

Annual Update

2019

"Ninety per cent of the diseases known to man are caused by cheap foodstuffs. You are what you eat."

Victor Lindlahr published *You Are What You Eat: how to win and keep health with diet.* 1942

"Ninety per cent of the diseases known to man are caused by malnutrition. You are what you absorb."

Dead Doctors Don't Lie by Joel D Wallach 2004



DON'T FORGET,
YOU ARE WHAT
YOU EAT.

I NEED TO
EAT A
SKINNY
PERSON.



brins

Menopause Cafes: Helpful or Harmful?

From [Medscape Ob/Gyn & Women's Health](#)

Medscape IN FOCUS



THE LATEST ON MENOPAUSE

[Menopausal Hormone Therapy and Breast Cancer Link Confirmed](#)

[Global Guidelines: Try Testosterone for Older Women's Sex Drive](#)

[Fractional CO2 Laser Improves Vaginal Health After Menopause](#)

[Acupuncture a 'Realistic Option' vs HRT for Hot Flashes](#)

'NEW LOW' Piers Morgan blasts Remainer Terry Christian's 'disgusting' tweet saying Brexit supporters should be denied flu jab

Ellie Cambridge

2 Sep 2019, 9:08 | Updated: 2 Sep 2019, 9:49



12 COMMENTS

PIERS Morgan slammed a "disgusting" tweet from Remainer Terry Christian saying Brexit supporters should be denied the flu jab.

The Good Morning Britain host re-tweeted the post suggesting doctors have two queues when dishing out the vaccines - one for Remainers and one for Brexit voters.

SENT FRY-ING McDonald's fight video of woman tossing bloke around 'like a rag doll' goes viral after NFL star hails her 'tremendous' fighting skills

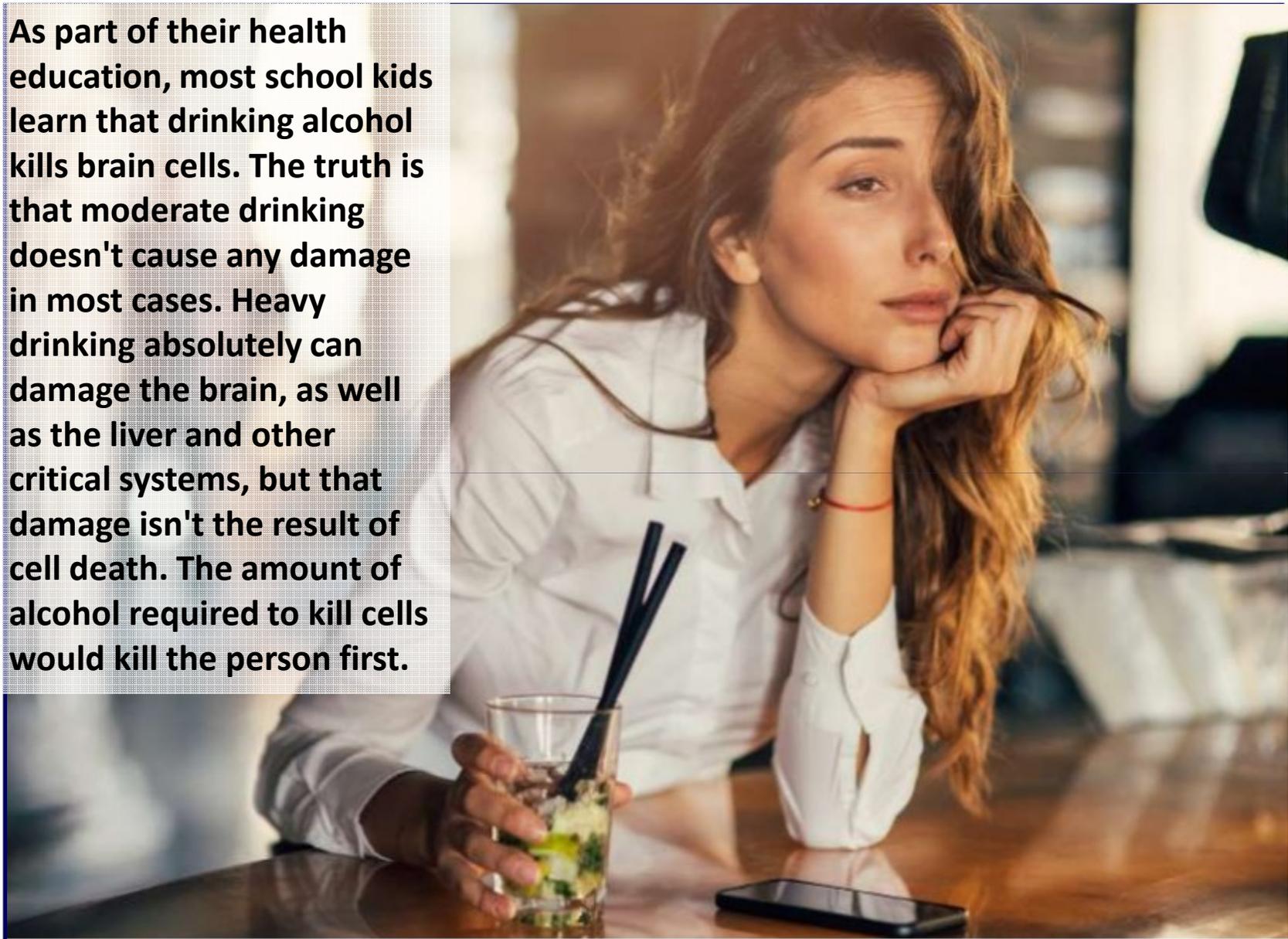
Jon Lockett

28 Aug 2019, 15:14 | Updated: 28 Aug 2019, 15:43

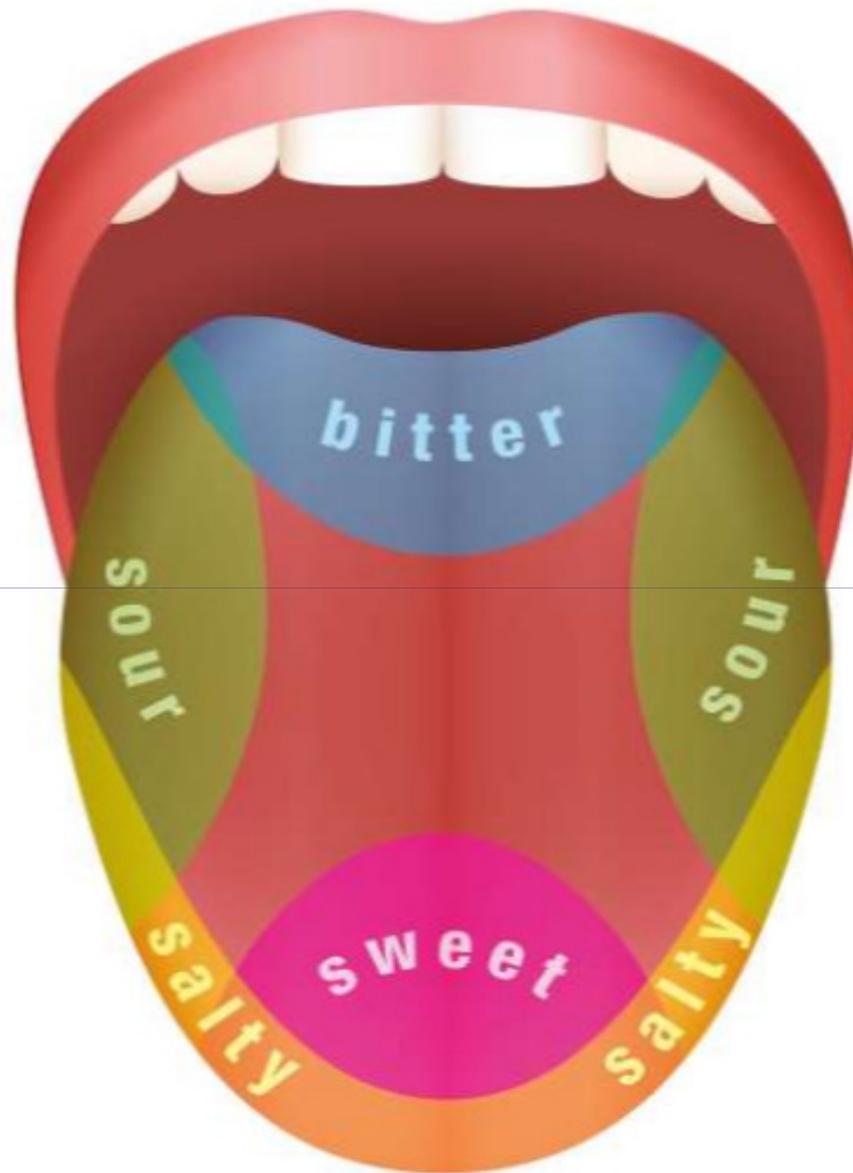


WATCH THE VIDEO
https://www.thesun.co.uk/news/9813574/mcdonalds-fight-video-nfl-fighting-skills/?amp_js_v=0.1&usqp=mq331AQEKAFwAQ==

As part of their health education, most school kids learn that drinking alcohol kills brain cells. The truth is that moderate drinking doesn't cause any damage in most cases. Heavy drinking absolutely can damage the brain, as well as the liver and other critical systems, but that damage isn't the result of cell death. The amount of alcohol required to kill cells would kill the person first.



One part of the tongue senses bitter tastes. Another detects sweetness, and others sense salty and bitter tastes, according to the tongue map. The tongue map drawn back in 1901 is a lie. Scientists now know that the tongue works in concert to detect all tastes and sensations.



A persistent myth presumes that 90 percent of the brain lies dormant in humans, waiting for evolution to catch up, and leaves kids imagining what kind of telepathic super beings they could be if only they could harness the rest. In reality, humans use all of their brains, there is no scientific evidence to suggest otherwise, and the 10 percent myth probably comes from a misquote attributed to Albert Einstein.



Homeopathy: “an outrage to reason”

The world’s scientists and doctors came to a decision some while ago on homeopathy, said Leyla Sanai in *The Spectator*: it doesn’t work. “There has been extensive research, and the unambiguous conclusion is that it has no more benefit than any other placebo.” In 1846, Queen Victoria’s physician declared that homeopathy was an “outrage to human reason”. A BMA inquiry concluded that it had no scientific validity in 1986. And in 2017, NHS England’s chief executive, Simon Stevens, described homeopathic treatments as a “misuse of scarce funds”, and ruled that they should no longer be available on the NHS. Yet the “heir to the throne, who is neither a doctor nor a scientist, begs to differ”. Prince Charles still believes that homeopathy works, and last week, announced that he has become patron of The Faculty of Homeopathy.

It’s true that homeopathy doesn’t stand up to scientific scrutiny, said Dr Max Pemberton in the *Daily Mail*. It is based on the idea that infinitesimally small quantities of substances derived from plants and minerals can trigger in the body a healing process. But these ingredients



Charles: not a doctor

are so massively diluted, often no molecule of the original remains.

So it is a nonsense – except for on thing: it does, in fact, work on many patients. That may well be down to the placebo effect, but if people feel better, is there any harm in promoting the practice?

Yes, there is, said Martha Gill in *The Times*. For one thing, it is not risk-free: the remedies are not rigorously safety-tested and can be unexpectedly strong. Secondly, people who put their trust in “natural” treatments may delay seeking conventional ones for serious illnesses, with disastrous consequences. Finally, its promotion reinforces the creeping view that scientific evidence matters less than anecdote and gut instinct – a trend that has fuelled the lucrative “wellness” industry, as well as the positively dangerous anti-vaxxer movement. It’s only a few weeks since Prince Charles was berating Donald Trump for his climate change denial, said Rivkah Brown in *The Independent*. By continuing to give his “royal seal of approval to a pseudo-science – an anti-science even – he is emboldening the very sceptics he seeks to convert”.

Finding the Definitive Meridian

Explanation of each Chromosomal biomarkers

Methylation / Sulfation / Glutathione GGT

Sulfite oxidase

Alkaline phosphatase

Hemochromatosis

Trimethylamine

CGRP and Migraine headaches

PEA and intractable pain

Mitochondrial disorders

Phospholipids and Cardiolipin

Tocopherols and Tocotrienols

Ubiquinol v ubiquinone

https://www.lifeextension.com/magazine/2007/1/report_coq10/Page-01

Catecholamine intermediates and their relationship to mental illnesses.

Xanthine and Alloxan

How much of a supplement do we absorb? Liposomes v capsules v aqueous solutions.

Naturally occurring endogenous and exogenous chemicals

EM Stress and devices

A **distal muscle can facilitate an inhibited proximal muscle.**
e.g. clenching fist may facilitate a shoulder girdle muscle.
e.g. Dorsi flexing foot may facilitate a hip joint muscle.

Watch carefully for this when muscle testing.

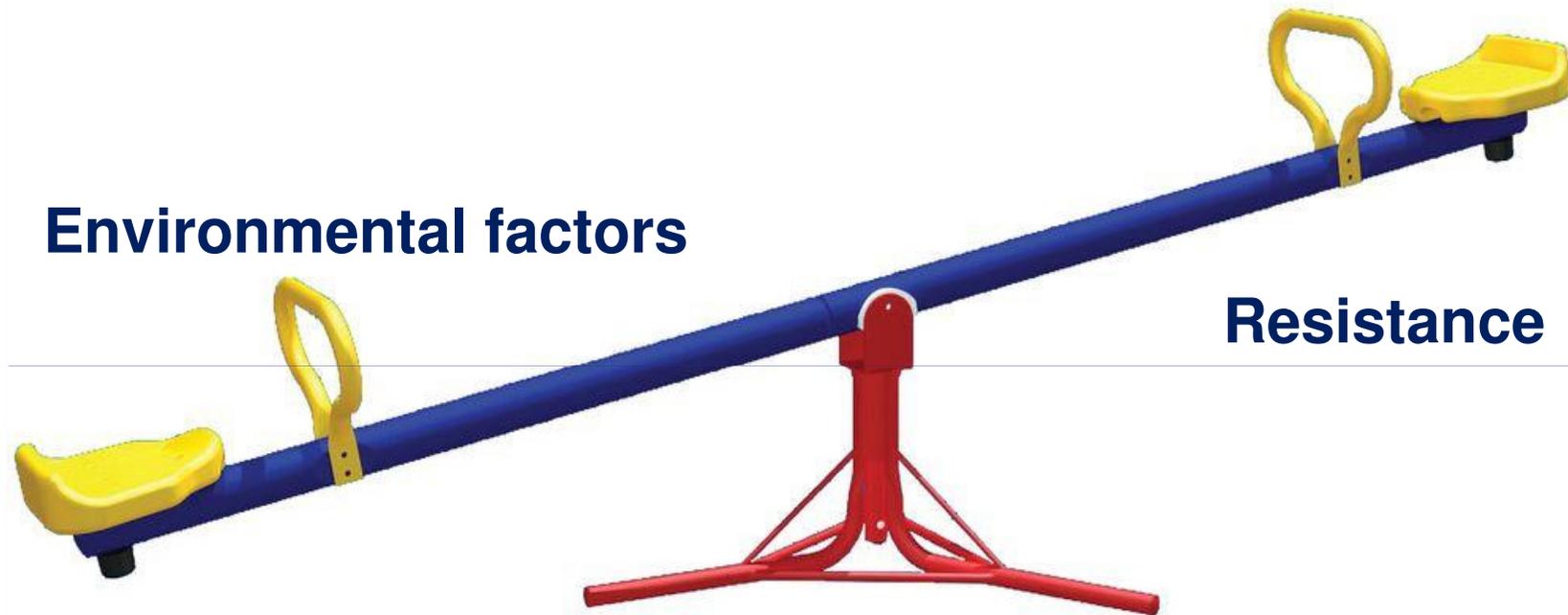
The name of the game is to get people better. The body heals itself in a sure, sensible, practical, reasonable, and observable manner. Man possesses a potential for recovery through the innate intelligence (*subconscious*) or the physiological homeostasis of the human structure. The recovery potential with which he is endowed merely waits for the hand and the heart and the mind of a trained individual to bring it into manifestation, allowing health to come forth. This knowledge, with physiological facts, creates predictable certainty. It should be done, it can be done.

