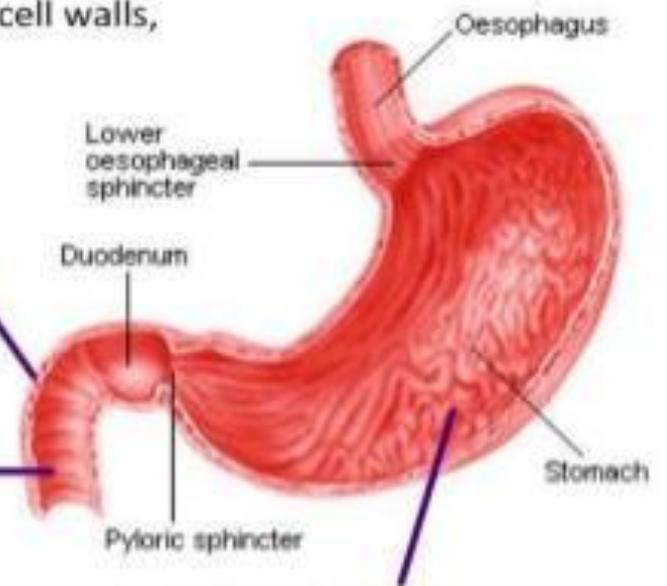
However, many high-fibre foods (including vegetables) are packed with other useful nutrients - so they are doubly healthful!

Cellulose, a polysaccharide in plant cell walls, cannot be digested by humans\*.

Fibre mass gives the smooth muscles of the intestines something to work against, strengthening peristalsis

Fibre clears trapped materials and dead cells from the digestive tract, reducing chances of cancer and blockage.

A high-fibre diet can prevent constipation and is an effective part of a weight-control diet.



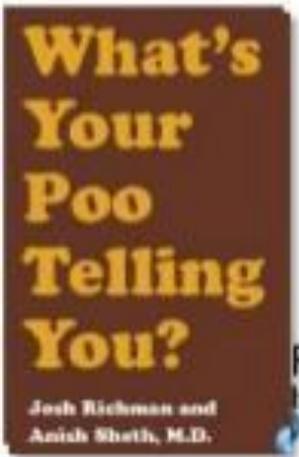
Fibre adds bulk to food, activating stretch receptors in the stomach and giving a feeling of fullness.

<http://www.mydr.com.au/gastrointestinal-health/stomach-and-duodenum>

Fibre also helps regulate blood sugar and can reduce blood cholesterol by blocking uptake of lipids in the diet.

Find out how healthy you are:  
<http://www.drstool.com/qa.php>

\*Our ancestors may have used bacteria in the appendix for this function - a bit like cows and other ruminants



# **INSOLUBLE FIBRE**

**Contains cellulose, hemicellulose and lignin. It helps your bowel to pass food by making stools soft and bulky. This type of fibre helps prevent constipation.**

- beans, brown rice, fruits with edible seeds, lentils, maize, oats, pulses, wheat bran, wholegrain breads, wholegrain cereals, wholemeal pasta and wholewheat flour.**

# SOLUBLE FIBRE

Contains gums and pectin. This type of fibre lowers cholesterol levels and controls blood sugar. It can be found in all fruit and vegetables, but the following are rich sources:

- apples, barley, citrus, guar gum, legumes, oats, pears and strawberries.