David Traster Brisbane March 2019



**Dr George Goodheart DC
1918-2008**

Health



Environmental factors

Resistance

Dr James B. Harper DC

Disease

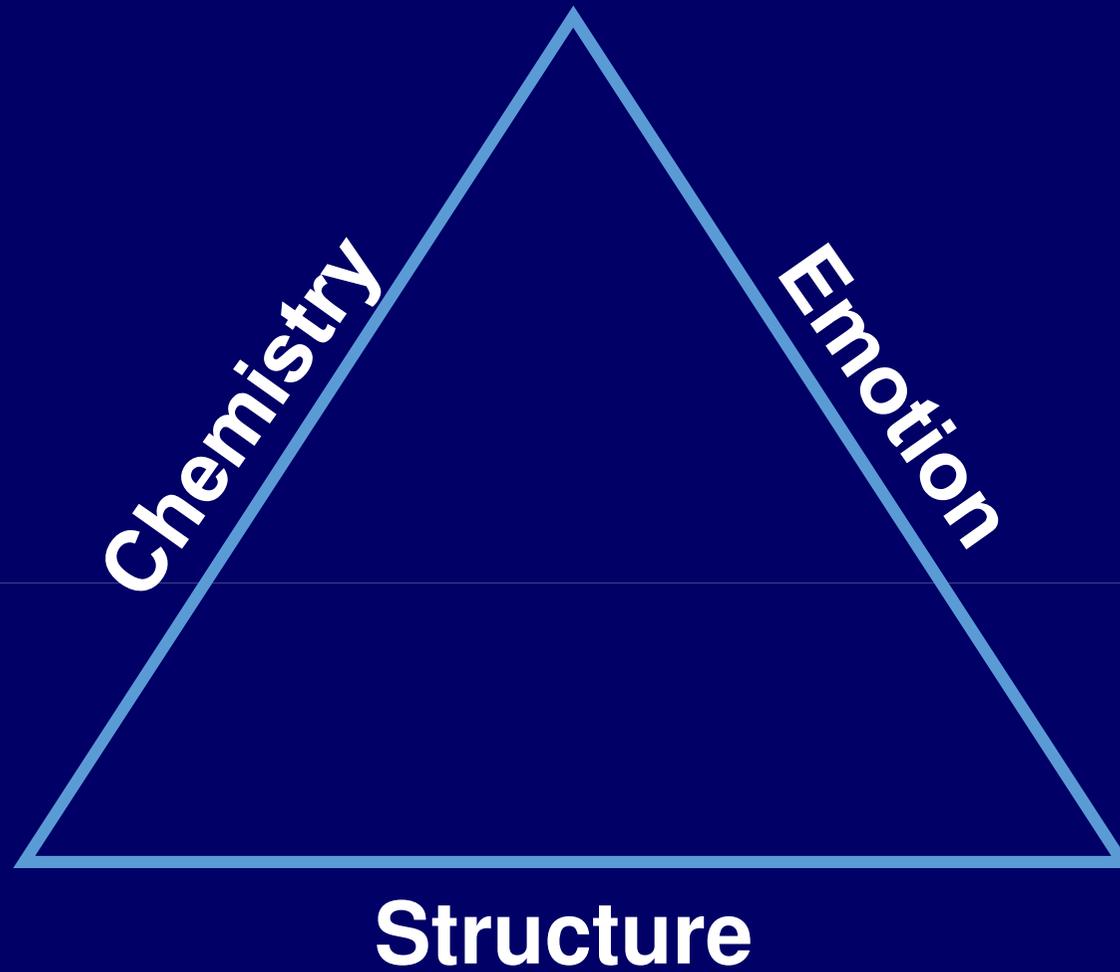


Resistance

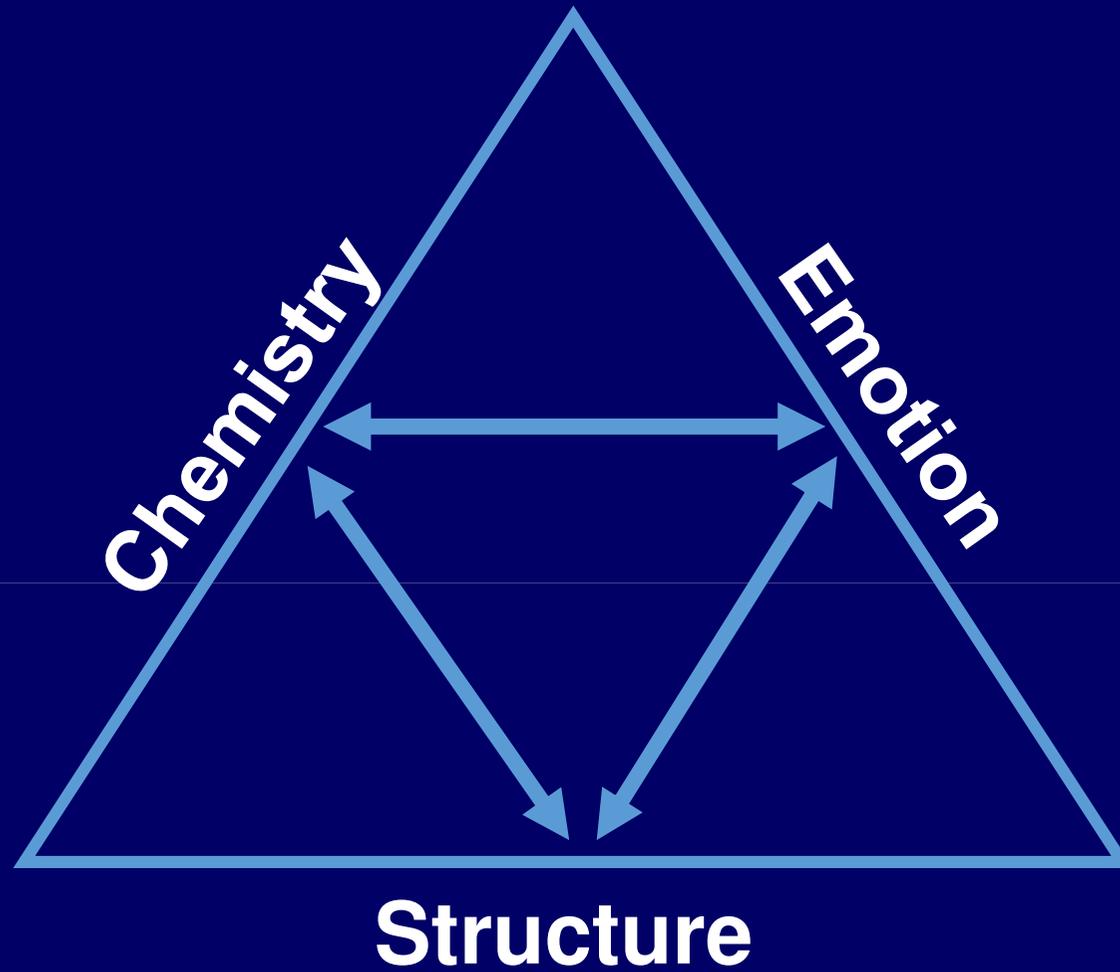
**Environmental
factors**

Dr James B. Harper DC

Triad of Health



Triad of Health



Triad of Health

Chemistry

Emotion



Structure

Energy Qi Prana Vital energy

Chemistry

Emotion



Structure

Disease

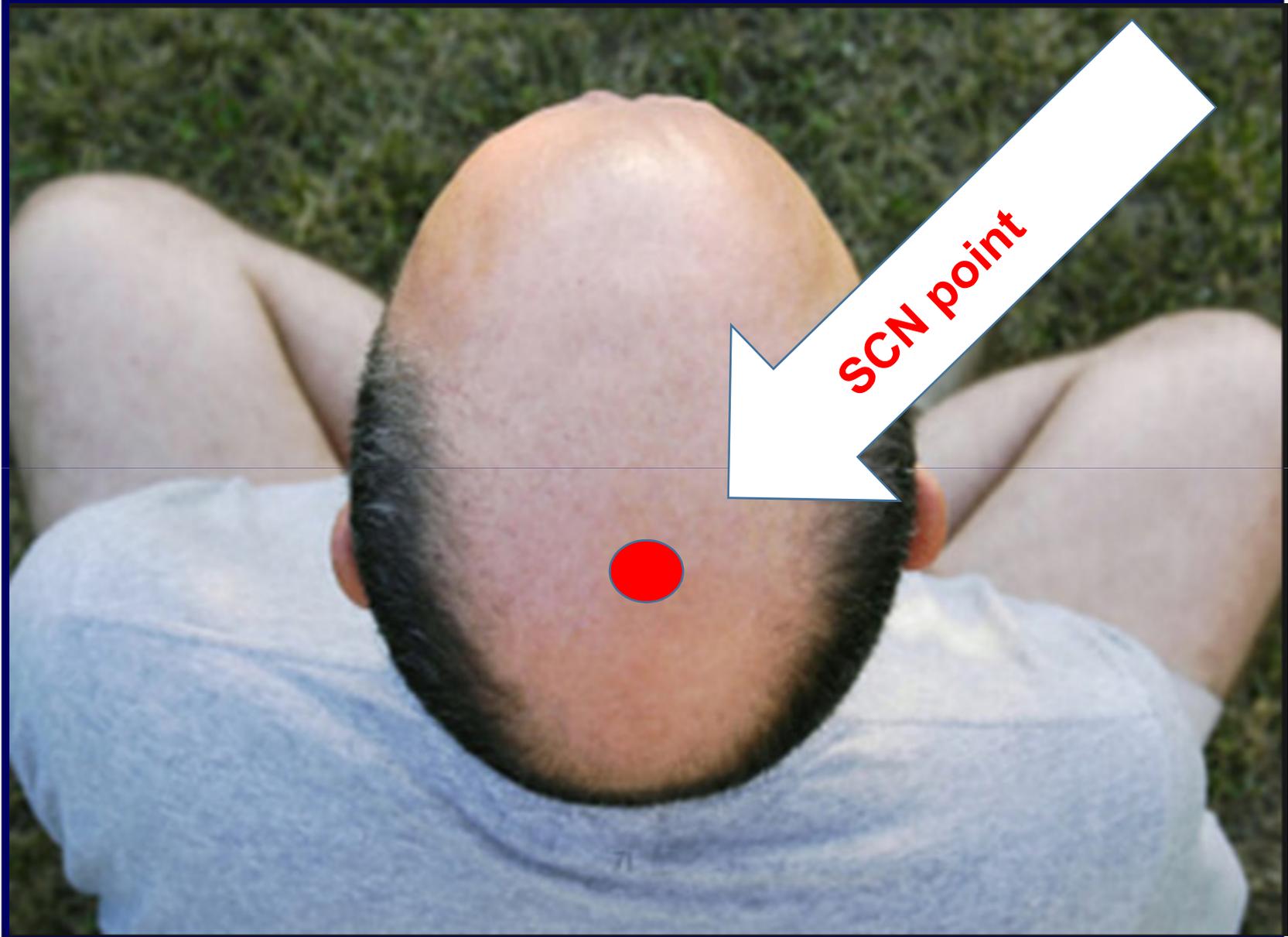


**Which is the Cause and
which is the Effect?**

Finding the Causal Meridian

Therapy localise the **Supra Chiasmatic Nucleus (SCN)** point (GV19 ½) on vertex of head.

Should remain strong. (if weakens challenge for a cranial fault).



SCN point

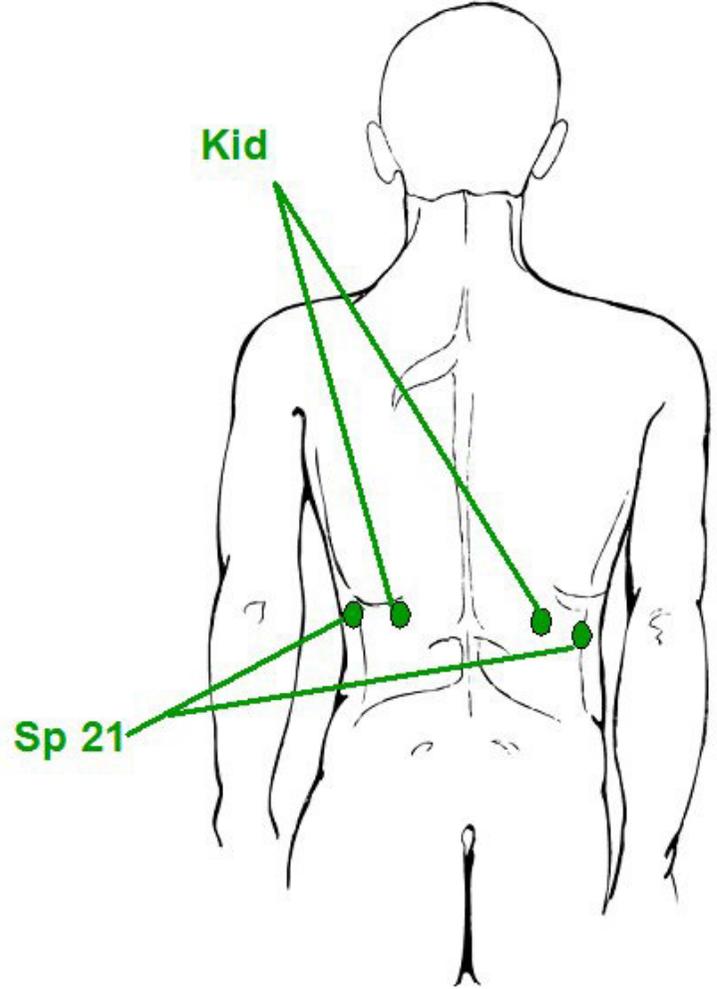
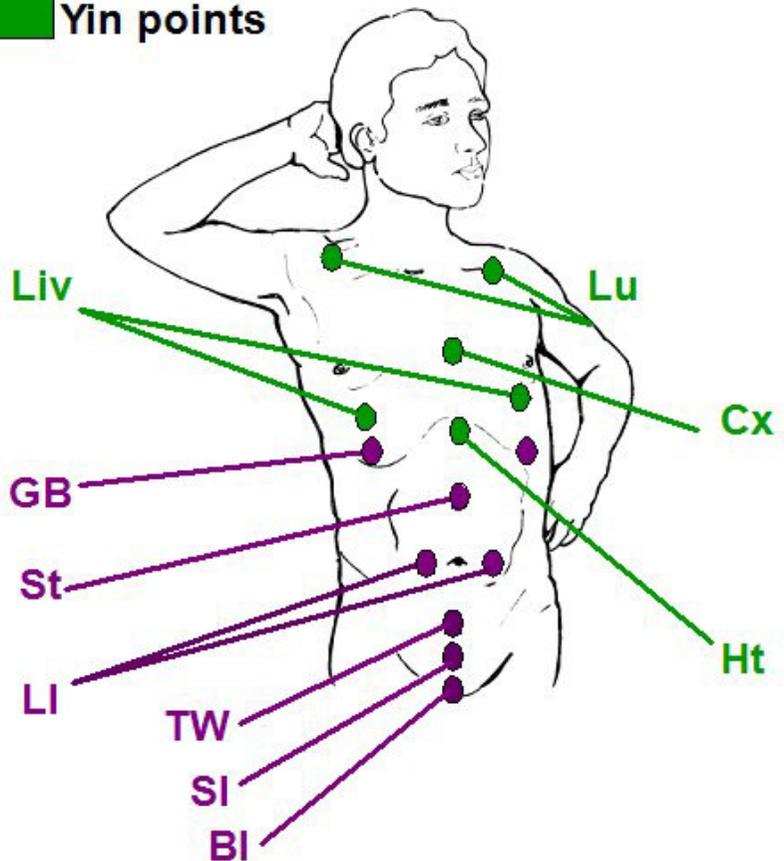
Whilst maintaining TL, challenge with YIN and YANG acetates for weakening to establish whether Causal meridian is a YIN or YANG.

Then identify exact meridian using Alarm points or Meridian coloured acetates.

Alarm Points

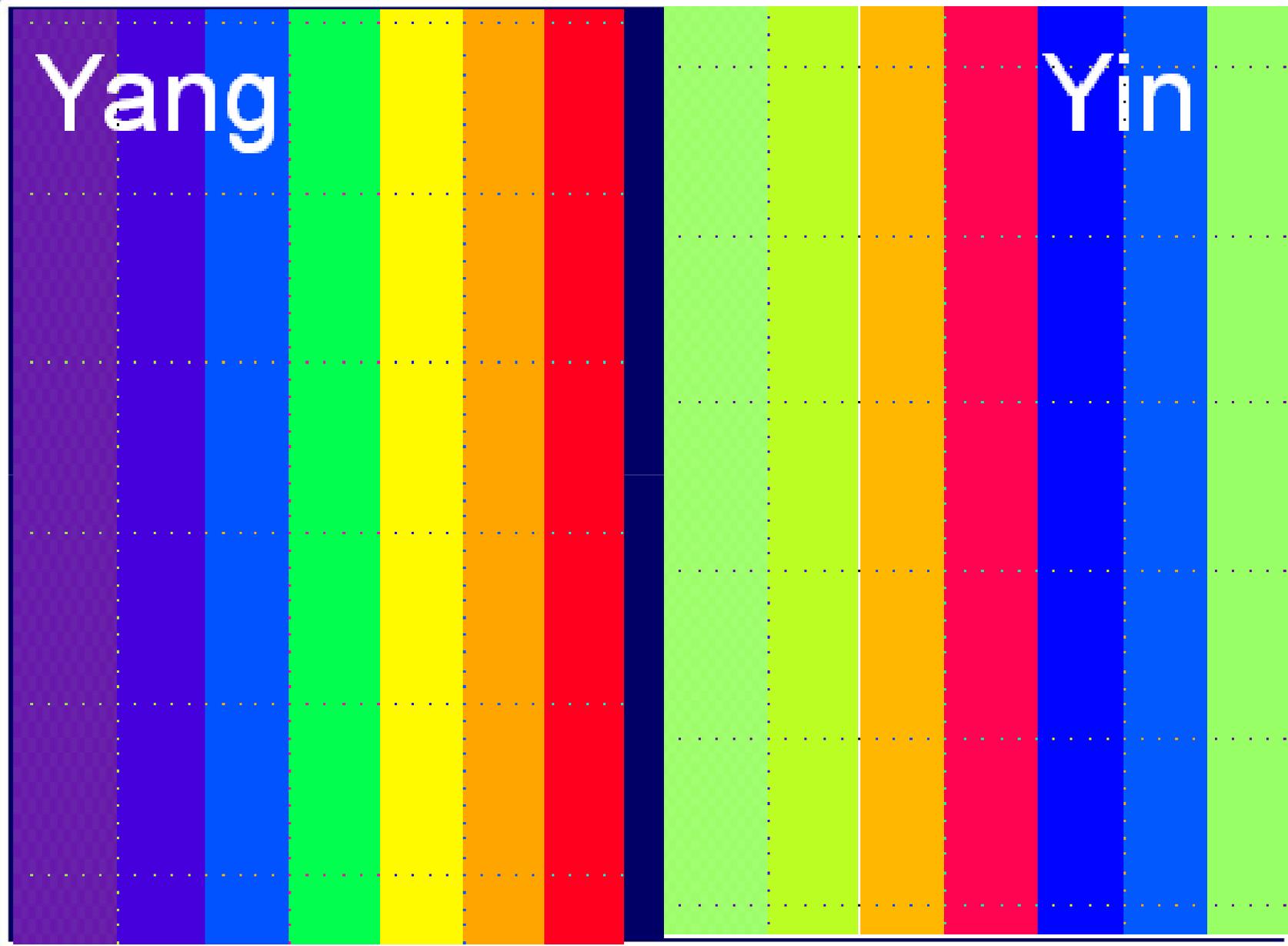
 Yang points

 Yin points



Yang

Yin



Maintain Therapy localisation or positive meridian acetate and tap SCN point 60x at 2Hz. This will lock the patient into the causal body clock.

The Effect meridian will negate the Causal meridian and now will weaken in the clear.

There will be **weak associated muscles** on both meridians found and tapped in.

These can be used to establish optimal remedies.

Muscles and their meridian relationship.

Meridian	Muscles
Bladder	Tibialis ant, Tibialis post, Peroneus long/brevis, Peroneus tertius
Kidney	Psoas, Iliacus, Upper trap
Gall bladder	Popliteus
Liver	PMS, Rhomoids
Large Intestine	TFL, Hamstrings, QL
Lung	Deltoid, Serratus ant, Coracobrachialis
CV	Supraspinatus, Diaphragm
GV	Teres major
Triple warmer	Teres minor, Infraspinatus
Circulation / sex	Glut max, Glut med/min, Piriformis, Adductors, Sartorius, Gracilis
Stomach	PMC, Neck flexors, Biceps, Brachialis, Pronator teres, Pronator quadratus
Spleen	Lat dorsi, Mid trap, Lower trap, Triceps
Small intestine	Quads, Abdominals
Heart	Subscapularis

Nutrition / Muscle relationship.

Vitamin A - Latissimus dorsi, Pectoralis major clavicular, Pectoralis minor, Piriformis, Popliteus, Psoas, Quadratus lumborum, Rhomboids, Sacrospinalis, Tibialis anterior.

B. Complex - Pectoralis major clavicular, Pectoralis minor, Peroneals, Quadriceps, Subscapularis, Upper trapezius, Supinator.

Vitamin B1

Vitamin B2 - Neck extensors

Vitamin B3 - Gracilis, Neck flexors, Pectoralis minor

Vitamin B5 - Sartorius

Vitamin B6 - Opponens digiti minimi

Folic acid

Vitamin B12

Biotin

Vitamin C - Coracobrachialis, Deltoid, Diaphragm, Quadratus lumborum, Sacrospinalis, Sartorius, Serratus anterior, Middle trapezius, Lower trapezius

Vitamin D - Quadriceps, Tensor fascia lata, ICV

Vitamin E - Abdominals, Adductors, Gluteus maximus, Gluteus medius, Hamstrings, Quadratus lumborum, Sacrospinalis, Subscapularis

Vitamin K

Co-enzyme Q10

SAMe

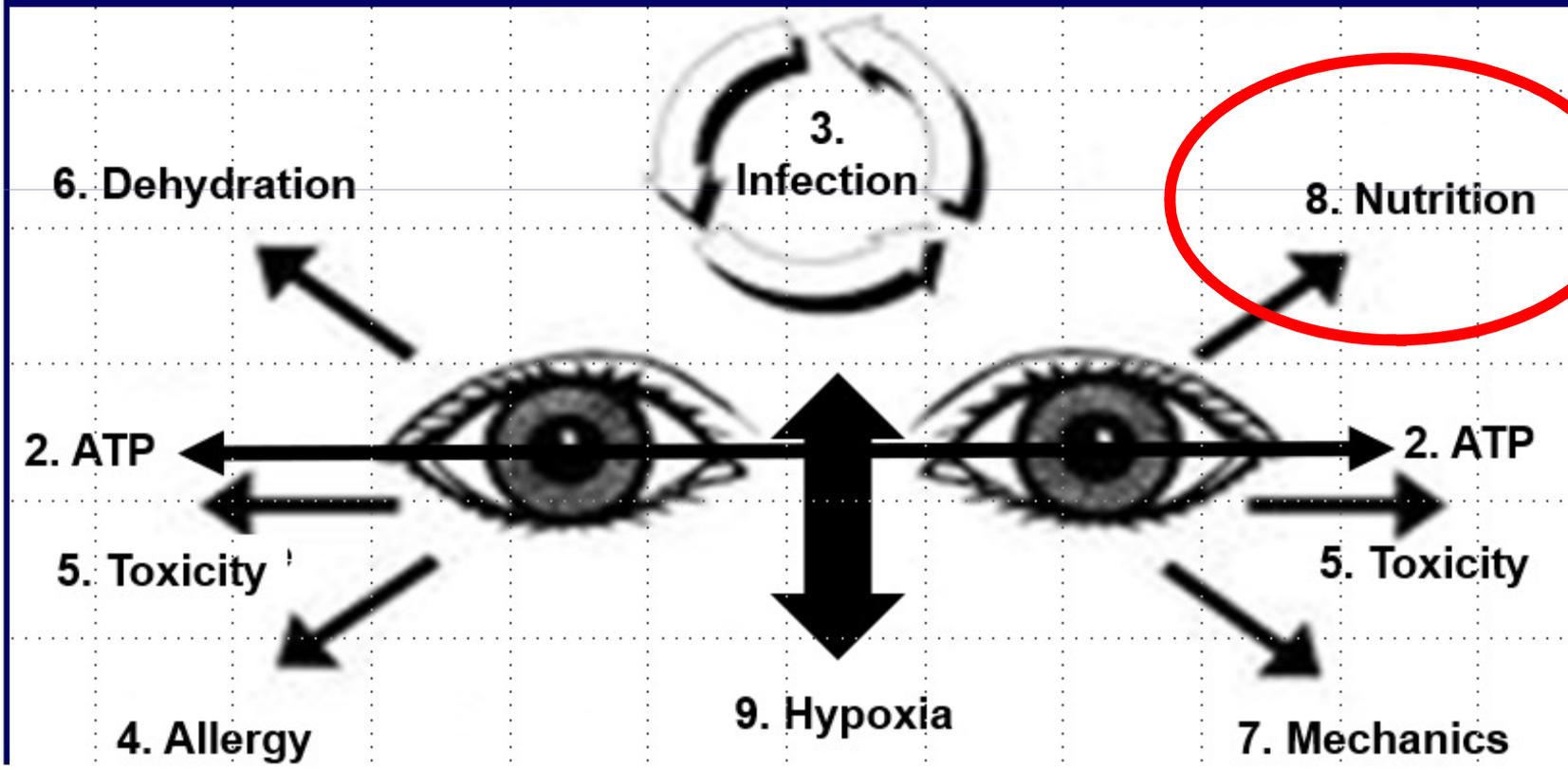
Muscle / Meridian / Nutrition relationship.

<u>Muscle</u>	<u>Meridian</u>	<u>Nutrition</u>
Abdominals	SI	Vit E
Adductors	Cx	Vit E
Biceps	St	HCl, Chlorophyll
Brachio Radialis	St	HCl
Coracobrachialis	Lung	Vit C
Deltoid	Lung	Vit C, RNA
Diaphragm	CV	Vit C
Gastrocnemius	Cx	Adrenal
Gluteus max	Cx	Vit E
Gluteus med	Cx	Vit E
Gracilis	Cx	Vit B3, Adrenal
Hamstrings	LI	Vit E, HCl, Ca
ICV		Chlorophyll, Ca, Vit D, HCl
Infraspinatus	TW	Thymus
Latissimus dorsi	Sp	Vit A, EFAs, Zn
Neck extensors	St	Vit B2, B3, B6, Iodine
Neck flexors	St	Vit B3, B6
Opponens digiti min	St	Vit B6
Pectoralis major clav	St	Vit B, B12, HCl
Pectoralis major sternal	Liv	Vit A, Bile salts
Pectoralis minor		RNA, Vit A, B, B3, Zn
Peroneals	BI	Vit B, Ca
Piriformis	Cx	Vit A
Popliteus	Gb	Vit A
Psoas / Iliacus	Kid	Vit A, E
Quadratus lumborum	LI	Vit A, C, E
Rhomboids	Liv	Vit A
Sacrospinalis	BI	Vit A, C, E, P, Ca
Sartorius	Cx	Vit B5, B6, C, Adrenal, Zn, Ginseng
Serratus anterior	Lung	Vit C
Soleus	Cx	Vit C
SCMastoid	St	Vit B3, B6, Iodine
Subclavius		Mg
Subscapularis	Ht	Vit B, C, E
Supinator	St	Vit B, G, HCl
Supraspinatus	CV	RNA
Tensorfacialata	LI	Vit D, Probiotics, Iron
Teres major	GV	Alkaline minerals, K, P
Teres minor	TW	Iodine
Tibialis anterior	Cx/BI	Adrenal
Tibialis posterior	BI	Vit A
Trapezius upper	Kid	Vit A, B, EFAs, Ca
Trapezii mid & lower	Sp	Vit C, Ca
Triceps	Sp	Vit A, HCl

“Of all the **essential nutrients your body requires to attain optimal health in every way, the percentage you obtain currently from your diet is**”

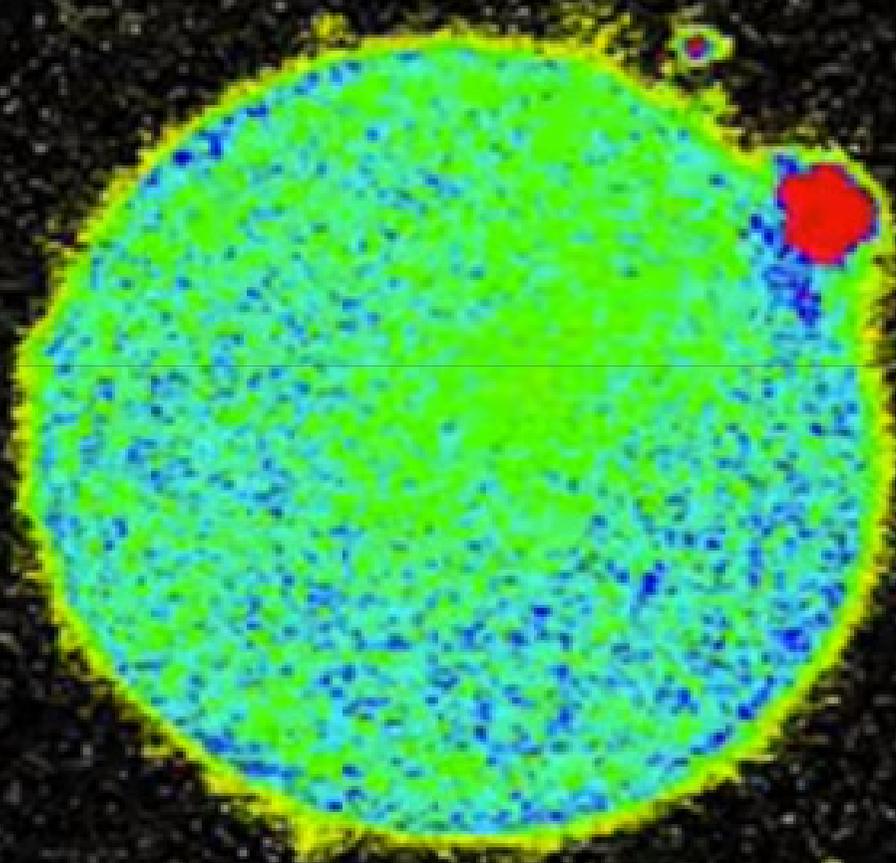
If less than 100% calibrate percentage

If 100% and shows to nutrition eye position then probably an absorption issue.