# VITAMINS AND MINERALS

# Vitamins & Minerals

**Minerals** are elemental ions found in food.

$I^-$  iodine       $Ca^{2+}$  calcium

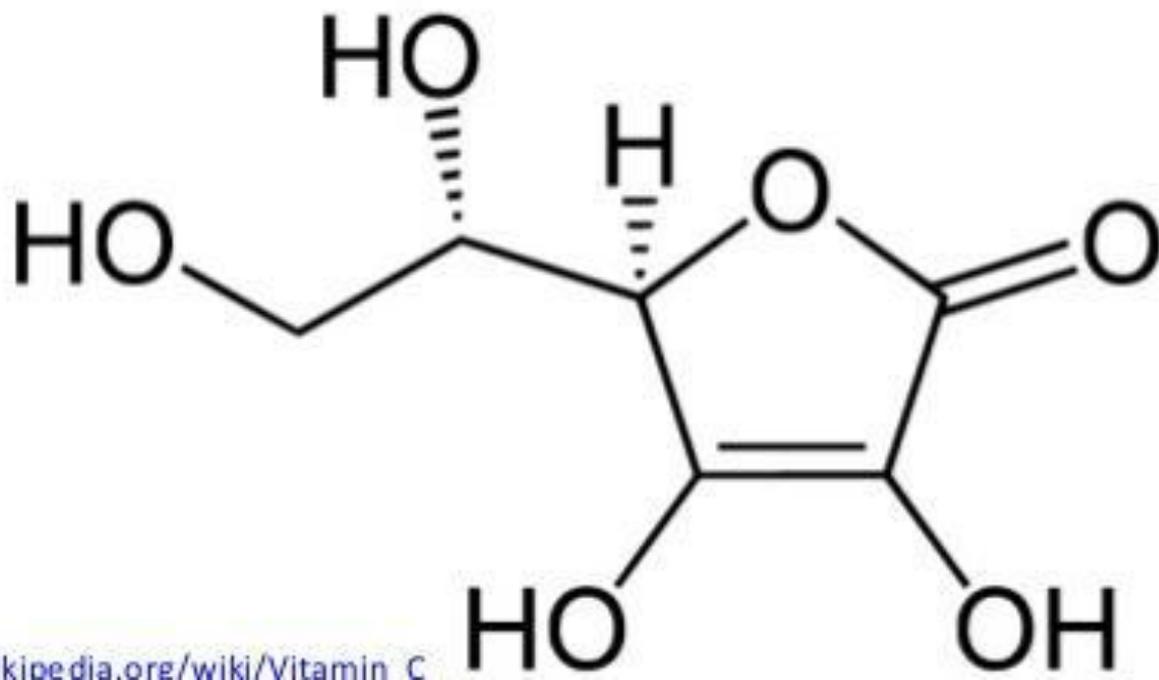
$K^+$  potassium       $Fe^{2+}$  iron

$Na^+$  sodium       $Zn^{2+}$  zinc



<http://tinyurl.com/35d6qyg>

**Vitamins** are complex *organic compounds* (contain C, H and O). Some can be made by the body, but others are essential in the diet.



[http://en.wikipedia.org/wiki/Vitamin\\_C](http://en.wikipedia.org/wiki/Vitamin_C)

# Essential Vitamins and Minerals

	Function	Sources
Vitamin A	Eye function, vision, hair, skin	Dairy, meat, fish
Vitamin B	Nervous system, control, digestion, coenzymes (enzyme assistants)	Dairy, meat, spinach, broccoli, bananas
Vitamin C	Immune system, healing, antioxidant*	Fruits (especially citrus)
Vitamin D	Calcium absorption - bones and teeth	Dairy, fish and fish oils
Iodine	Thyroid function Metabolism, temperature control	Seaweeds, seafood, fish

\*Oxidation is a chemical reaction that happens all the time during metabolism. Over time, this can damage cell membranes and cause cells to break down - or 'age'.

How are recommended daily intakes (RDI's) set?