Chromosomes

<https://www.youtube.com/watch?v=5jl0sD9xBP0>



Chromosomes

(chroma means colour, *soma* means body) is a DNA molecule with part or all of the genetic material (genome) of an organism.

Humans contain 23 pairs of chromosomes in each cell nucleus

Chromosomes are normally visible under a light microscope only when the cell is undergoing the metaphase of cell division (where all chromosomes are aligned in the centre of the cell in their condensed form).

Humans are **diploid organisms**, carrying two complete sets of chromosomes: one set of 23 chromosomes from their father and one set of 23 chromosomes from their mother. The two sets combined provide a full complement of 46 chromosomes. This total number of chromosomes is called the chromosome number.*

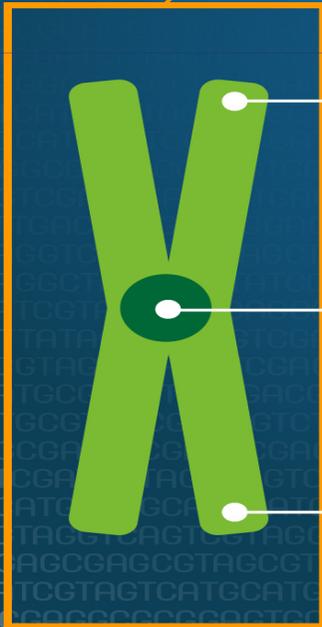
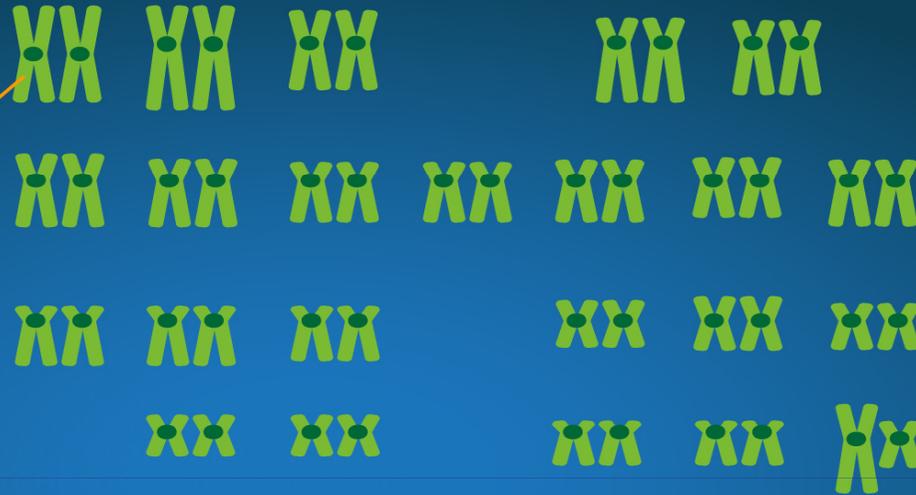
*D. Peter Snustad; Michael J. Simmons (2012). *Principles of Genetics, 6th edition*. John Wiley & Sons. p. 115



CHROMOSOMES

NHGRI FACT SHEETS

genome.gov



Telomere

Centromere

Telomere

**Human Chromosomes
23 Pairs**



NIH

National Human Genome
Research Institute

**Kingfisher birds
contain 76 pairs
of Chromosomes**



DNA condensation of the duplicated chromosomes during cell division (mitosis - division or meiosis - multiplication) results either in a **four-arm structure** if the centromere is located in the middle of the chromosome or a two-arm structure if the centromere is located near one of the ends.

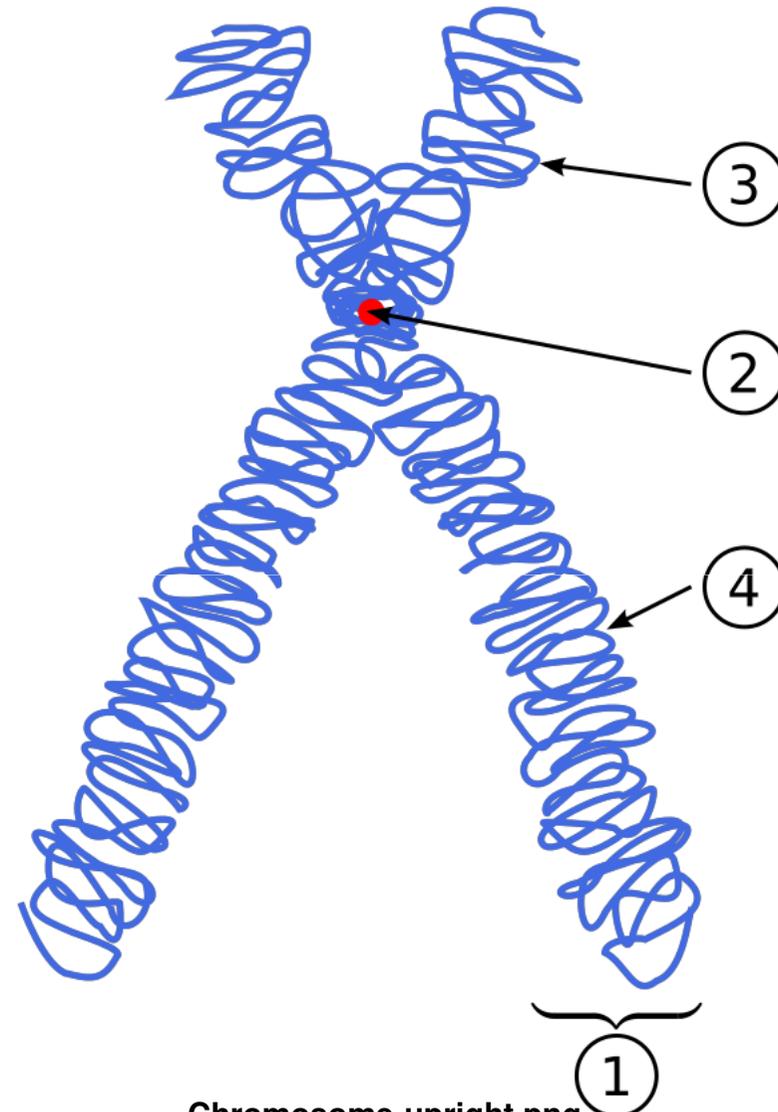
Schleyden, M. J. (1847). Microscopical researches into the accordance in the structure and growth of animals and plants.

Diagram of a replicated and condensed metaphase eukaryotic chromosome.

(1) Chromatid – one of the two identical parts of the chromosome after S phase.

(2) Centromere – the point where the two chromatids touch.

(3) Short (p) arm. (4) Long (q) arm.



Chromosome-upright.png
Modifications made by Tryphon.

Metacentric

These are X-shaped chromosomes, with the centromere in the middle so that the two arms of the chromosomes are almost equal.

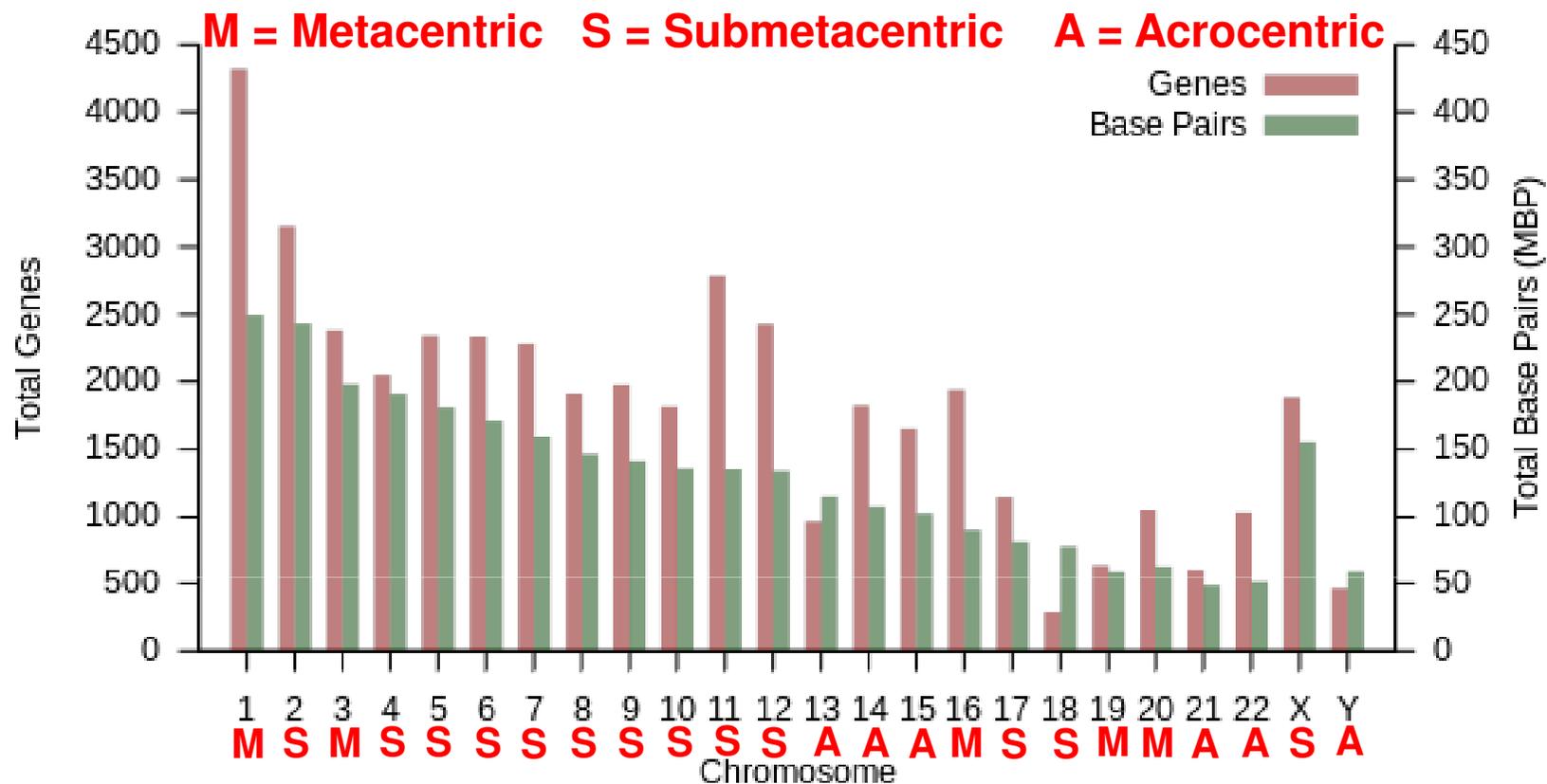
Submetacentric

If arms' lengths are unequal, the chromosome is said to be submetacentric. Their shape is j shape during anaphase

Acrocentric

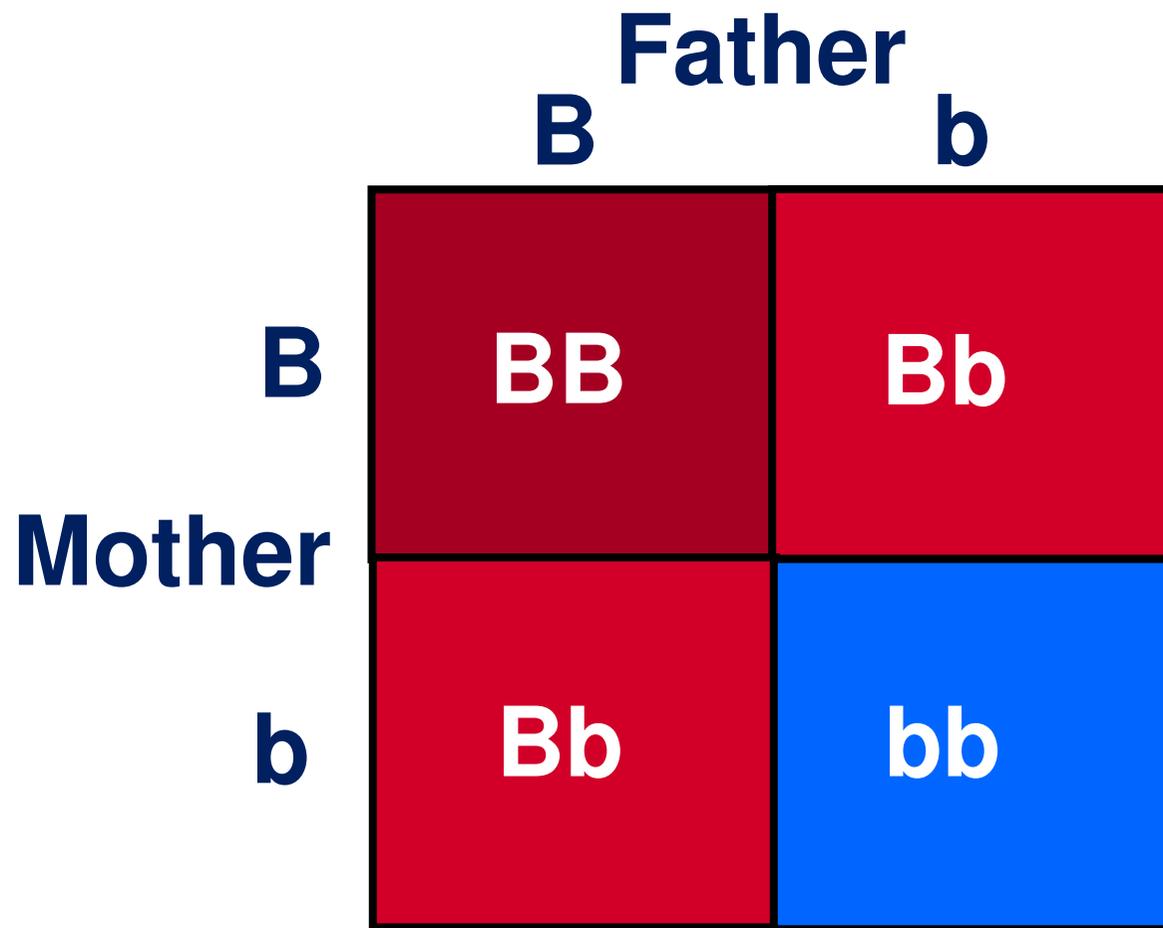
If the p (short) arm is so short that it is hard to observe, but still present, then the chromosome is acrocentric

Pluta, A.; A.M. Mackay; A.M. Ainsztein; I.G. Goldberg; W.C. Earnshaw (1995). "The centromere: Hub of chromosomal activities". *Science*. 270(5242): 1591–1594. doi:10.1126/science.270.5242.1591. PMID 7502067



Estimated number of genes and base pairs (in mega base pairs) on each human chromosome

Genetic dominance



B = Brown eyes

b = Blue eyes

**Relationship of the
Chromosomes to the
Violet / Ultraviolet
wavelengths**

370nm

371nm

380nm

381nm

372nm

373nm

382nm

383nm

374nm

375nm

384nm

385nm

376nm

377nm

386nm

387nm

378nm

379nm

388nm

389nm



Each Biophoton wavelength appears to modulate a specific chromosome in sequence 1-23 starting at 370nm and finishing at 400nm - X chromosome.

Identifying the Diagnostic Biophoton Wavelength (DBW)

Strong muscle weakens to one of the 31 Diagnostic Biophoton Wavelengths.

This indicates the chromosome that is emitting non-coherent light due to one or more polymorphisms.

Source: *European Journal of Nutrition*

August 2019, Volume 58, Issue 5, pp 1821–1827, doi: [10.1007/s00394-018-1732-z](https://doi.org/10.1007/s00394-018-1732-z)

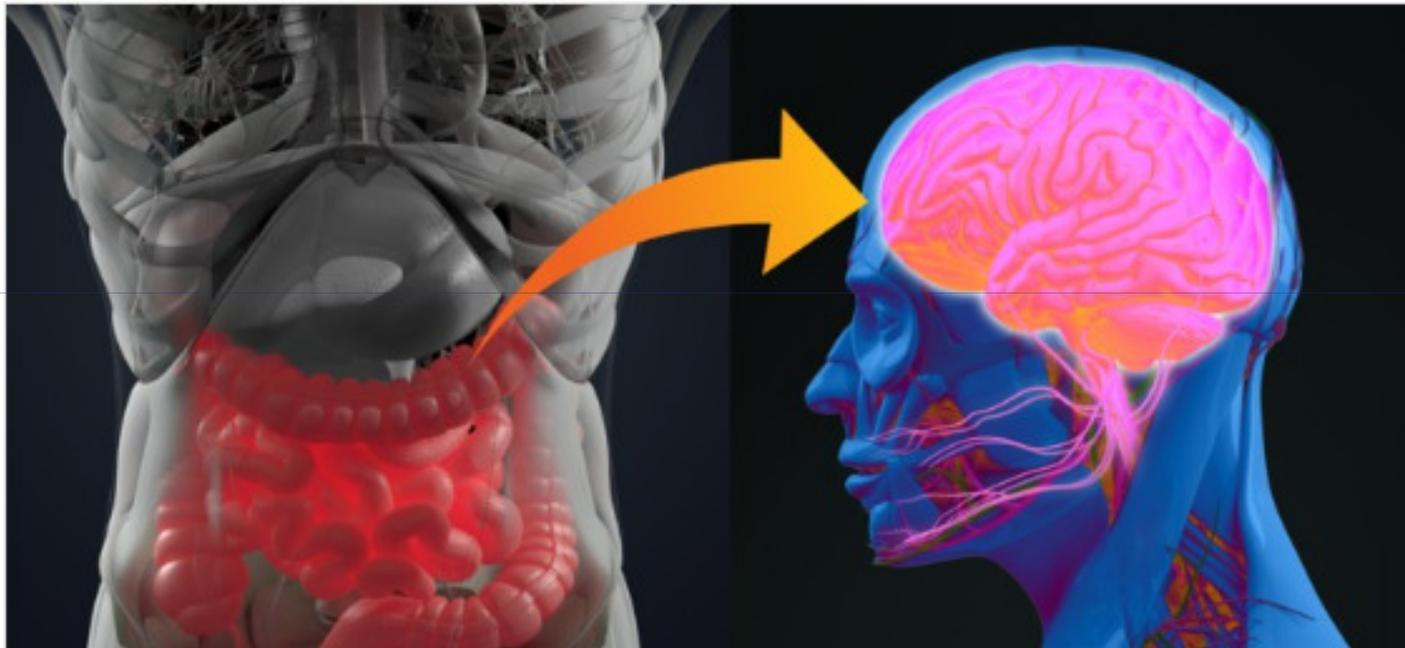
"Influence of 4-week multi-strain probiotic administration on resting-state functional connectivity in healthy volunteers"

Authors: D. Bagga et al.

'Promising': Multi-strain probiotic may help modulate behavior in healthy people

By Stephen Daniells [✉](#)

15-Aug-2019 - Last updated on 15-Aug-2019 at 16:03 GMT



Brain imaging technology (fMRI) indicated that four weeks of supplementation with Winlove's Ecologic 825 product led to significant changes in functional connectivity of various regions and networks in the brain, which suggested that the probiotics may be impacting higher order cognitive processes as well as emotional ones.

The study product is composed of nine bacterial strains, including *Lactobacillus casei* W56, *L. acidophilus* W22, *L. paracasei* W20, *Bifidobacterium lactis* W51, *L. salivarius* W24, *Lactococcus lactis* W19, *B. lactis* W52, *L. plantarum* W62, and *B. bifidum* W23.