World Health Organisation

<http://whqlibdoc.who.int/publications/>

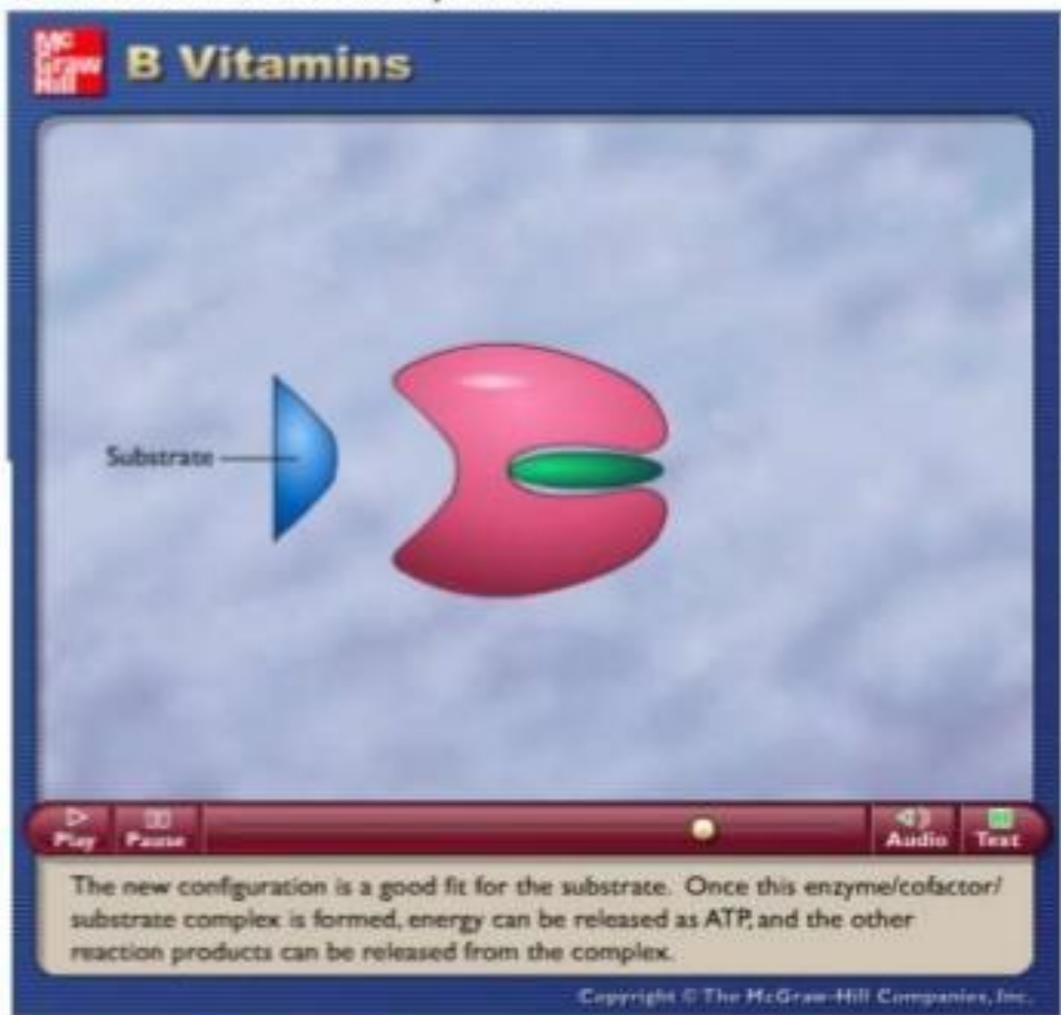
2004/9241546123.pdf



World Health  
Organization

<http://whqlibdoc.who.int/publications/2004/9241546123.pdf>

B vitamins are coenzymes:



The animation shows a blue substrate binding to a pink enzyme. The substrate is a blue, semi-circular shape with a pointed end. The enzyme is a pink, irregular shape with a green oval-shaped pocket. The substrate is shown entering the pocket, forming a complex. The text below the animation reads: "The new configuration is a good fit for the substrate. Once this enzyme/cofactor/substrate complex is formed, energy can be released as ATP, and the other reaction products can be released from the complex." The video player interface includes a play button, a progress bar, and buttons for "Audio" and "Text".

**B Vitamins**

Substrate

The new configuration is a good fit for the substrate. Once this enzyme/cofactor/substrate complex is formed, energy can be released as ATP, and the other reaction products can be released from the complex.

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[http://highered.mcgraw-hill.com/sites/0072507470/student\\_view0/chapter25/animation\\_b\\_vitamins.html](http://highered.mcgraw-hill.com/sites/0072507470/student_view0/chapter25/animation_b_vitamins.html)

Vitamin A: Helps you see in the dark



The image shows three panels illustrating the benefits of Vitamin A. The first panel shows a woman's face with the text "Eye Health". The second panel shows a close-up of a hand with the text "Skin Health". The third panel shows a cross-section of a mucus membrane with the text "Mucus Membrane".

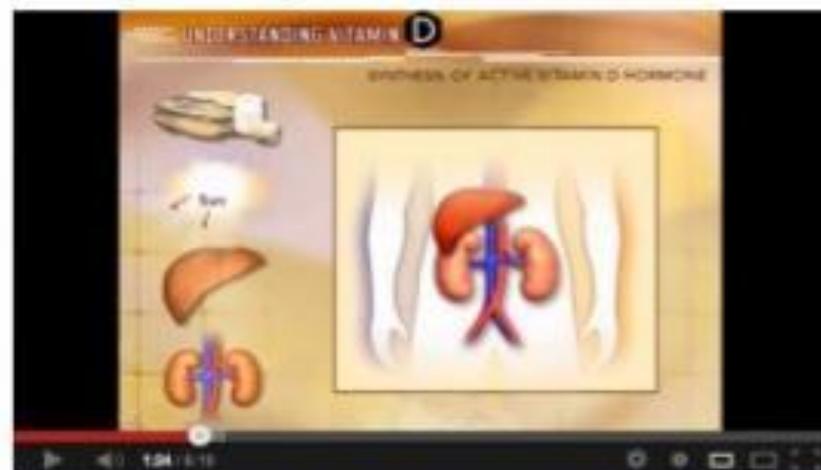
Eye Health

Skin Health

Mucus Membrane

<http://www.youtube.com/watch?v=dcw1m31zuTE>

Understanding Vitamin D



The diagram illustrates the synthesis of active Vitamin D hormone. It shows the sun, the liver, and the kidneys. The sun is shown shining on the liver, which is shown producing Vitamin D. The Vitamin D is then shown being transported to the kidneys, which are shown producing the active Vitamin D hormone. The diagram is titled "UNDERSTANDING VITAMIN D" and "SYNTHESIS OF ACTIVE VITAMIN D HORMONE".

UNDERSTANDING VITAMIN D

SYNTHESIS OF ACTIVE VITAMIN D HORMONE

<http://www.youtube.com/watch?v=onSPZ0aBUKM>

<http://www.youtube.com/watch?v=onSPZ0aBUKM>

# Vitamin D is produced by the skin

Paler skin produces more vitamin D than dark skin.

Therefore, darker-skinned people need more vitamin D in the diet, especially in colder countries.

Paler skin is at greater risk of developing skin cancer, so in very hot countries, paler-skinned people are also advised to get plenty of dietary vitamin D and avoid prolonged sun exposure.

**Sources of vitamin D:** Dairy, fish and fish oils.

Vitamin D decreases cancer death rates:



<http://www.youtube.com/watch?v=C7IGBT3oMiw>

## Data analysis: How do skin covering and skin colour relate to vitamin D deficiency?

2: Proportion of women with serum vitamin D (25-hydroxyvitamin D<sub>3</sub>) levels under 22.5nmol/L, according to skin covering and skin colour

Skin covering*	Skin colour			Total
	Very dark	Intermediate	Light	
Consistently covered	6/6 (100%)	1/2 (50%)	23/25 (92%)	30/33 (91%)
Inconsistently covered	3/5 (60%)	1/3 (33%)	18/24 (75%)	22/32 (69%)
Uncovered	2/2 (100%)	2/3 (67%)	0 (0)	4/5 (80%)
Total	11/13 (85%)	4/6 (67%)	41/49 (84%)	56/70 (80%)

\*Consistently covered - women always covered up, including arms, hair and neck, when outdoors; inconsistently covered - women did not usually cover fully in their own garden; and uncovered - women did not generally cover their arms, hair and neck when outdoors.

[http://www.mja.com.au/public/issues/175\\_05\\_030901/grover/grover.html](http://www.mja.com.au/public/issues/175_05_030901/grover/grover.html)

# RICKETS

Insufficient supply of vitamin D results in the develop of rickets



# VITAMIN D

What happens if you don't have enough or less Vitamin D?

If you don't have enough Vitamin D it can cause depression range of physical and mental symptoms.

Can our body produce Vitamin D?

Our body can make Vitamin D by sunlight: Sunlight is a natural source of Vitamin D. But however getting too much sunlight can cause skin cancer too.



# VITAMIN D

## Risk of contracting malignant melanoma

- Ultraviolet light has some harmful consequences, including mutations that can lead to skin cancer.
- Melanin in the skin intercepts and absorbs light, including the ultraviolet wavelengths. Dark skins therefore give good protection against cancer, but they also reduce vitamin D synthesis.
- In indigenous human populations, skin color balances the twin risks of vitamin D deficiency and cancer or other damage due to ultraviolet light.
- After population migrations there can be problems. In the 1970s immigrants with dark skin from the Indian subcontinent living in the UK started to show symptoms of vitamin D deficiency.
- Immigrants from northern Europe with light skin living in Australia were found to have high rates of malignant melanoma.
- Australians with light skin were then advised to stay out of bright sunlight, cover their skin or apply sun-block creams.