Methylation

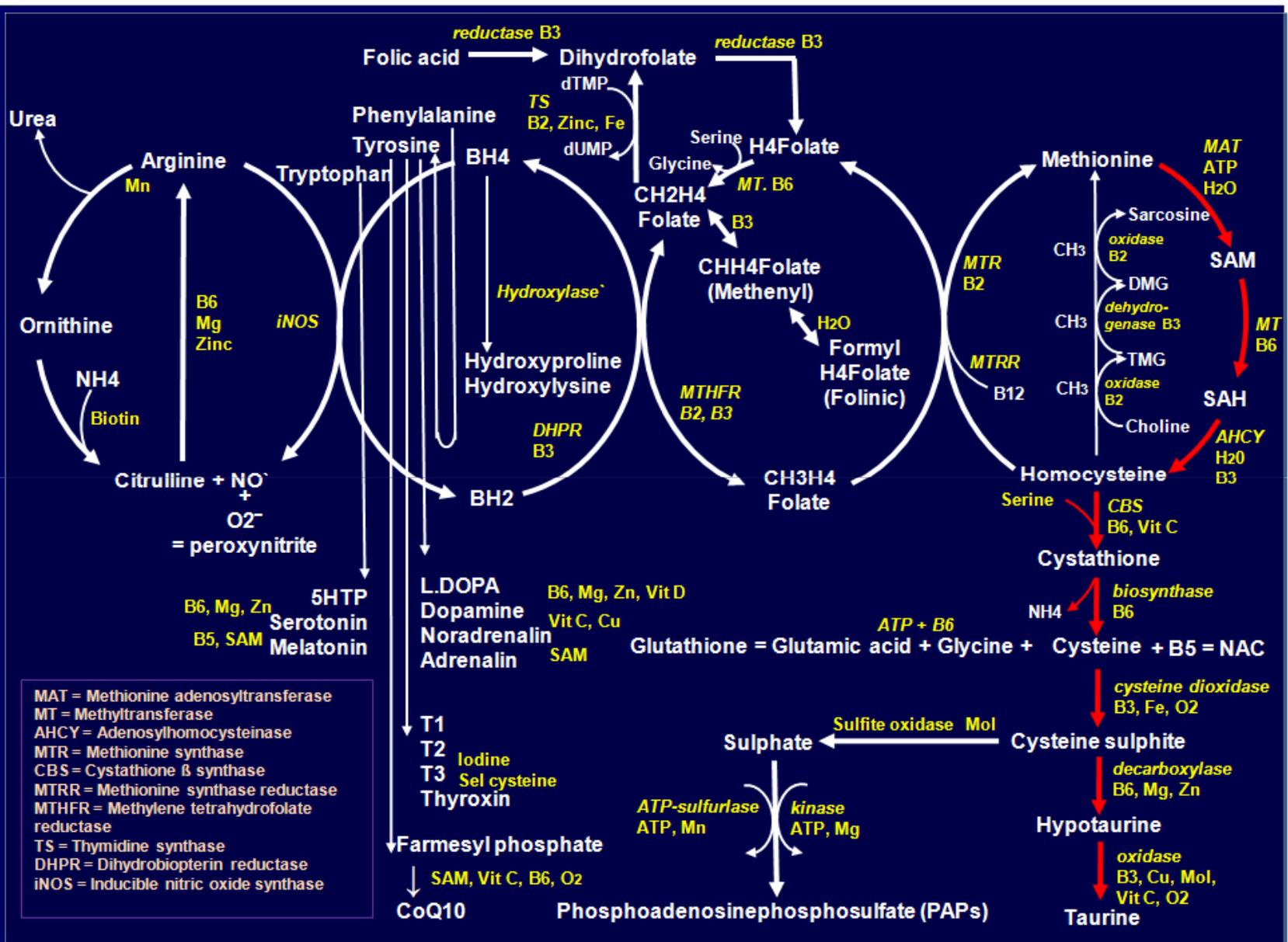
Sulphur containing Amino Acids

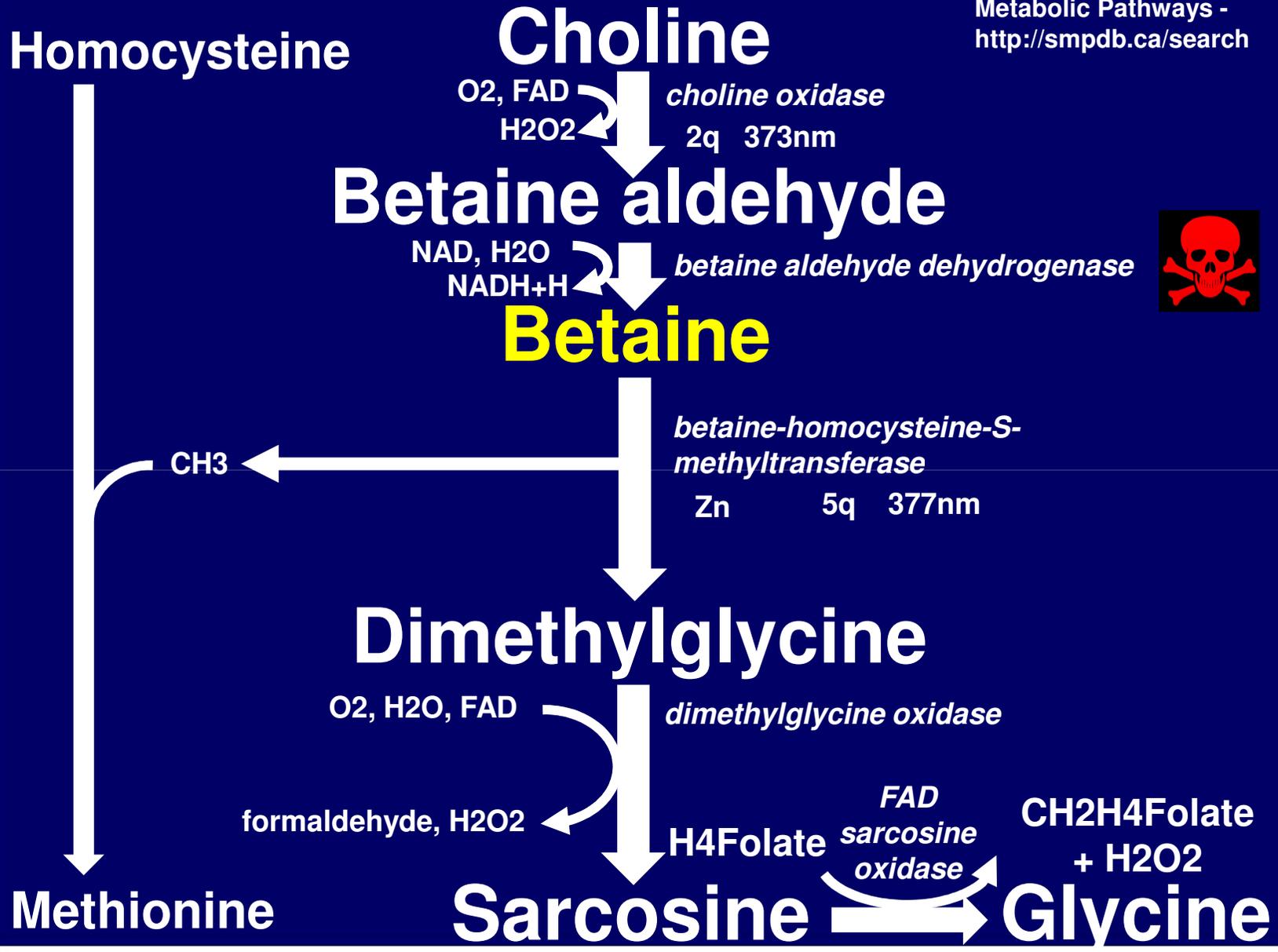
- Methionine
- Cysteine
- Taurine



Sulphur containing Amino Acids

- **Chemically different from other amino acids since they contain a sulphur molecule**
- **Sulphur combines with hydrogen molecules to become powerful anti-oxidants to fight free radicals**
- **Methionine, cysteine, taurine**





Cysteine

O₂, NADPH, Fe



cysteine dioxygenase 5q 377nm

Cysteine sulfinat

P-5-P

cysteine sulfinat decarboxylase

12q 385nm

CO₂

Hypotaurine

NAD, Fe, Mol



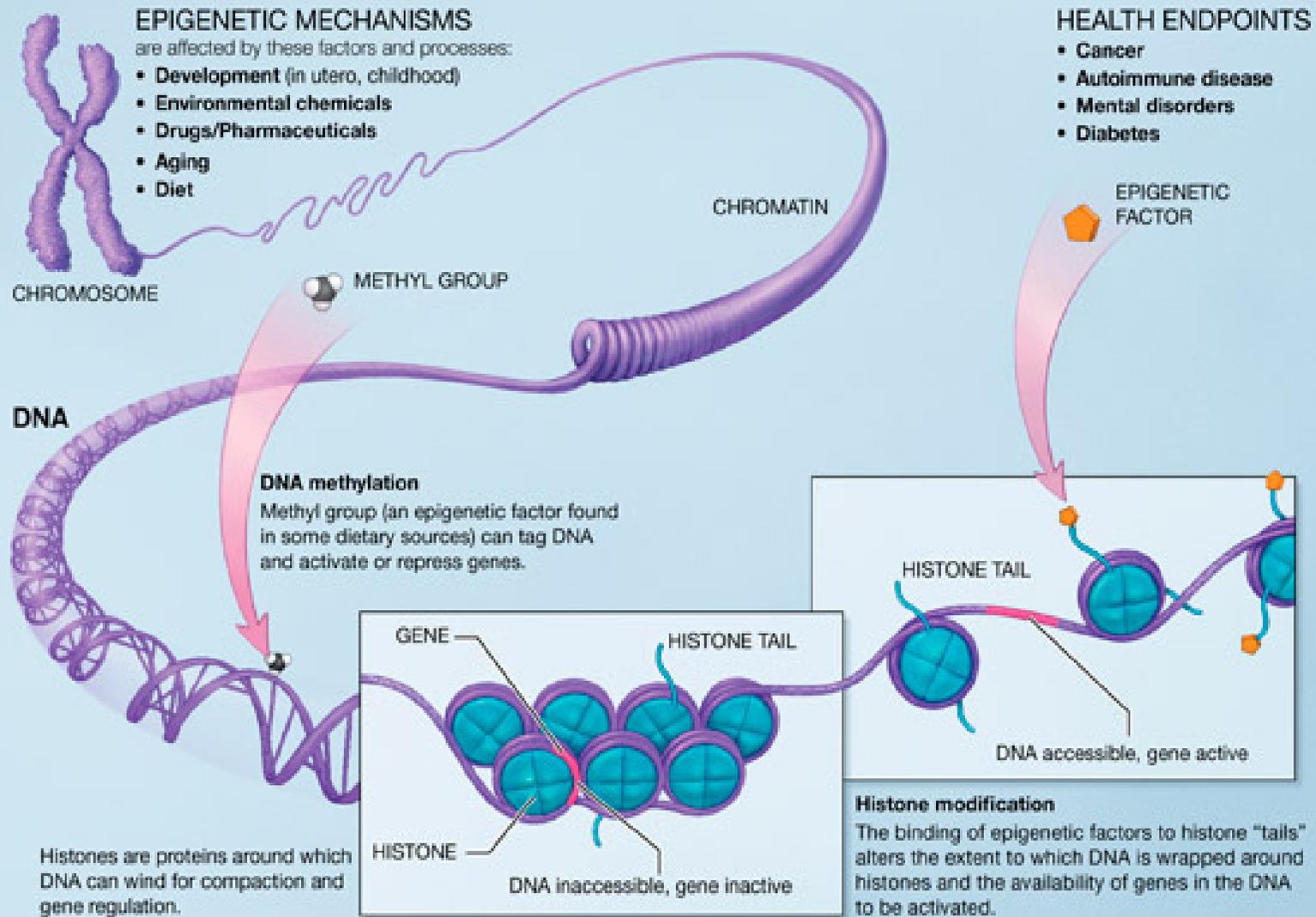
hypotaurine dehydrogenase

12q 385nm

NADH+H

Taurine

Metabolic Pathways -
<http://smpdb.ca/search>



Some Methylation functions

**Phosphatidylethanolamine to
phosphatidylcholine**

Noradrenalin to adrenalin

**Metabolism Dopamine, Noradrenalin and
Serotonin**

Metabolism of Estrogens and Testosterone

DNA methyltransferases

Histone methyltransferases

Methyl Caps DNA /RNA

Synthesis of Creatine, Carnitine

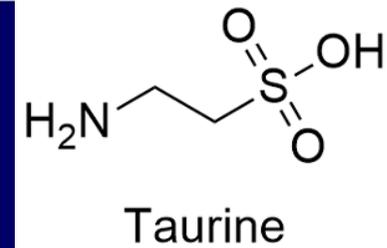
Synthesis of myelin

Leon Chaitow "Thorsons Guide to Amino acids" page

Selenocysteine is an alpha amino acid found in proteins from every domain of life. A selenium atom replaces the sulfur of its structural analog, cysteine. It is thus referred to as the 21st amino acid.

U>G SNIP

Taurine – Good for the Heart



- By-product of sulphurous amino acids cysteine and methionine.
- Not contain a carboxyl group and not used in protein strings.
- An amino sulphonic acid
- Critical in preterm and newborns – normal growth and development.

Amino acids Biochemistry and Nutrition by Guoyao Wu Pub CRC Press page 361

Leon Chaitow "Thorsons Guide to Amino acids" page 68

Taurine

- **Increases levels of prolactin.**
- **Concentrated in CNS, heart, and retina.**
- **Facilitates the passage of sodium, potassium, calcium and magnesium ions in and out of cell and electrically stabilises the cell membrane.**

Amino acids Biochemistry and Nutrition by Guoyao Wu Pub CRC Press page 361

Leon Chaitow "Thorsons Guide to Amino acids" page 68

Taurine

Brain and CNS

- **Most plentiful amino acid in developing brain and second in the adult brain. Mostly in olfactory bulb, hippocampus and pineal.**
- **Inhibitory neurotransmitter, anti-anxiety and protects against glutamate excitotoxicity.**

Leon Chaitow "Thorsons Guide to Amino acids" page 68

Amino acids Biochemistry and Nutrition by Guoyao Wu Pub CRC Press page 361

Taurine

Heart



- **Most abundant free amino acid.**
- **Metabolism of calcium for the transmission of nerve impulses.**
- **Depleted in arrhythmia or abnormal heartbeats.**
- **Promotes pumping, increases force of heart muscle contraction.**

Leon Chaitow "Thorsons Guide to Amino acids" page 68

Amino acids Biochemistry and Nutrition by Guoyao Wu Pub CRC Press page 361

Taurine

Hypertension

- Antagonist to blood pressure increasing effect of angiotensin.
- With low levels of taurine, renin is activated and angiotensin is formed and blood pressure rises.
- Taurine breaks the renin-angiotensin feedback loop.



Leon Chaitow "Thorsons Guide to Amino acids" page 68

Amino acids Biochemistry and Nutrition by Guoyao Wu Pub CRC Press page 361

Taurine



Gall Bladder function

- Stimulates taurocholic acid, bile salt which breaks down fats in SI
- Increases the cholesterol excretion in bile
- Improves fat metabolism in the liver and lowers atherosclerotic plaque in the arteries

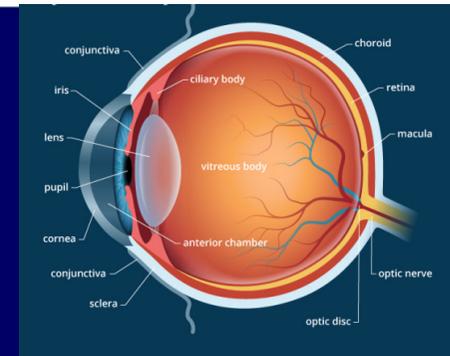
Leon Chaitow "Thorsons Guide to Amino acids" page

Amino acids Biochemistry and Nutrition by Guoyao Wu Pub CRC Press page 361

Taurine

Eye

- Most abundant amino acid in retina
- Low levels in retinitis pigmentosa
- Protects the eye from toxins
- Particularly effective against hypochlorite (swimming baths)



Leon Chaitow "Thorsons Guide to Amino acids" 68

Amino acids Biochemistry and Nutrition by Guoyao Wu Pub CRC Press page 361

Taurine

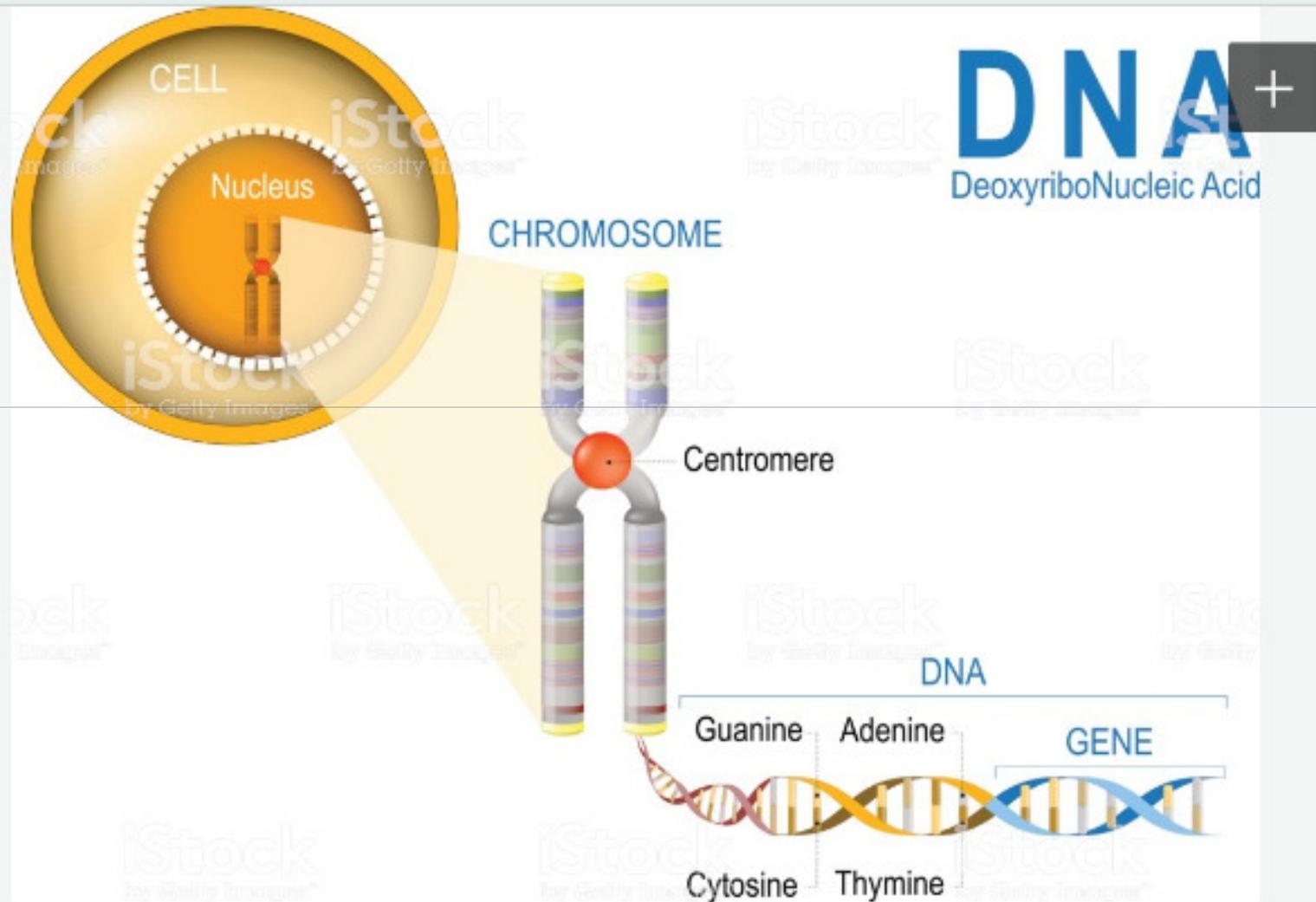
- **Can be used in prevention of epileptic seizures**
- **Acts as an antioxidant and protects against toxicity, such as lead and cadmium**

Leon Chaitow "Thorsons Guide to Amino acids" page 68

Amino acids Biochemistry and Nutrition by Guoyao Wu Pub CRC Press page 361

Phenotype
v
Genotype

Cell, Chromosome, DNA and gene. Cell Structure. - Illustration



The 'dark heart' of human DNA contains mysterious Neanderthal genes, scientists find



Jasper Hamill Wednesday 19 Jun 2019 1:03 pm

METRO NEWS... BUT NOT AS YOU KNOW IT

We don't know for sure what happened to our predecessors the Neanderthals, but it's a fair bet we humans had something to do with their demise.

Now scientists have found remnants of this lost species lurking within the 'dark heart' of our DNA.

A new study has discovered genes from this proto-human species in areas of human chromosomes called centromeres which have not been fully mapped.

'It's the heart of darkness of the genome, we warn students not to go there,' said Charles Langley, professor of evolution and ecology at the University of California.

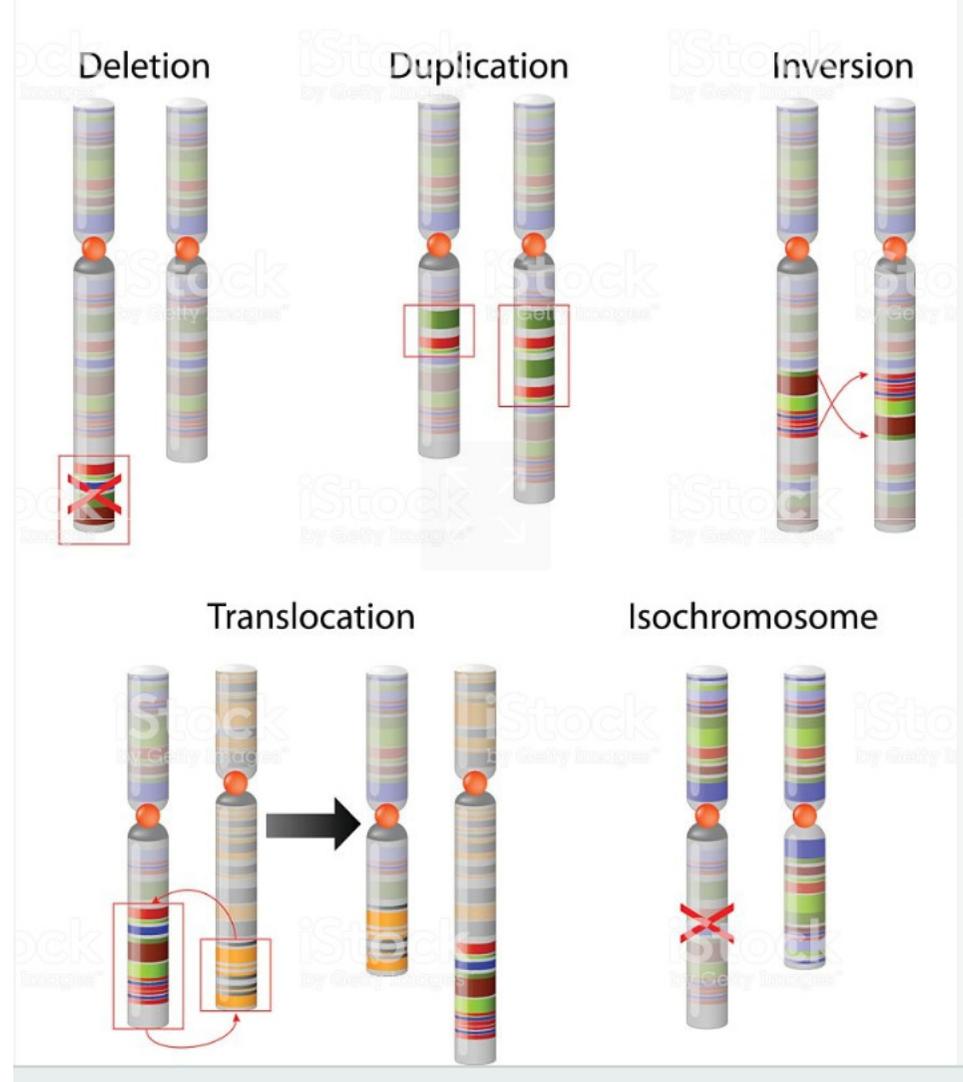
The researchers looked at centromere sequences from the 1000 Genomes Project, a public catalogue of human DNA.