# Iodine deficiency is avoidable through cheap food supplementation



(Goitre)

Iodine is used by the thyroid gland to produce hormones, which are responsible for regulating metabolism and body temperature.

Iodine deficiency blocks negative feedback to the pituitary gland, resulting on goitre - severe swelling of the thyroid gland as it becomes overstimulated.

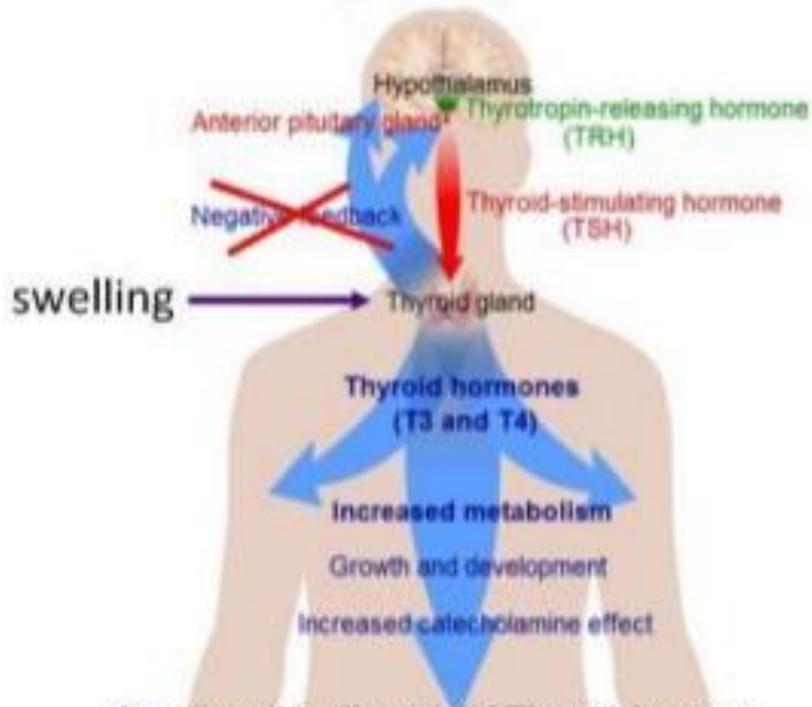
<http://www.teara.govt.nz/EarthSeaAndSky/MineralResources/Salt/1/ENZ-Resources/Standard/5/en>

Although not often fatal, goitre can lead to excess pressure on the breathing system, cancers as it grows and intolerance of heat. Other symptoms of iodine deficiency include mental development retardation and miscarriages.

**Iodized salt** is a simple global **supplementation programme** that has had dramatic positive effects in reducing iodine deficiency.

Genetically modified crops might also be used to provide iodine in the diet, along with other essential nutrients.

## Thyroid system



[http://en.wikipedia.org/wiki/Thyroid\\_hormone](http://en.wikipedia.org/wiki/Thyroid_hormone)

# IODINE

If a pregnant woman gets IDD the child may be born with permanent brain disease or other mutations. The solution would be to put iodine in salt. It would cost about 5 c per person and would solve serious problems.



# VITAMIN C

## Importance of vitamin C

protect against infection

helping in wound healing

maintaining healthy gums, teeth, bones and blood vessels

prevent scurvy



# Vitamin C: Experimental determination of RDI

RDI is the *recommended daily intake* of a nutrient. RDI's are set by government health bodies and the World Health Organisation based on clinical studies and evidence.

## Functions of Vitamin C:

- Collagen production
- Maintain mucus membranes
- Promotes healing and skin growth

} Clinical trials are based on **quantitative analysis** of the effects of Vitamin C.

## Experiment 1: Guinea Pig Trials

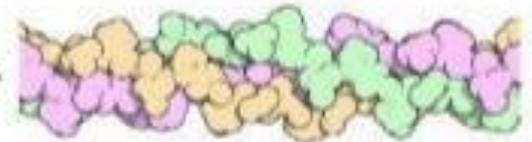
Aim: to observe collagen structure with varying levels of vitamin C  
Collagen is the main structural protein in the body.