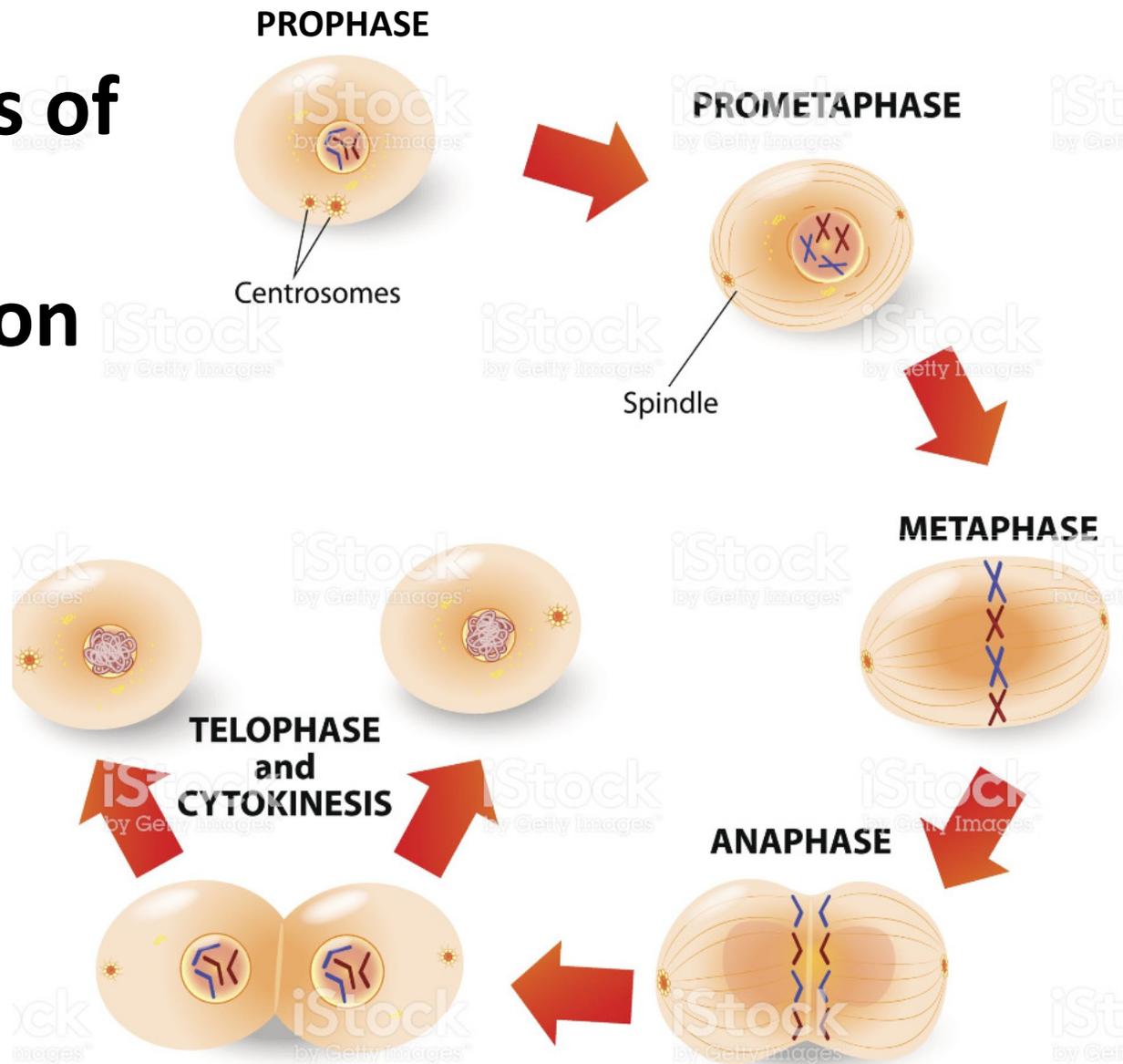
They found Neanderthal DNA as well as 'ancient, archaic' genes that 'appears to be derived from an unknown relative'.

It's believed the Neanderthal DNA contained in the 11th human chromosome 'could be influencing differences in our sense of smell to this day'.

CHROMOSOMAL TRANSLOCATION



Stages of Cell Division

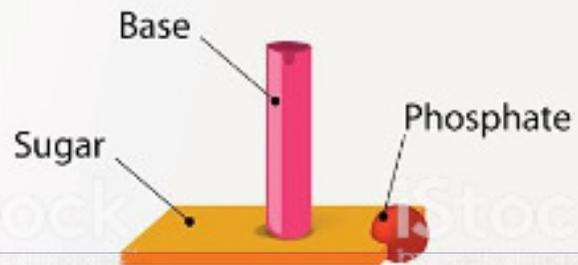




DNA structure

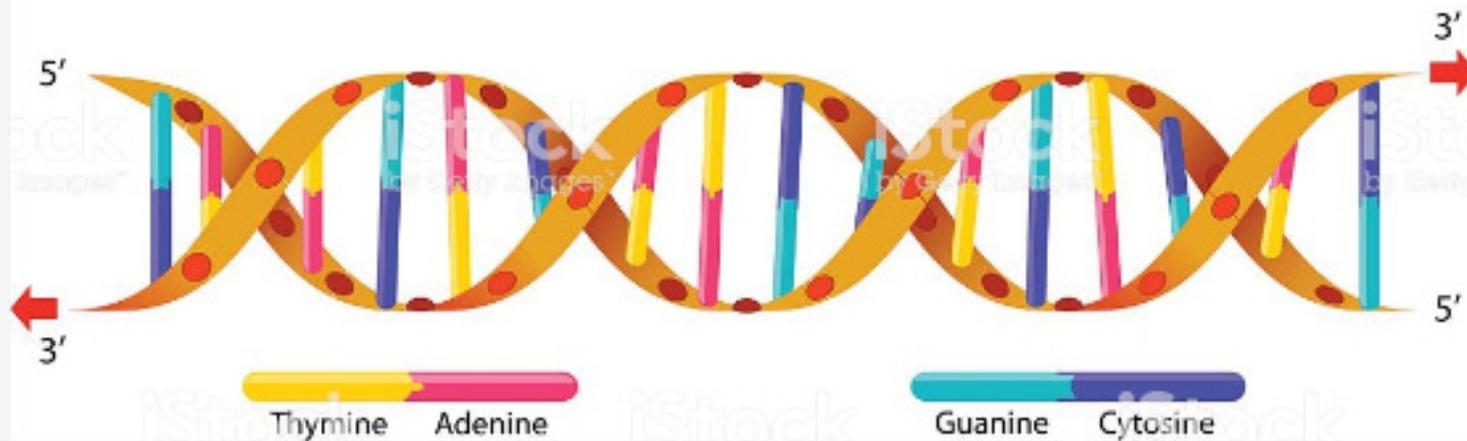


Nucleotide

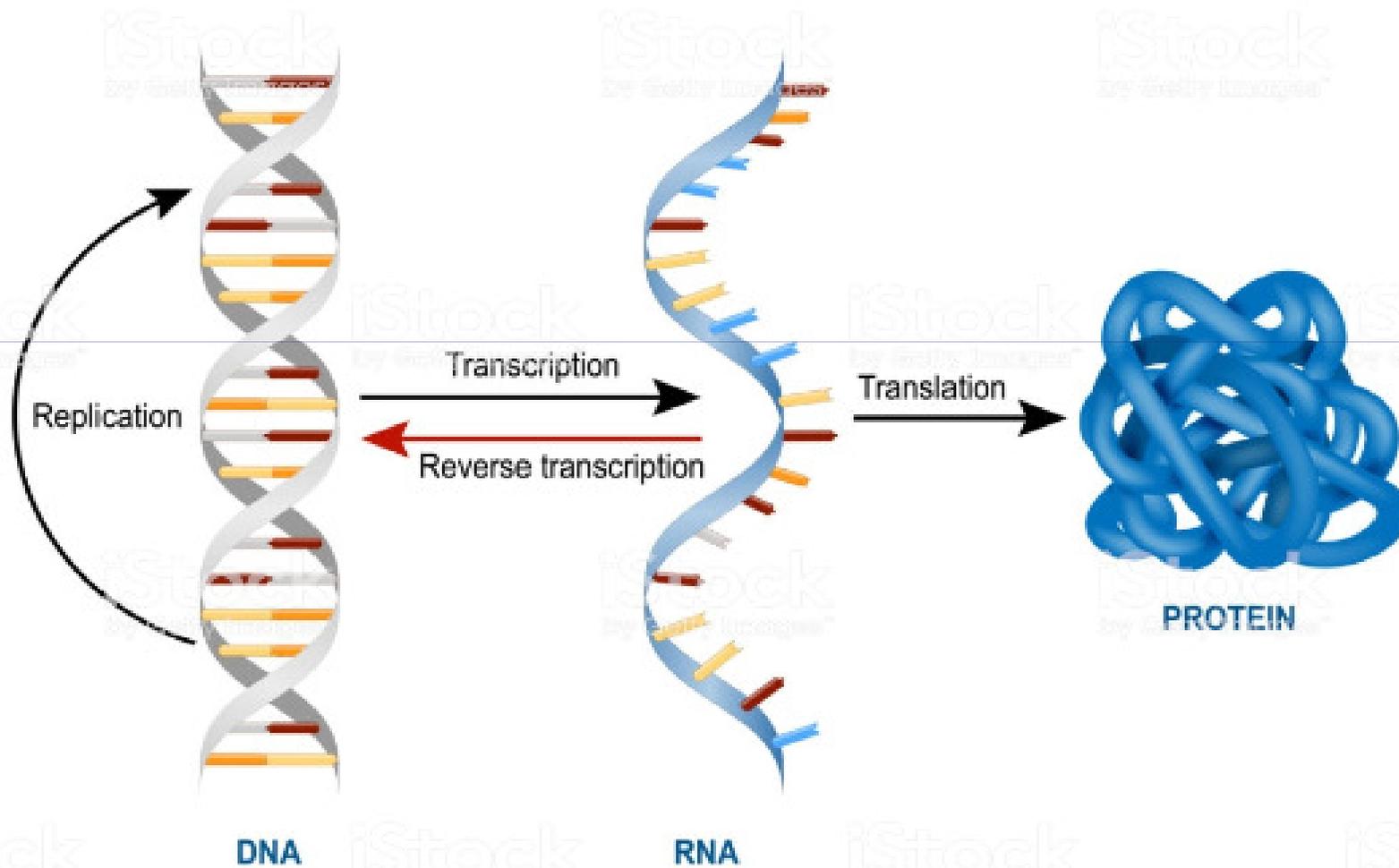


Bases

- Adenine
- Cytosine
- Guanine
- Thymine



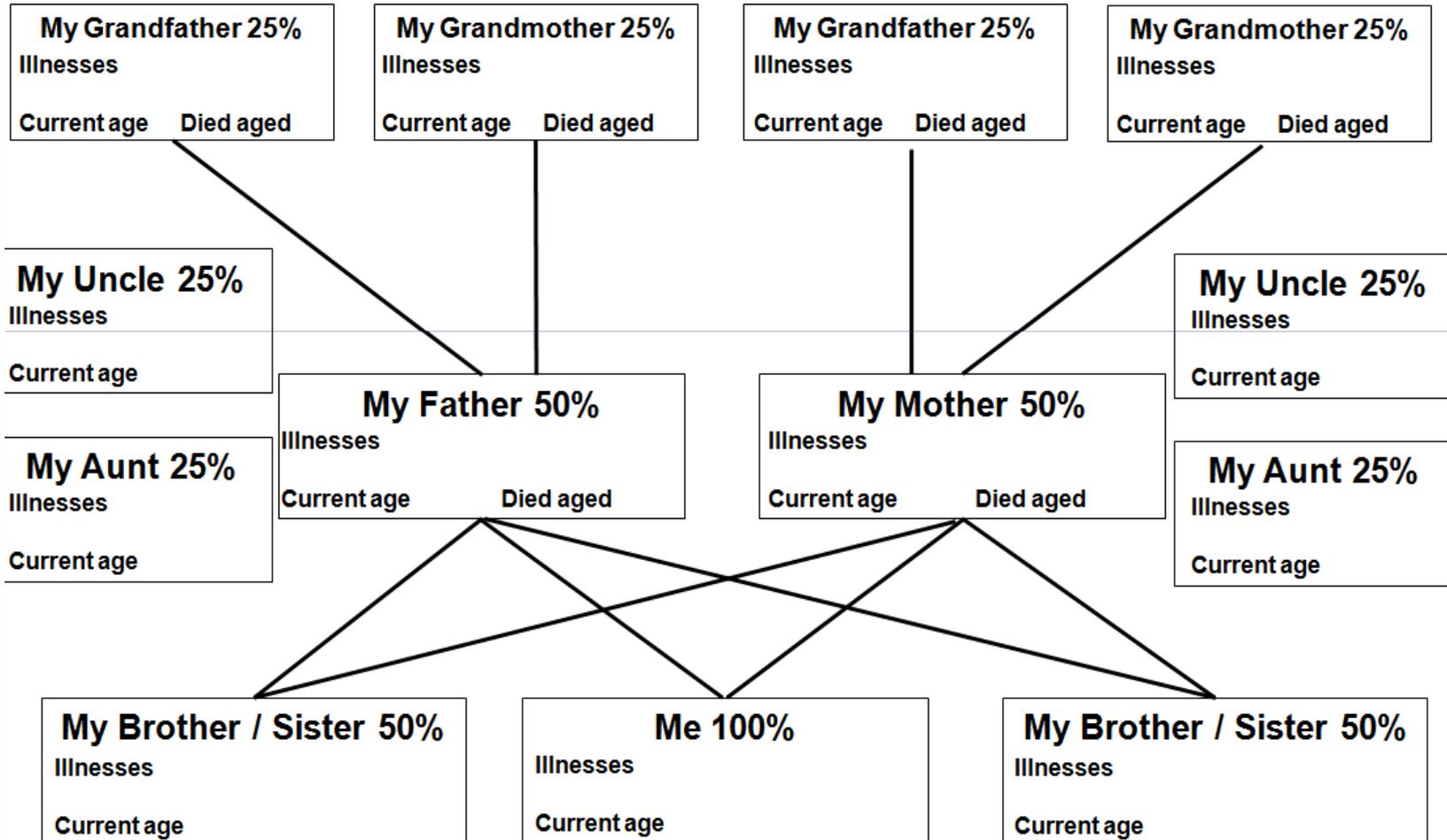
Transcription and Translation



- When examining **health issues** there are two aspects to consider
1. **Phenotype-** how genes express themselves to repair, regenerate and maintain health and wellness.
 2. **Genotype-** What you were conceived with from your parents genome. Your constitution.

My Family Tree

Name.....

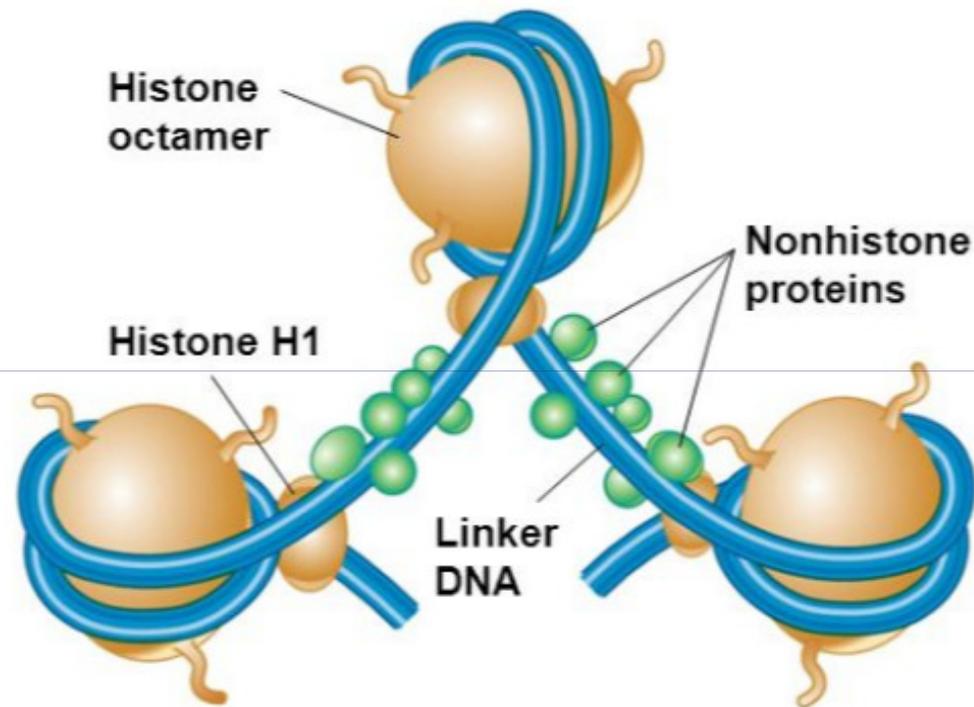


Selenocysteine is an alpha amino acid found in proteins from every domain of life. A selenium atom replaces the sulfur of its structural analogue, cysteine. It is thus referred to as the 21st amino acid.

U>G SNIP

50% of chromosomes is DNA but 50% is protein which surrounds the DNA like a sleeve. This protein is called **non histone protein of which there are over 1000 and are involved with gene expression. The DNA of the gene is not exposed but covered by the protein. So to read the gene the protein sleeve has to be withdrawn.**

Non-histone proteins play role in chromosomes organization and compaction



Nucleosomes showing linker histones and nonhistone proteins

If there is no intracellular protein for the effector to effect then the **signal** sends its message direct to the gene. The signal effect specifically allow the exact protein sleeve to be uncovered as the protein sleeve convolution changes allowing the gene to be exposed and make a RNA copy.

The RNA is a copy of the DNA and travels to the ribosome via the cytoplasm.

Genes control nothing. Genes are responsive to the signals of the environment. **THIS IS THE DEFINITION OF EPIGENETICS.**

A single gene maybe able to thus provide for over 2000 different proteins.

Biology of Belief by Bruce Lipton

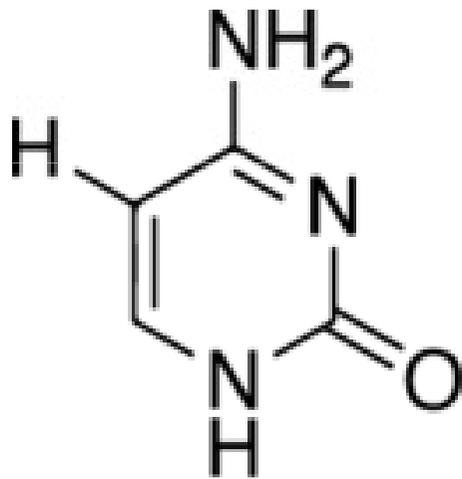
DNA methylation is a process by which methyl groups are added to the DNA molecule. Methylation can change the activity of a DNA segment without changing the sequence.

When located in a gene promoter, DNA methylation typically acts to repress gene transcription.

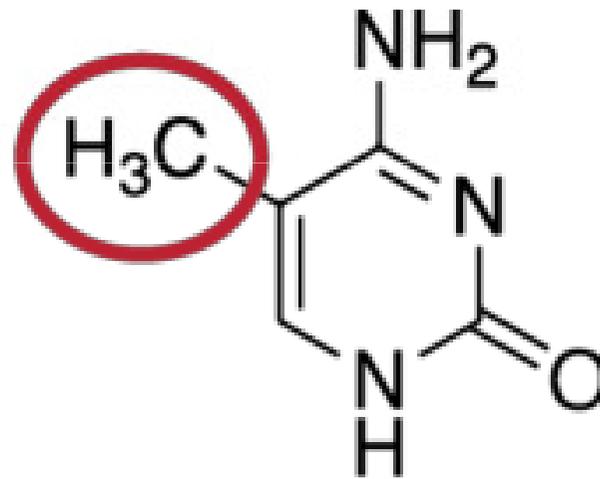
DNA methylation is essential for normal development and is associated with a number of key processes including genomic imprinting, X-chromosome inactivation, repression of transposable elements, aging, and carcinogenesis.*

*Zemach A, McDaniel IE, Silva P, Zilberman D (May 2010). "Genome-wide evolutionary analysis of eukaryotic DNA methylation". *Science*. 328 (5980): 916–9.

Two of DNA's four bases, cytosine and adenine, can be methylated.



Cytosine



methylated Cytosine

Histone methylation is a process by which methyl groups are transferred to amino acids of histone proteins that make up nucleosomes, which the DNA double helix wraps around to form chromosomes.