Supplement diet with varying levels of vitamin C



kill and observe collagen

Low vitamin C: weak collagen



High vitamin C: strong collagen



test vitamin C levels in urine and blood

Protein databank:  
<http://tinyurl.com/3xf5mt6>

# Vitamin C: Experimental determination of RDI

## Experiment 2: Human Trials on conscientious objectors in World War II

Aim: to observe healing and scurvy in vitamin C-limited volunteers

They were put on a range of vitamin C restricted diets and the effects were logged and measured, including the healing of incisions made on their thighs and observations of scurvy. Vit C in blood and urine was also measured.

Healing of incisions was measured:



Days 1-7: no vitamin C in food, but all given 70mg supplement.

Days 8 - end (8 months): trial groups

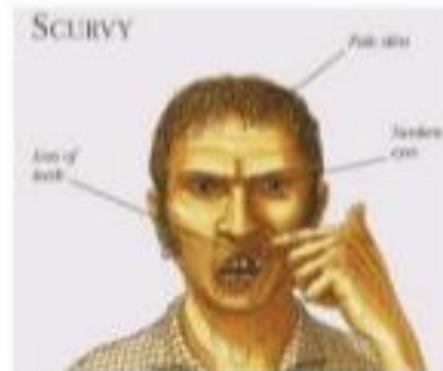
**Group 1: 70mg per day** | **Group 2: 10mg per day** |

No ill effects or scurvy

These results were replicated in a prison trial in Iowa, USA.

**Group 3: 0mg per day**

Scurvy developed after 6 months and one patient developed heart problems. Scurvy cured with 10mg doses of vitamin C.



<http://www.med.uc.edu/departme/cellbiol/ecm.htm>

### Ethics Discussion:

*To what extent are animal and human testing necessary for the advancement of medicine?*

Read full papers here:

HA Krebs, original paper (Cambridge journals)  
<http://tinyurl.com/27wrzwq>

J Pemberton article (Journal of Epidemiology)  
<http://tinyurl.com/27q8zjx>

# Vitamin C Megadoses: Rebound Malnutrition?

The RDI for vitamin C (ascorbic acid) is set at 45-60mg per day.

Some claims that megadoses (over 100mg vitamin C per day) are beneficial may be countered with the risk of rebound malnutrition.

The human body is effective at regulating itself internally - maintaining balance through negative feedback mechanisms.

We know that most of the vitamin supplements we use in excessively high doses end up being flushed down the toilet, as the kidneys balance the blood by removing excess and getting rid of waste in urine.

There may be another ill effect, though.

As the body becomes accustomed to very high levels of a nutrient, it develops tolerance and adapts by removing it in greater quantities.

If someone who has become used to a high intake of vitamin C then stops taking it, their body will continue to flush it out, resulting in lower blood levels than before - and a deficiency of vitamin C!

With megadoses:

too high?

remove from blood

'normal' level

Stop megadoses:

low intake

removal continues

as before

'normal' level

deficiency

# VITAMIN C: RECOMMENDED DAILY INTAKE

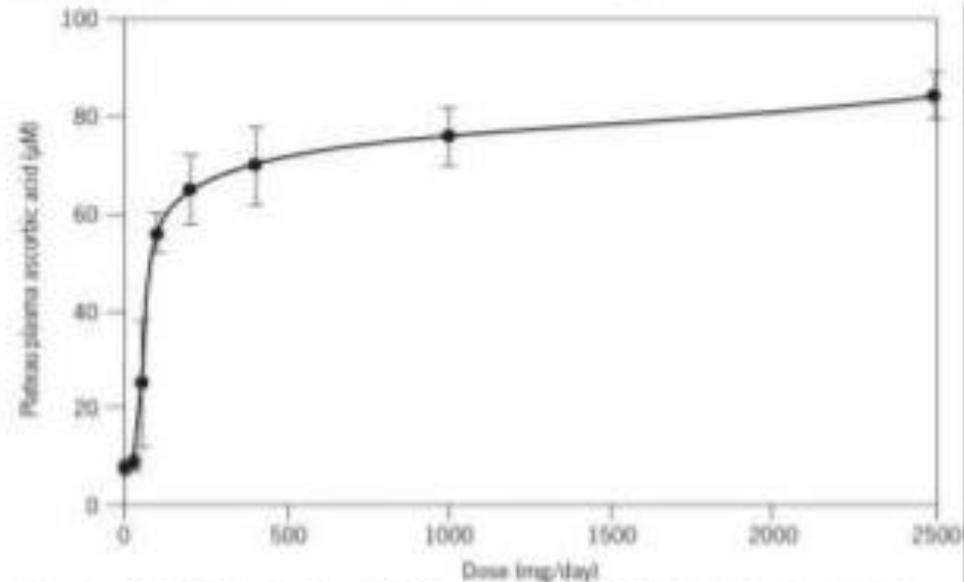
Debate on how much to take

Linus Pauling suggested mega doses can prevent infections of respiratory track and speed healing and recovery.