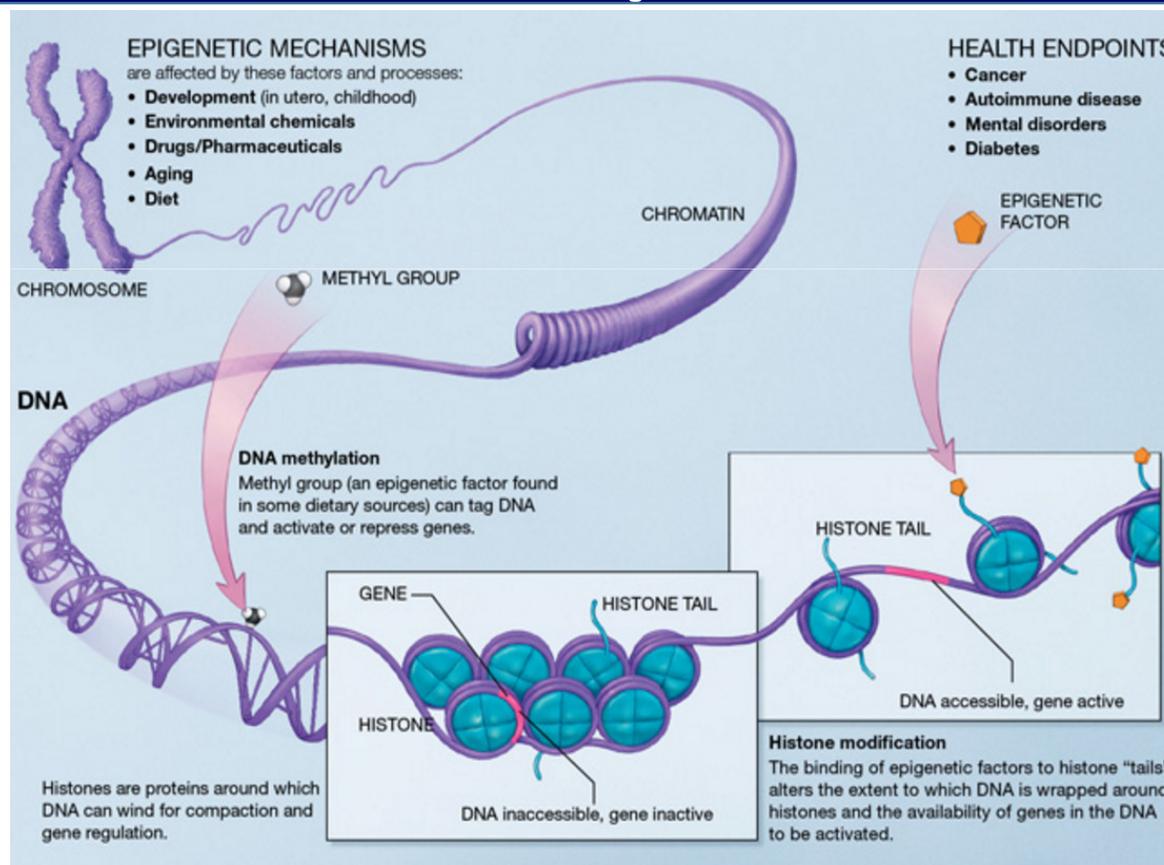
Methylation of histones can either increase or decrease transcription of genes, depending on which amino acids in the histones are methylated, and how many methyl groups are attached.

Lysine and arginine are the amino acids most subject to methylation.

Greer, Eric L.; Shi, Yang (2012). "Histone Methylation: A Dynamic Mark in Health, Disease and Inheritance". *Nature Reviews Genetics*. 13: 343–57

Histones - (De)Methylation and (De)Acetylation

Inherent or Acquired



DNA loosens when it is about to divide and when it is under stress. It tightens when repairing.

Without **histones**, the unwound DNA in chromosomes would be very long (a length to width ratio of more than 10 million to 1 in human DNA). Each human cell has about 1.8 metres of DNA, (~6 ft) but wound on the histones it has about 90 micrometres (0.09 mm) of chromatin.

Redon C, Pilch D, Rogakou E, Sedelnikova O, Newrock K, Bonner W (Apr 2002). "Histone H2A variants H2AX and H2AZ". *Current Opinion in Genetics & Development*. 12 (2): 162–9.

They share the feature of long **'tails'** on one end of the amino acid structure - this being the location of post-translational modification. *

*Strahl BD, Allis CD (Jan 2000). "The language of covalent histone modifications". *Nature*. 403 (6765): 41–5

Such modifications include

1. Methylation

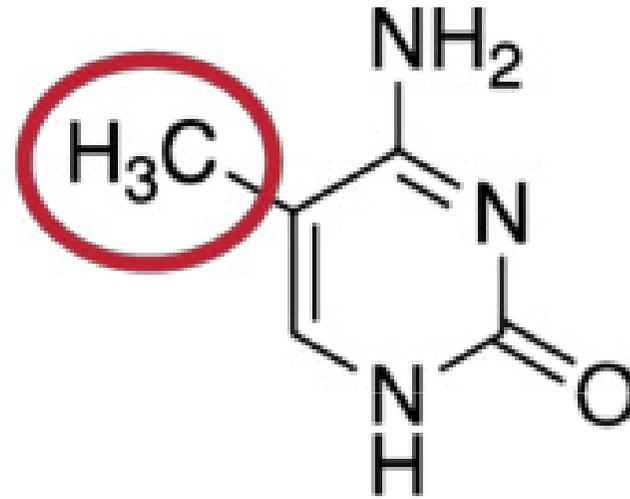
2. Acetylation

**This affects their function of
gene regulation.**

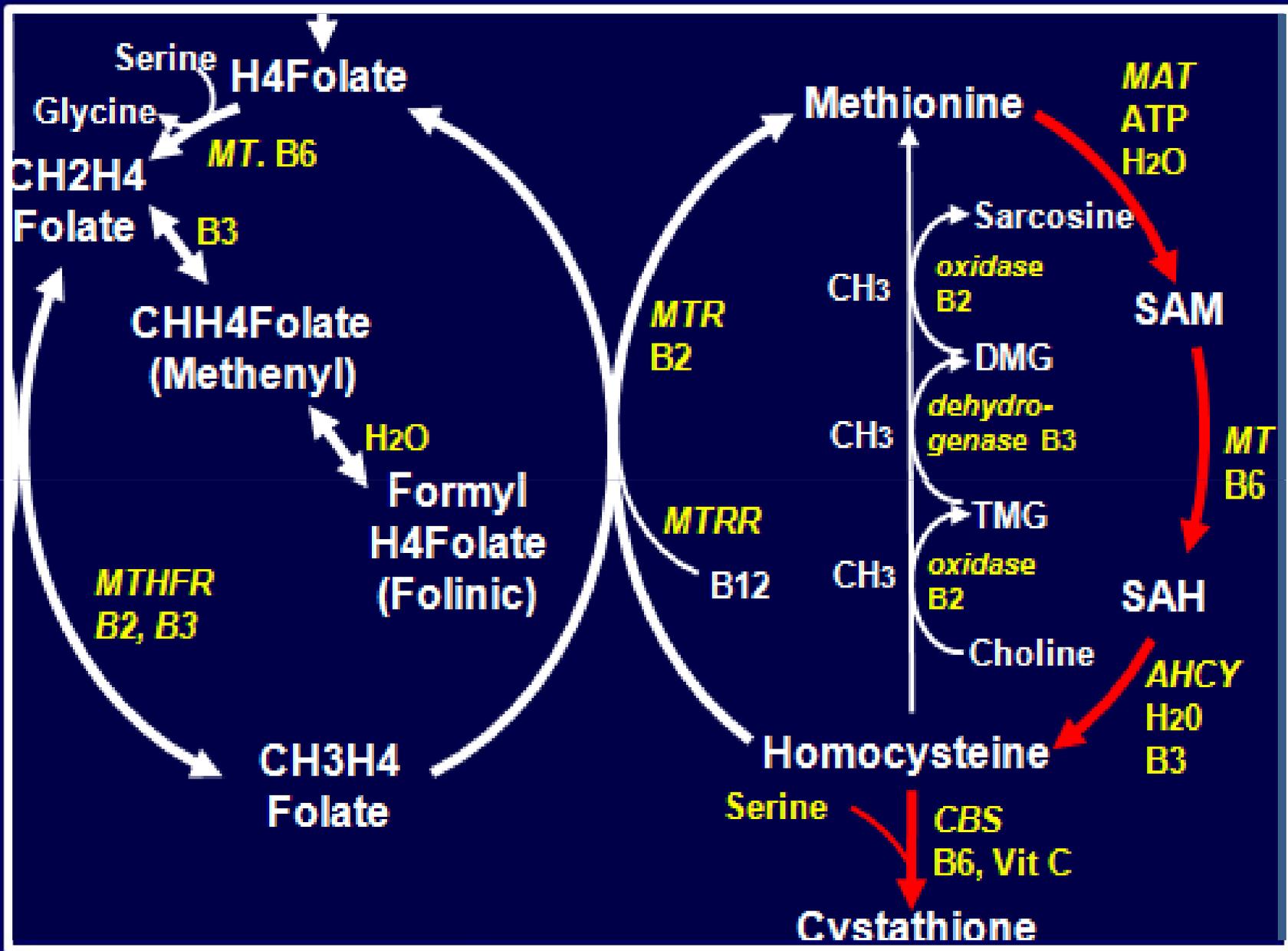
*Jenuwein T, Allis CD (Aug 2001). "Translating the histone code" (PDF). *Science*. 293 (5532): 1074–80.

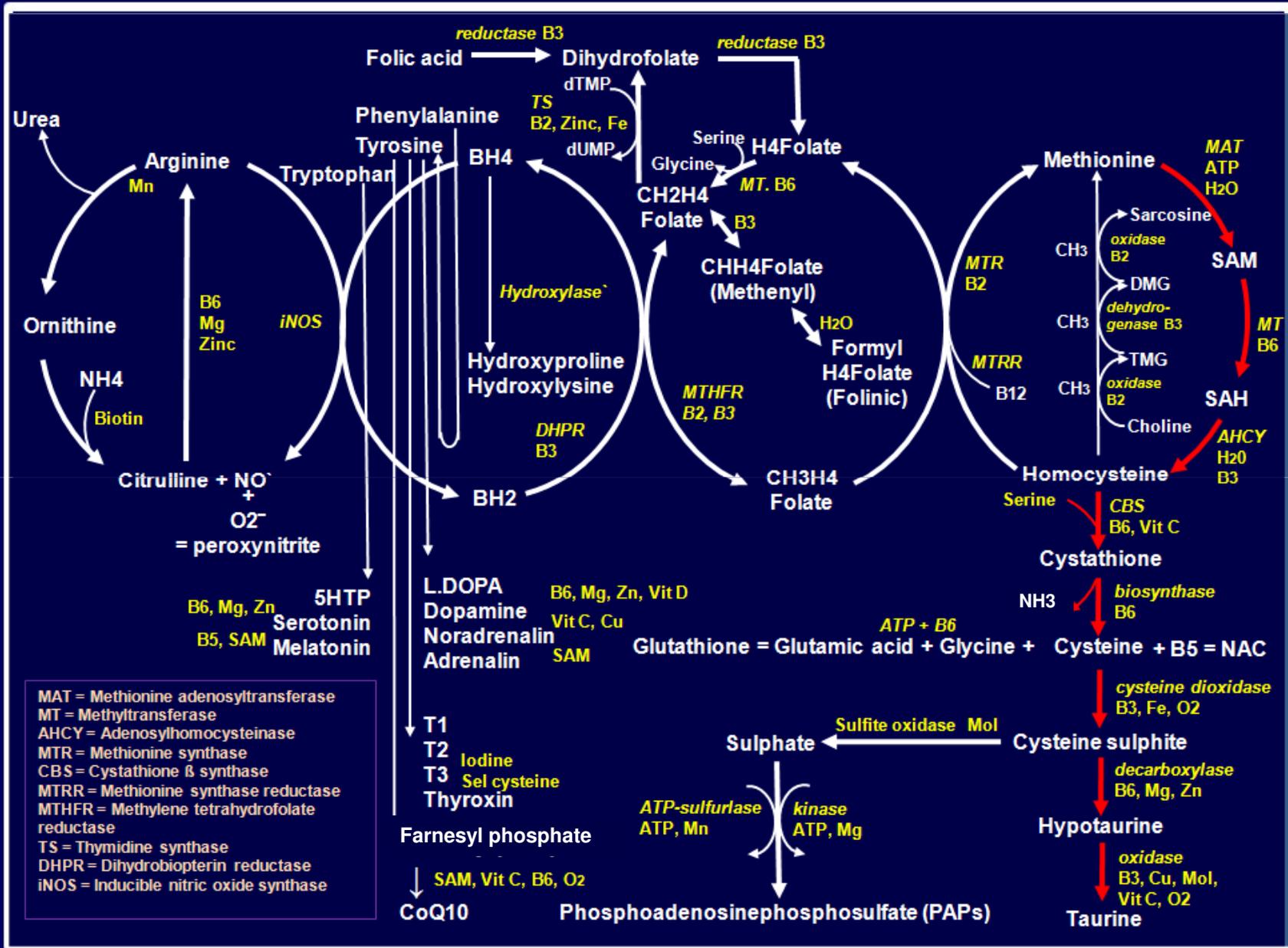


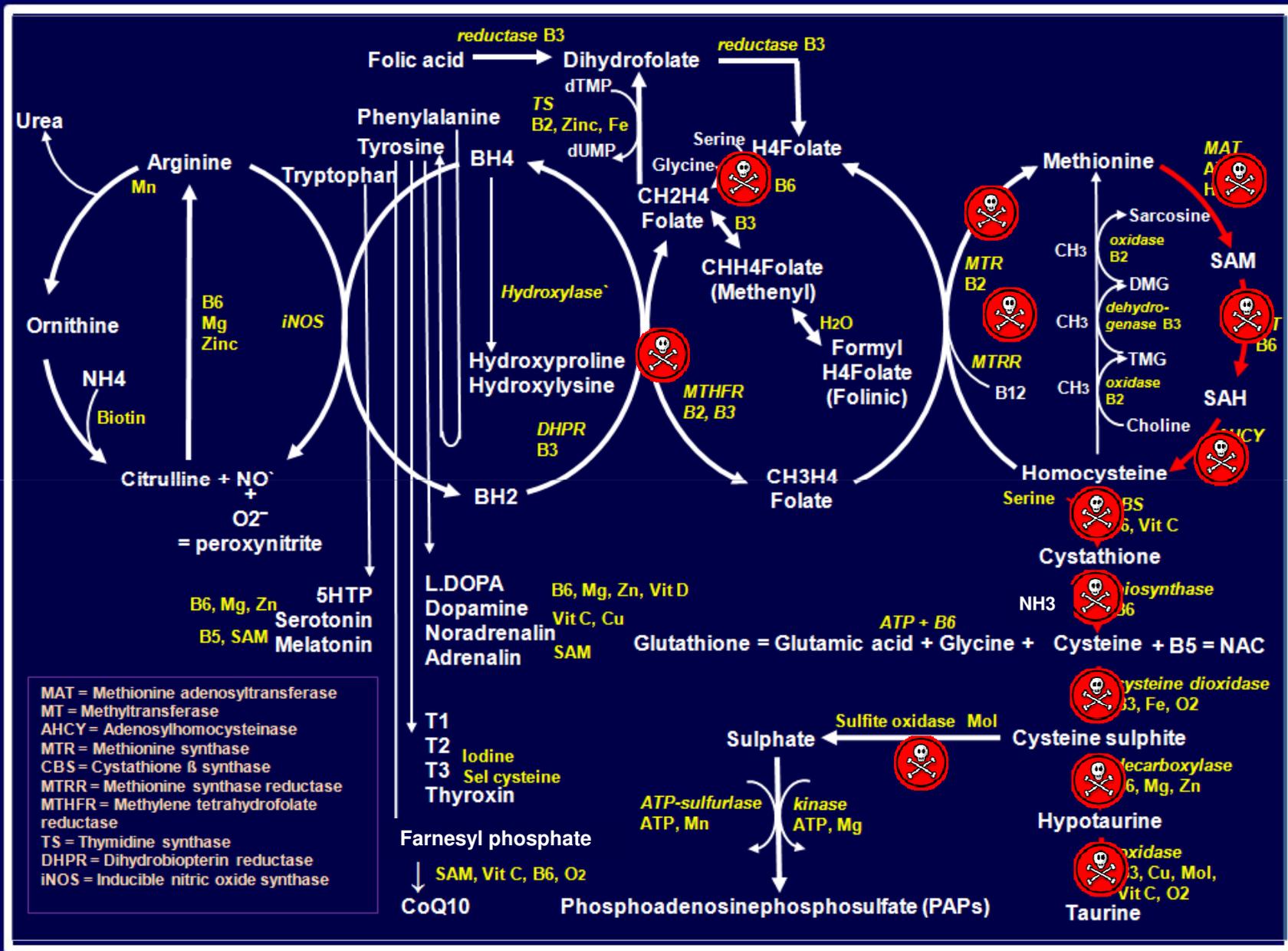
Cytosine



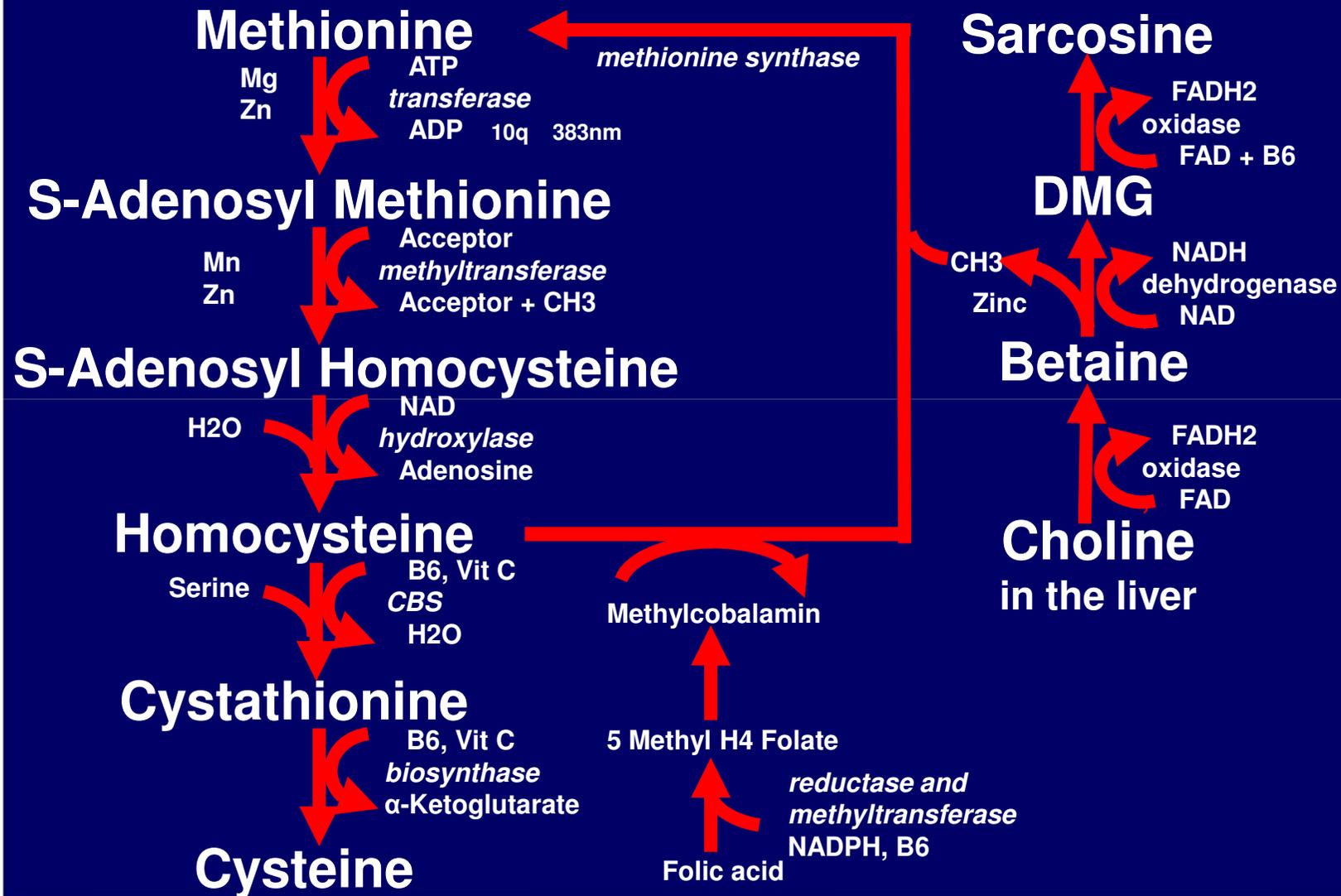
methylated Cytosine







S Adenosylmethionine (SAM)



Main methylators are

S. Adenosylmethionine (SAM)

Methylcobalamin

5MTHF

Choline, Betaine (TMG)

Cofactors Zn

Also check for

Folinic acid

P-5-P

Yarrow (Achilles mil)



Functional Test for Methylation Defects

Caffeine challenge test
Sellotape challenge test



Demethylation

Cytochrome p450 enzymes

**Alpha-ketoglutarate-dependent
non-heme enzymes are active
for demethylation of DNA.**

**Flavin adenine dinucleotide
(FAD)-dependent amine oxidase**

Vitamin C

Iron

Hydroxycobalamin

DNA is wrapped around histones, and, by transferring an **acetyl group** to the histones, genes can be turned on and off. In general, histone acetylation increases gene expression.

*Sadoul K, Boyault C, Pabion M, Khochbin S (2008). "Regulation of protein turnover by acetyltransferases and deacetylases". *Biochimie*. 90 (2): 306–12.

Histone **deacetylases** are a class of enzymes that remove acetyl group from an N-acetyl lysine amino acid on a histone, allowing the histones to wrap the DNA more tightly.

CoA. ATP, Co-enzyme NAD+
Cofactors Zn and Na

Inhibited by Curcumin, peroxynitrite, aspirin, Resveratol, Butyric acid

Examples A **BRCA mutation*** is a mutation in either of the **BRCA1** and **BRCA2** genes, which are tumour suppressor genes. Hundreds of different types of mutations in these genes have been identified, some of which have been determined to be harmful, while others have no proven impact.

*Hamel PJ (2007-05-29). "BRCA1 and BRCA2: No Longer the Only Troublesome Genes Out There". HealthCentral. Retrieved 2010-07-02.



BRCA Gene 1

Chromosome 17



BRCA Gene 2

Chromosome 13

Both genes produce proteins that help repair damaged DNA, keeping the genetic material of the cell stable. A damaged BRCA gene in either location can lead to increased risk of cancer, particularly breast or ovarian in women.