This graph comes from the WHO outlining how recommended daily intakes are set

What does it show in relation to increasing dosage of vitamin C

Where does the excess vitamin C go?



[http://whqlibdoc.who.int/publications/2004/9241546123\\_chap7.pdf](http://whqlibdoc.who.int/publications/2004/9241546123_chap7.pdf)

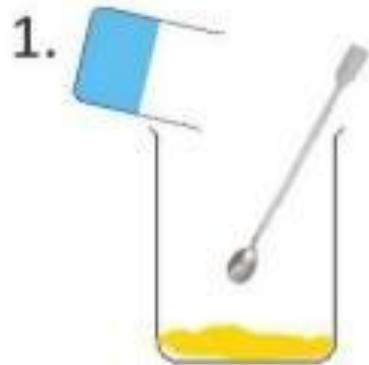
[http://whqlibdoc.who.int/publications/2004/9241546123\\_cha](http://whqlibdoc.who.int/publications/2004/9241546123_cha)

**Blood plasma vitamin C plateaus after 500 mg  
per day**

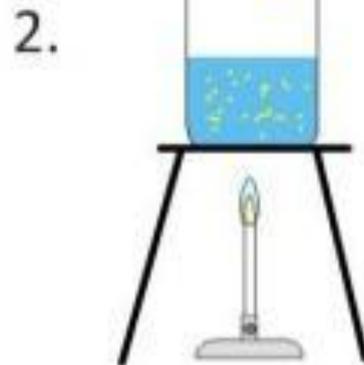
**Excreted by the kidneys and flushed out in urine**



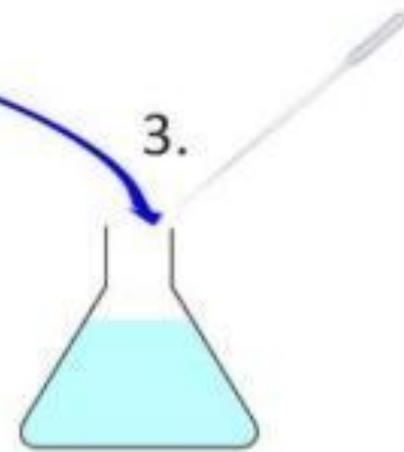
# Test for vitamin C:



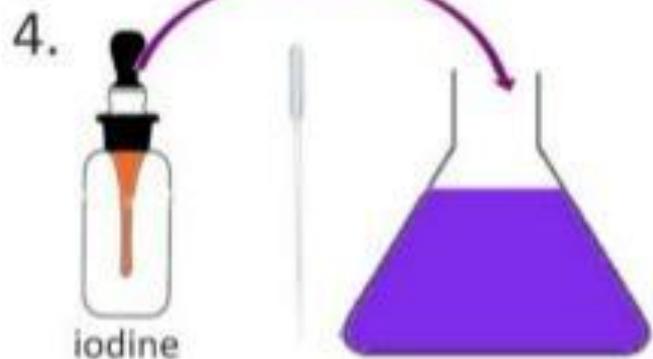
Make a paste of 1 heaped teaspoon cornstarch and water



Add 100ml water and boil for 3-5 minutes. Do not let it boil over the sides.



Add 10 drops of the starch solution to 60ml water



Now add enough iodine to the starch solution to make it turn dark blue-purple.

This is your Vitamin C indicator.

Add some of this to each test tube before you add the food sample.

A positive test for vitamin C will cause the indicator to lose its colour.

A higher concentration of vitamin C will cause it to become clearer (and change more quickly).

# **ARTIFICIAL DIETARY SUPPLEMENTS**

**When food doesn't meet the vitamin and mineral demand you need to look for additional help**

**Tablets**

**Iodized salt**

**Fresh herbs**

**Folic acid from fortified foods**



# REVIEW

Copy the table on page 219