Harmful mutations in these genes may produce a hereditary breast-ovarian cancer syndrome in affected persons. Only **5-10%** of breast cancer cases in women are attributed to *BRCA1* and *BRCA2* mutations (with *BRCA1* mutations being slightly more common than *BRCA2* mutations).*

*Morris, Joi L.; Gordon, Ora K. (2010). *Positive Results: Making the Best Decisions When You're at High Risk for Breast or Ovarian Cancer*. Amherst, N.Y.: Prometheus Books.

Women with harmful mutations in either **BRCA1** or **BRCA2** have a risk of breast cancer that is about five times the normal risk, and a risk of ovarian cancer that is about ten to thirty times normal. The risk of breast and ovarian cancer is higher for women with a high-risk **BRCA1** mutation than with a **BRCA2** mutation.

*Morris, Joi L.; Gordon, Ora K. (2010). *Positive Results: Making the Best Decisions When You're at High Risk for Breast or Ovarian Cancer*. Amherst, N.Y.: Prometheus Books.

High-risk mutations, which disable an important error-free DNA repair process (homology directed repair), significantly increase the person's risk of developing **breast cancer, ovarian cancer and certain other cancers.***

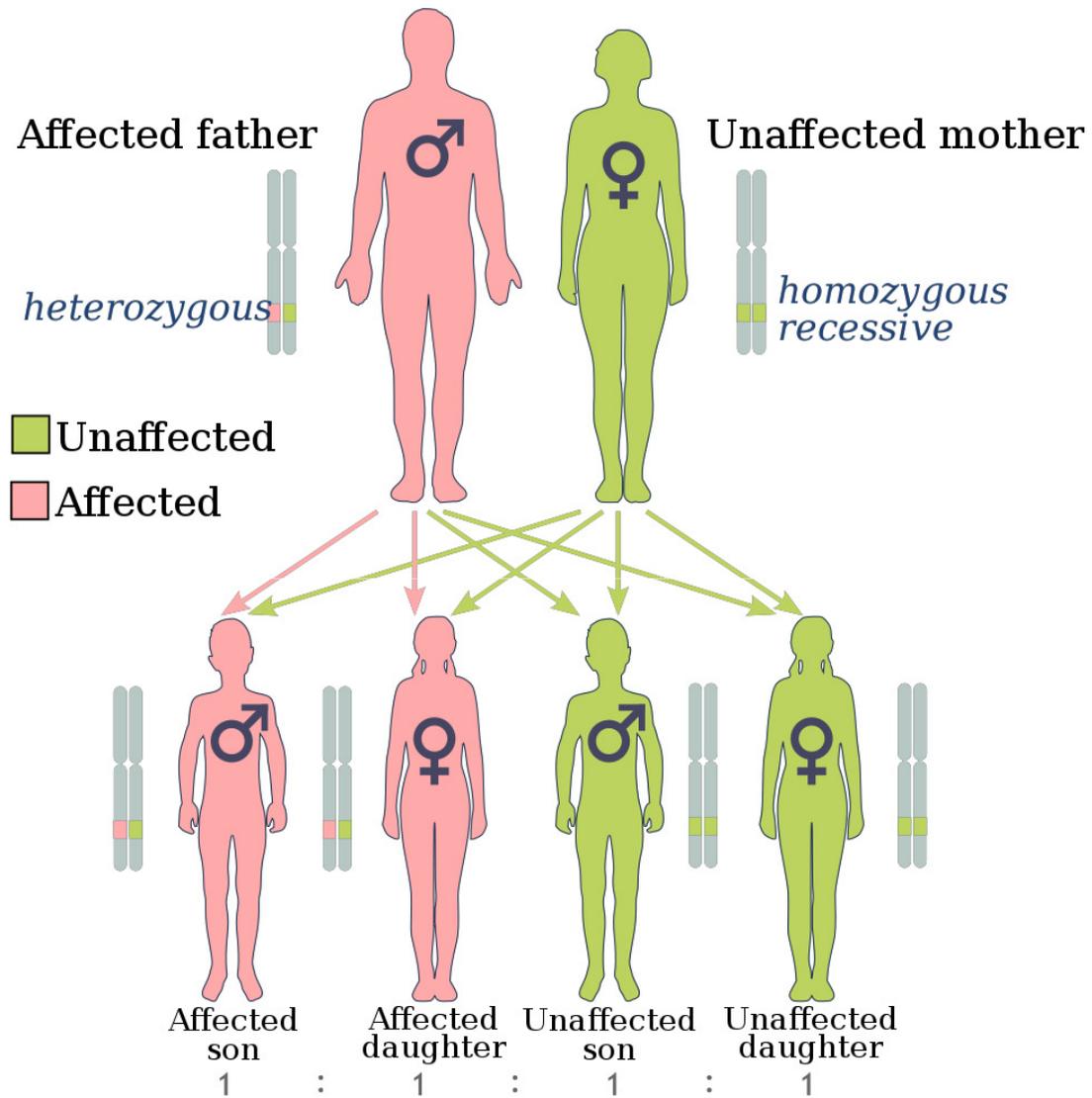
*Morris, Joi L.; Gordon, Ora K. (2010). *Positive Results: Making the Best Decisions When You're at High Risk for Breast or Ovarian Cancer*. Amherst, N.Y.: Prometheus Books.

Why ***BRCA1*** and ***BRCA2*** mutations lead preferentially to cancers of the breast and ovary is not known, but lack of ***BRCA1*** function seems to lead to non-functional X-chromosome inactivation.

Stadler, ZK.; Kauff, ND. (Jan 2010). "Weighing options for cancer risk reduction in carriers of *BRCA1* and *BRCA2* mutations". *J Clin Oncol.* 28 (2): 189–91

Mutations can be inherited from either parent and may be passed on to both sons and daughters. Each child of a genetic carrier, regardless of sex, has a **50% chance of inheriting the mutated gene from the parent who carries the mutation.**

Stadler, ZK.; Kauff, ND. (Jan 2010). "Weighing options for cancer risk reduction in carriers of *BRCA1* and *BRCA2* mutations". *J Clin Oncol.* 28 (2): 189–91



BRCA mutations are inherited in a genetically dominant fashion, from either parent.

As a result, half of the people with *BRCA* gene mutations are male, who would then pass the mutation on to 50% of their offspring, male or female.

Cui, J; Antoniou, AC; Dite, GS; Southey, MC; Venter, DJ; Easton, DF; Giles, GG; McCredie, MR; Hopper, JL (Feb 2001). "AfterBRCA1 and BRCA2-what next? Multifactorial segregation analyses of three-generation, population-based Australian families affected by female breast cancer". Am J Hum Genet. 68 (2): 420–31.

The risk of *BRCA*-related breast cancers for men with the mutation is higher than for other men, but still low.

However, ***BRCA* mutations** can increase the risk of other cancers, such as colon cancer, pancreatic cancer, and prostate cancer.*

*Friedenson B (2005). "*BRCA1* and *BRCA2* pathways and the risk of cancers other than breast or ovarian". *MedGenMed*. 7(2): 60.

72 previously unknown genes mutations have been recently found that lead to the development of breast cancer. **BRCA1** mutation contains 125,950 base pairs. A mutation is a misspelling such that the gene cannot code the proper protein.

Holly Yan (2013-05-14). "What's the gene that led to Angelina Jolie's double mastectomy?. Health. CNN.

According to the **National Cancer Institute** 55% - 65% of women who inherit the BRCA1 mutation and around 45% of women who inherit the BRCA2 mutation will develop breast cancer by the age of 70. However only 1% of women have these mutations which is only a small fraction of all inherited breast cancer.

Holly Yan (2013-05-14). "What's the gene that led to Angelina Jolie's double mastectomy?. Health. CNN.

Only about 10% of breast cancers are hereditary.

Most of the newly identified variants are in regions of the genome that **regulate nearby genes.**

Holly Yan (2013-05-14). "What's the gene that led to Angelina Jolie's double mastectomy?. Health. CNN.

Gene tests warning

Genetic testing kits are becoming ever more popular: hundreds of thousands of people in the UK are thought to have had their DNA tested by companies such as AncestryDNA. But now senior doctors are calling for a crackdown, after seeing an influx of patients who have been wrongly told they are carrying dangerous mutations. Research has found that the tests regularly give "false positives" for a mutation in BRCA genes, which increases the likelihood of several types of cancer. One patient even scheduled preventative breast-removal surgery after receiving such a result, only for it to be called off when the result was checked. "The NHS is incredibly irritated by these results, because they're more often wrong than right," said Prof Anneke Lucassen, chair of The British Society for Genetic Medicine. "I'm not saying to ban these tests, but they need more regulating."

HER2 (from human epidermal growth factor receptor 2) is a member of the human epidermal growth factor receptor family. Over-expression of this **oncogene** has been shown to play an important role in the development and progression of certain aggressive types of breast cancer. *

* "ERBB2 erb-b2 receptor tyrosine kinase 2 [Homo sapiens (human)] - Gene - NCBI" www.ncbi.nlm.nih.gov Retrieved 2016-06-14

In recent years the protein has become an important biomarker and target of therapy for approximately **30% of breast cancer** patients.*

**Mitri Z, Constantine T, O'Regan R (2012). "The HER2 Receptor in Breast Cancer: Pathophysiology, Clinical Use, and New Advances in Therapy". Chemotherapy Research and Practice. 2012:*

HER2 is so named because it has a similar structure to human epidermal growth factor receptor, or HER1. It is so named because it was derived from a rodent glioblastoma cell line, a type of neural tumour.*

* Mitri Z, Constantine T, O'Regan R (2012). "The HER2 Receptor in Breast Cancer: Pathophysiology, Clinical Use, and New Advanc in Therapy". *Chemotherapy Research and Practice*. 2012: 743193. PMC 3539433. PMID 23320171.

An **oncogene** is a gene that has the potential to cause cancer. In tumour cells, they are often mutated and/or expressed at high levels.

Activated oncogenes can cause mutant cells designated for apoptosis to survive and proliferate instead.*

*Wilbur, Beth, editor. The World of the Cell, Becker, W.M., et al., 7th ed. San Francisco, CA; 2009.

Dr Randy Jirtle

Is an American biologist noted for his pioneering research in epigenetics, the branch of biology that deals with inherited information that does not reside in the nucleotide sequence of DNA.



Dr. Randy Jirtle, who, with Bob Waterland, was credited-and justifiably so-with making the principal first discovery in the field of nutritional epigenomics. Dr. Jirtle's research group did folate and B12 high-level supplementation experiments in Agouti mice (white fat mice). If they did the supplementation early in pregnancy of the mother, the offspring of those mice, for the first time, didn't have white fur (they had a mottled pseudo-Agouti fur colour).

And the other interesting thing is the offspring-although exposed to the same ad lib animal chow of their parents-didn't get fat, they didn't get diabetes, they didn't get cancer like their parents did frequently, and they lived longer, without changing their genes, just changing the epigenetic marks due to methylation changes.

Bernal AJ, Jirtle RL. Epigenomic disruption: the effects of early developmental exposures. Birth Defects Res A Clin Mol Teratol. 2010 Jun 21.

CHOLINE

Pyruvate

Vit B1
Vit B2
Vit B3
Vit B5
α-Lipoic acid

Acetyl CoA

Inhibited by
atropine, ethanol,
Cd, Hg,

choline acetyltransferase 10q 383nm
K, I.

CoA

ACETYLCHOLINE

Metabolic Pathways - <http://smpdb.ca/search>
BRENDA enzyme database -
<http://www.brenda-enzymes.org/enzyme>

ACETYLCHOLINE

Inhibited by

Chemicals – pesticides
solanine, sodium fluoride
thyme, galantamine,
huperzine
aspartame, aspartate,
phenylalanine lovastatin
melatonin , methotrexate,
phos serine, diazepam,
eugenol, insulin, limonene
Toxic metals Cd, Cu, Hg,
Sn, Radiation

Metabolic Pathways -
<http://smpdb.ca/search>
BRENDA enzyme database -
<http://www.brenda-enzymes.org/enzyme>

H₂O

acetylcholinesterase

7q 380nm

B2

B3

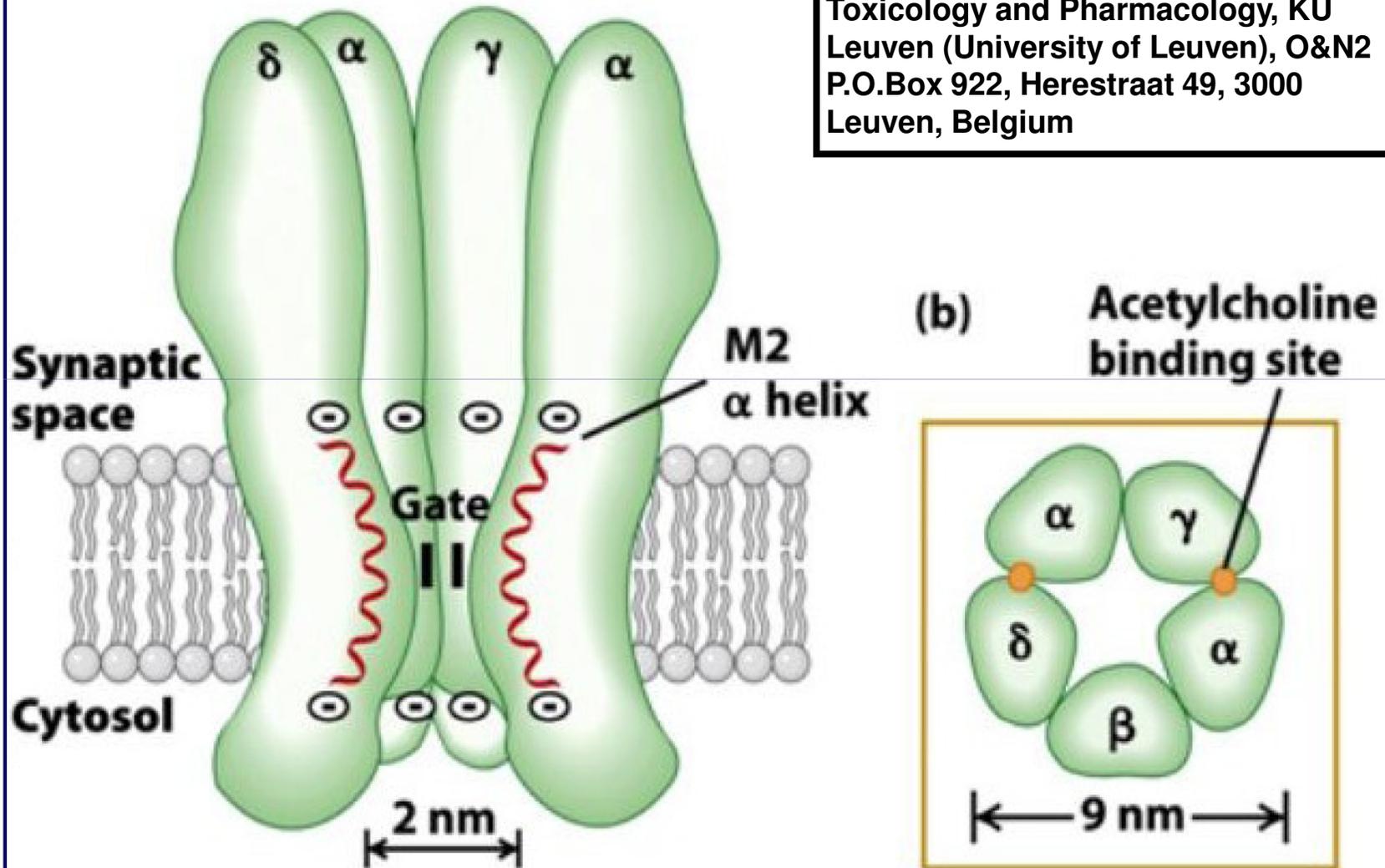
Mn⁺⁺

Zn⁺⁺ Cysteine Recycled

Acetate + Choline

Acetylcholine receptor

Toxicology and Pharmacology, KU
Leuven (University of Leuven), O&N2
P.O.Box 922, Herestraat 49, 3000
Leuven, Belgium

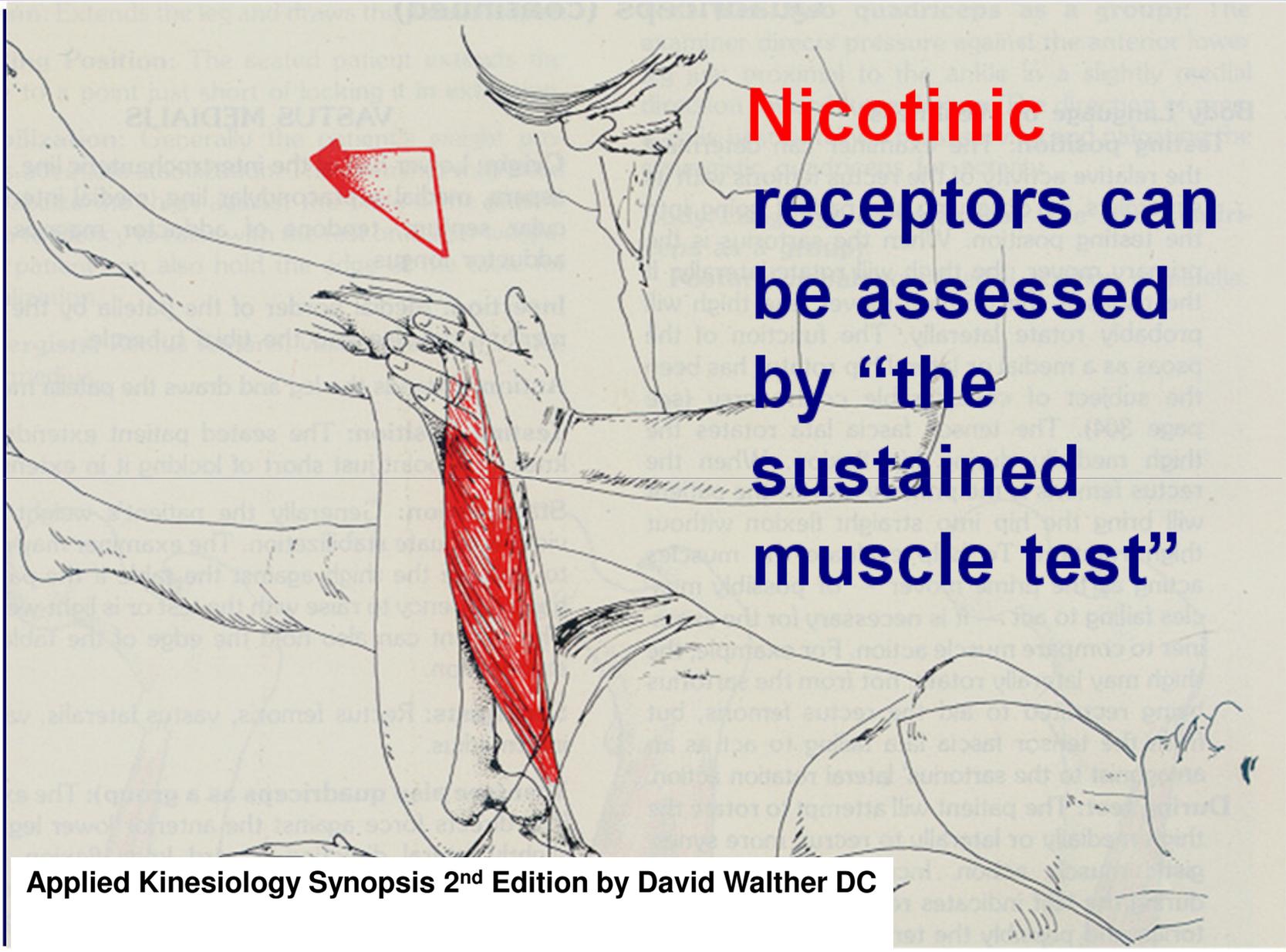


- 1. Muscarine receptors** occur in the parasympathetic nervous system. (Pupillary constriction)
- 2. Nicotinic receptors** occur at
 - i) CNS especially in the hippocampus.
 - ii) The neuromuscular junctions (Sustained muscle test)

Muscarinic receptors can be assessed by “the looking into a bright light” test.



Nicotinic
receptors can
be assessed
by “the
sustained
muscle test”



Applied Kinesiology Synopsis 2nd Edition by David Walther DC

Anticholinergics

Atropine family

Tomatoes

Potato

Tobacco

Green peppers

Chilis



Desfosses, M. (1820): *Extrait d'une lettre à M. Robiquet*. In: *J. de Pharmacie*. Bd. 6, S. 374–376.

Natural Acetylcholinesterase Inhibitors

Alpha Solanene Tomatoes

Potato

Tobacco

Green peppers

Chilis

**Galantathine
(Galanthamine)**

Snowdrops

Daffodils

Lemon balm, Sage

News

Loss of smell a “warning”

It is normal for people’s sense of smell to decline as they get older. However, those who experience extreme smell loss have been found to die younger than those who retain their olfactory powers – suggesting that it could be a “warning sign” of impending ill-health. For the Michigan State University study, researchers looked at data on more than 2,200 people in the US who’d taken a smell test in their 70s, with follow-ups over the next 13 years. During that period, about half the participants died.

When the researchers cross-referenced their causes of death with their result in the smell test, they found – after taking account of factors such as smoking – that the poorest smellers had a 46% greater risk of dying within ten years than the strongest ones. The biggest association was with deaths from dementia and Parkinson’s disease, and, to a lesser extent, cardiovascular disease. The scientists are unclear what explains the link, and emphasise that further research is needed to confirm it.

Helping to impr

Meat lovers are risking cancer

Meat eaters are already urged to limit their daily consumption of red and processed meats to 70g, to reduce their risk of bowel cancer. But according to research by Oxford University, this official guidance doesn’t go far enough. Using data from the UK biobank, scientists looked at the diets and cancer histories of nearly half a million people aged between 40 and 69 over a six-year period in the late 2000s. Among those who averaged 76g of red or processed meat a day – the equivalent of three-and-a-half rashers of bacon, or half an 8oz steak – bowel cancer diagnoses were 20% higher than among those who averaged 21g a day: this means that for every 10,000 people in the study who ate 21g a day of red and processed meat, 40 were diagnosed with bowel cancer, while the comparable figure for those who ate 76g a day was 48. “Our results strongly suggest that people who eat red and processed meat four or more times a week have a higher risk of developing bowel cancer than those who [do so]... less than twice a week,” said co-author Prof Tim Key.



SYMPTOMS



DEFICIENCY

Guilt and Blame

↓ NK cell activity

Tachycardia, Hypertension

Dry mouth, Poor digestion

Constipation, Urinary retention

Long sight (hypermetropia)

Glaucoma, Myesthesia gravis

Hypercholesterolemia

Inhibition of short term
memory.

Confusion. Delirium

Hallucinations

Alzheimer's

EXCESS

Pride and Scorn

↑ NK cell activity

Aggressive behaviour

Panic attacks (fear paralysis)

Bradycardia

Hypotension leading to vertigo

Excess salivation

Fast transit time, nausea,
vomiting, diarrhoea

Involuntary micturition

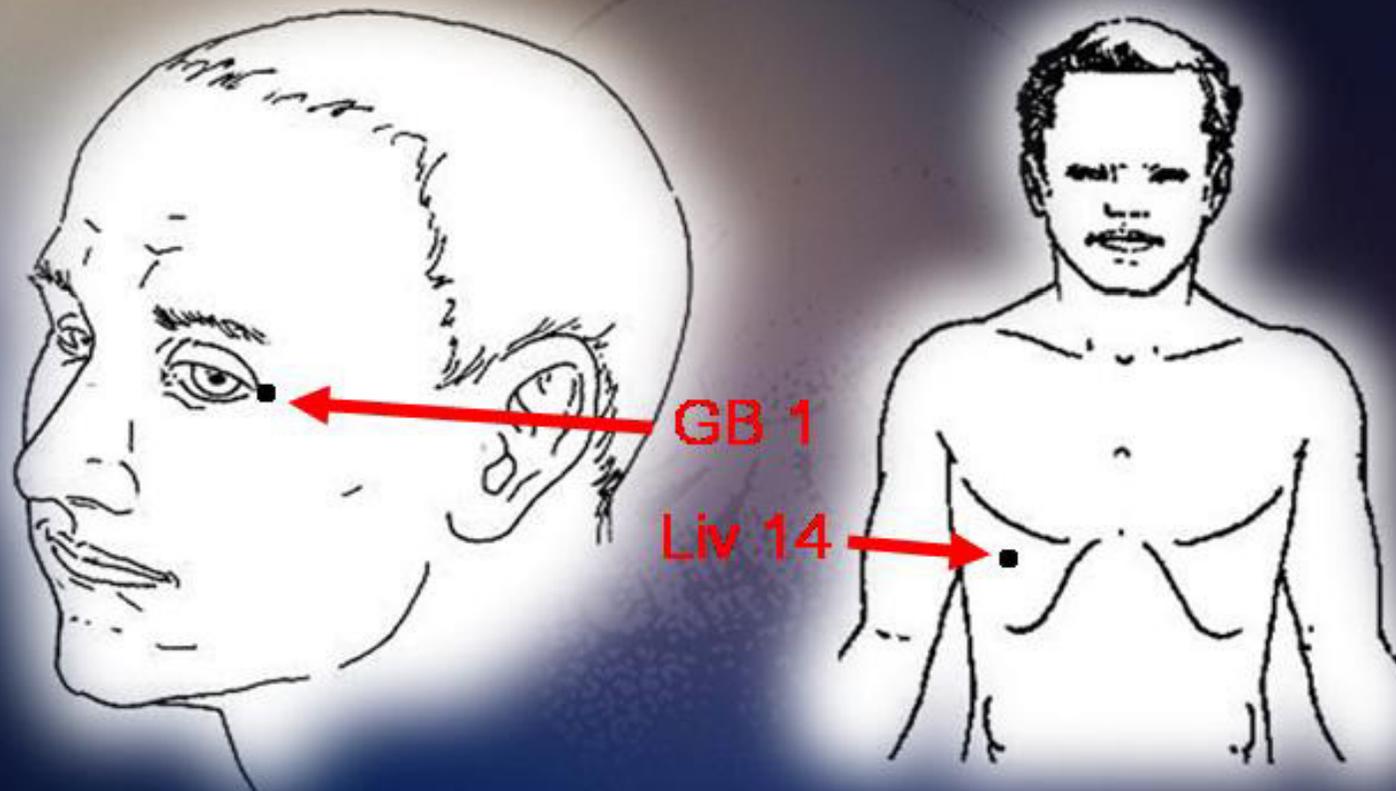
Asthma from excess mucous

Resting tremor and rigidity

Liver toxicity

ACETYLCHOLINE MERIDIAN DIAGNOSTIC POINTS

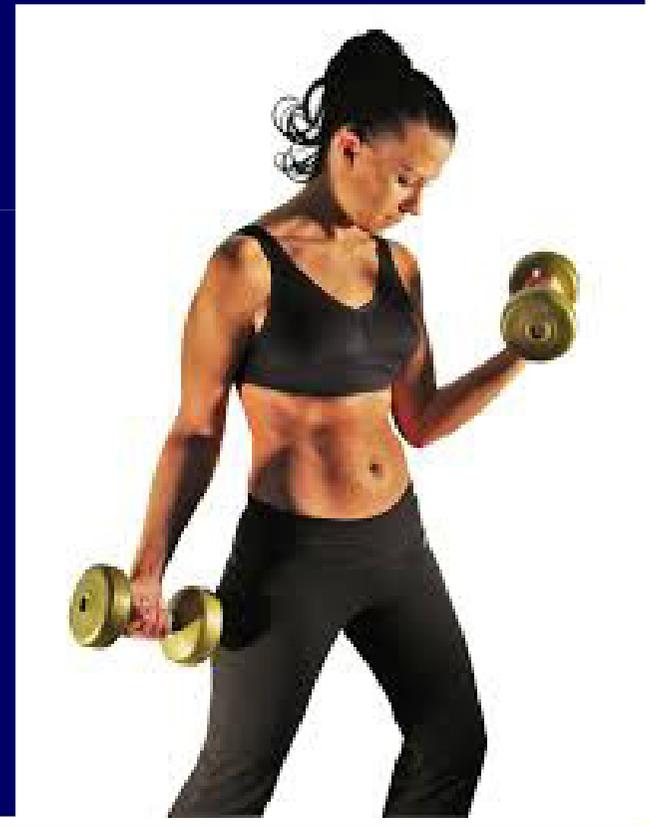
YANG POINTS (DEFICIENCY) YIN POINTS (EXCESS)



BLUE
445-500nm
GALL BLADDER
Low
Acetylcholine

Complementary
to BLUE
LIVER
High
Acetylcholine

**Exercises to stimulate
Acetylcholine**
Resistance / Weight training



Exercises to inhibit Acetylcholine

Yoga, stretching tight muscles to loosen up.





WHY Chinese people WALK BACKWARDS !??



Watch later



Share

WALKING

Dr Mercola

10/12/2018



Walking Backward Boosts Your Memory

Written by Dr. Joseph Mercola [Fact Checked](#)



December 08, 2018

Available in: English

Researchers from London's University of Roehampton suggest people who walk backward perform better on memory tests than those who stand still or walk forward. If you are looking to inject new energy into your exercise routine, you might want to try walking or running backward. Beyond the physical benefits to your body, exercising backward may boost your brain power, balance and more.

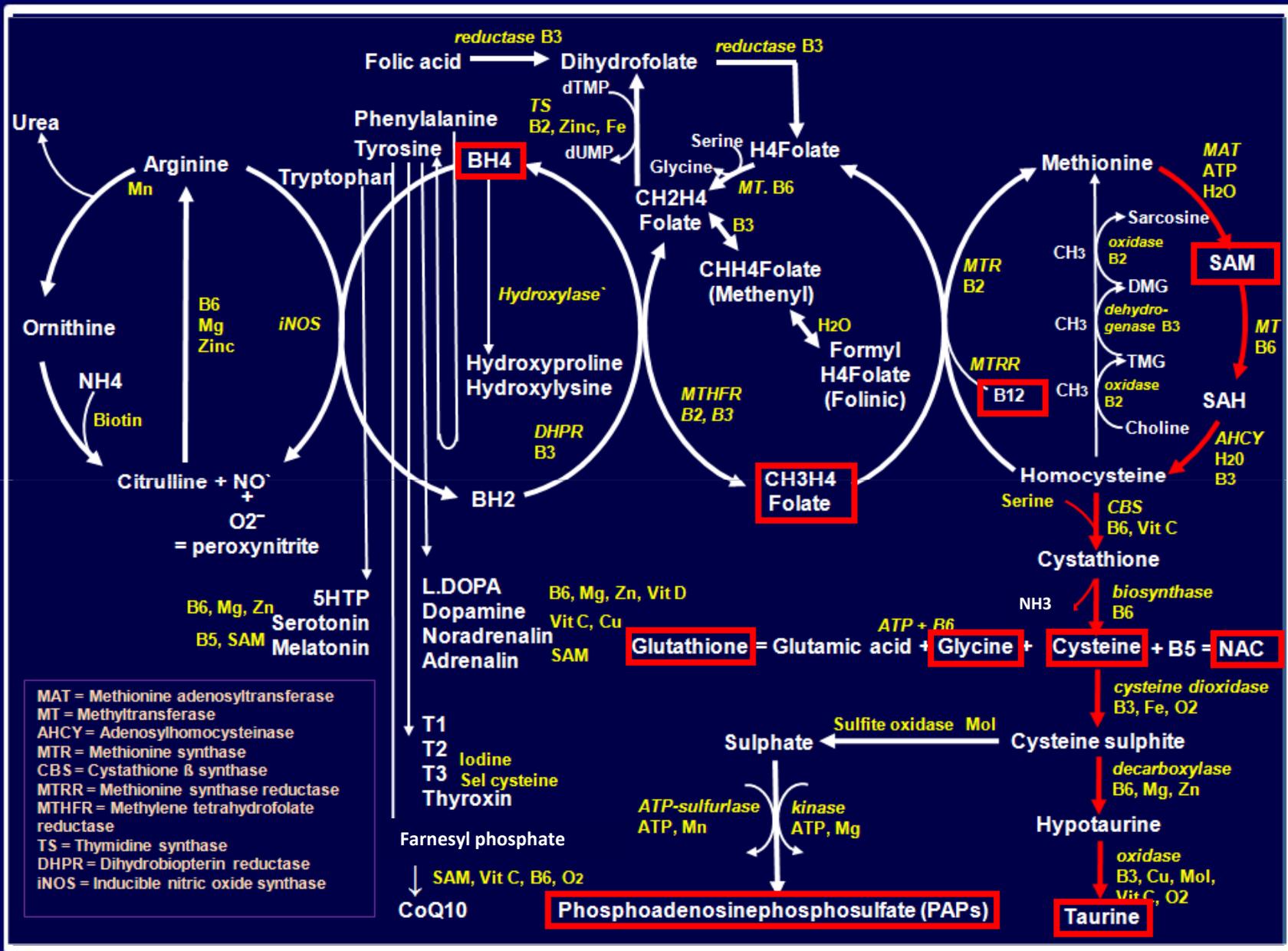
Methylation

Mant xenobiotics, amines, phenols, thiols (isothiocyanates), noradrenalin, adrenalin, L.DOPA, dopamine, melatonin, histamine, serotonin, pyridine, sulfites and hypochlorites, heavy metals, caffeine, solanene.

"HNMT histamine N-methyltransferase". NCBI Genetic Testing Registry. Retrieved 18 February 2014.

COMT catechol-O-methyltransferase". NCBI Genetic Testing Registry. Retrieved 18 February 2014.

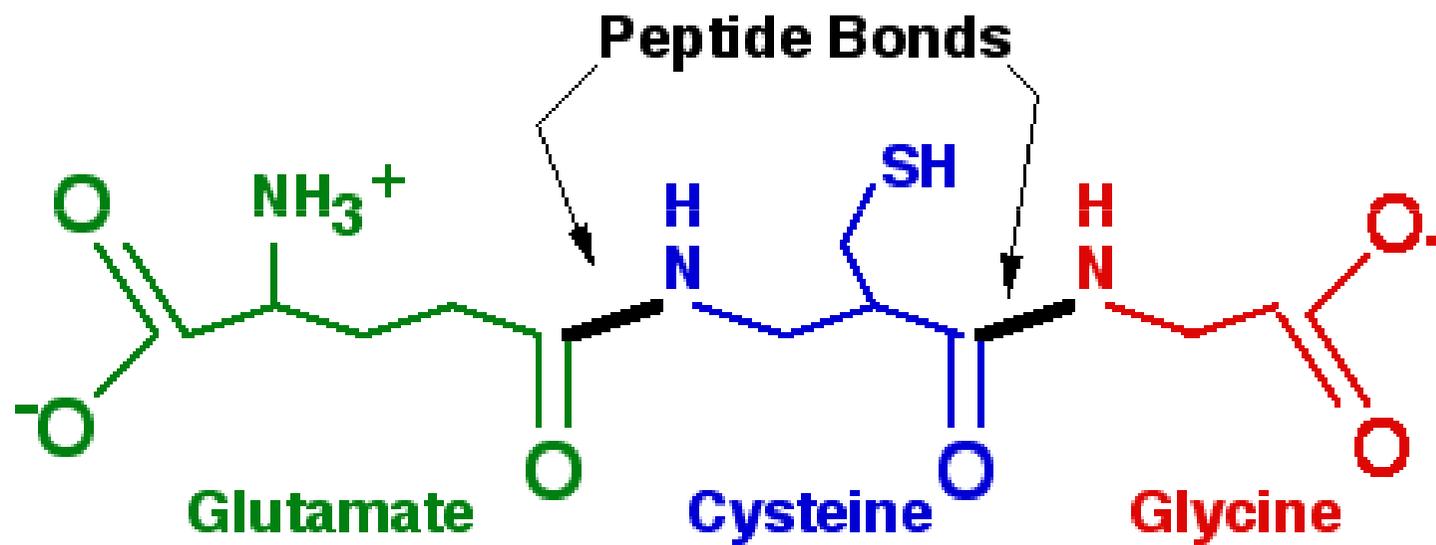
*Ragsdale, S.W. "Catalysis of methyl group transfers involving tetrahydrofolate and B12" **Vitamins and Hormones**, 2008*



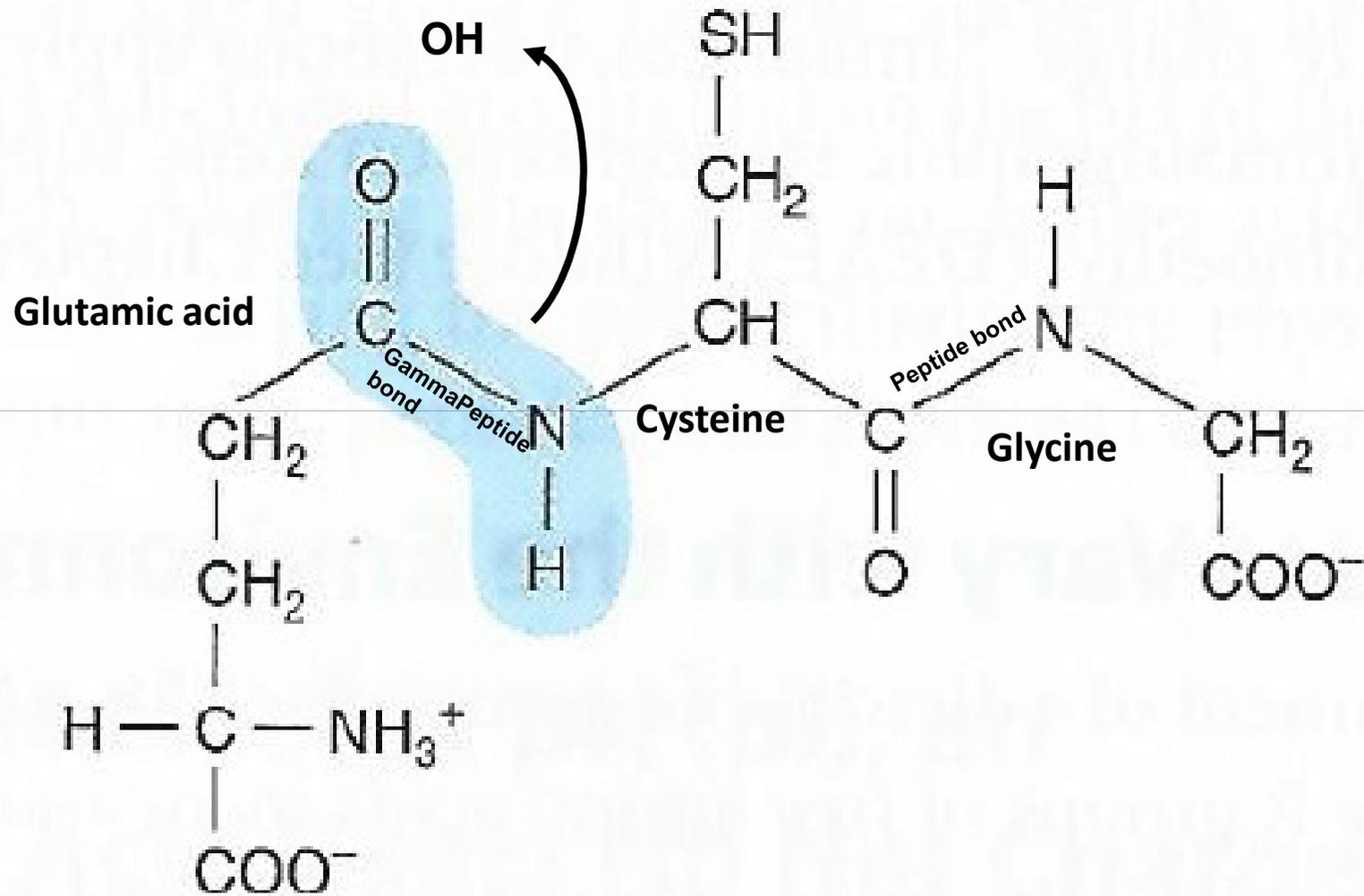
Glutathione

Glutathione a long word, many implications, the most important antioxidant known in human physiology. An enigma in some respects. We recognise glutathione has multiple functions in human physiology thus is called a pleiotropic molecule.

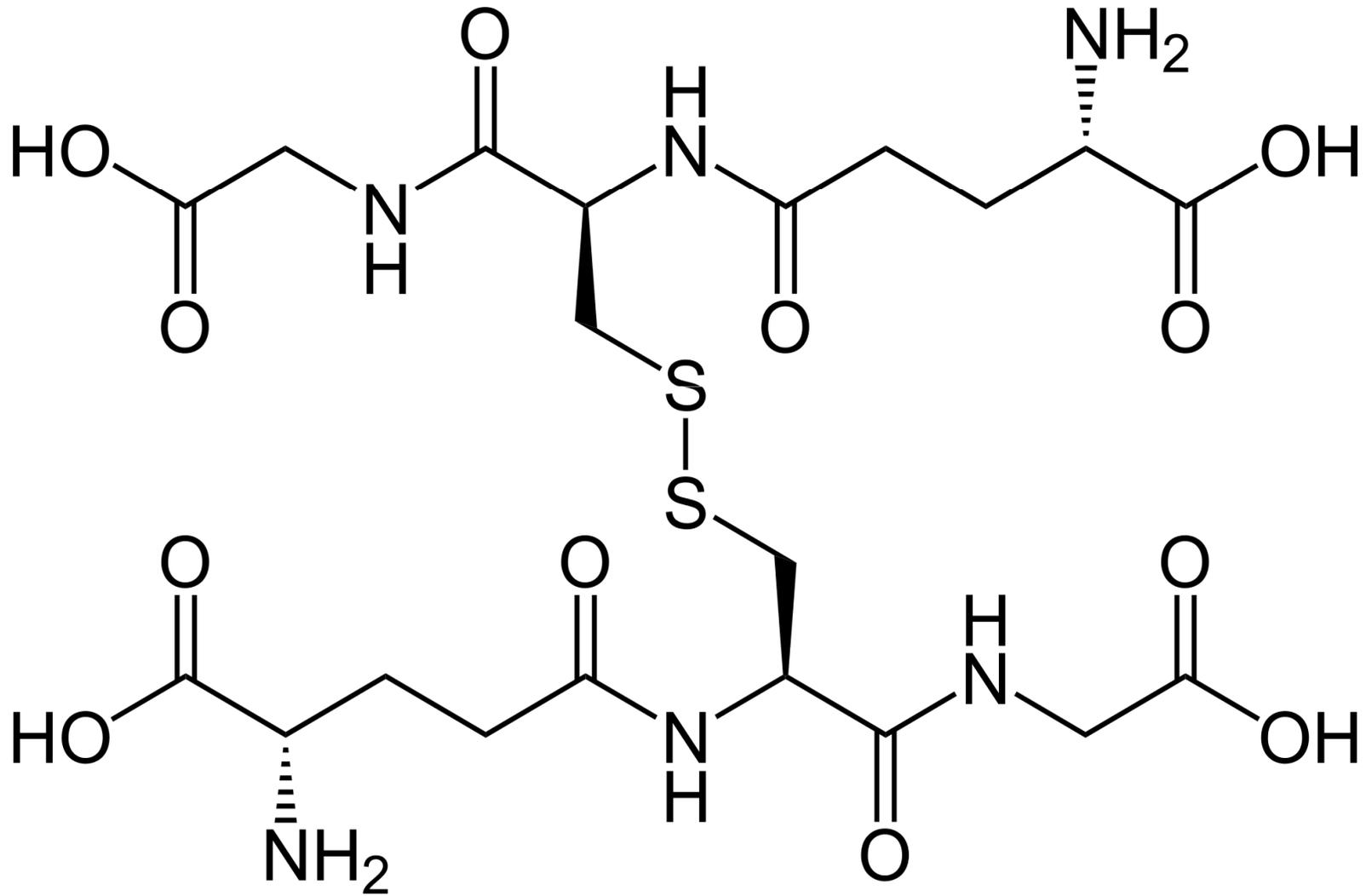
Glutathione



Reduced Glutathione (GSH)



Oxidised Glutathione (GSSG)



Glutathione is the main intracellular antioxidant and detoxifier. It is capable of preventing damage to important cellular components caused by reactive oxygen species such as free radicals, peroxides, lipid peroxides, and heavy metals.*

**Pompella A, Visvikis A, Paolicchi A, De Tata V, Casini AF (October 2003). "The changing faces of glutathione, a cellular protagonist". *Biochemical Pharmacology*. 66 (8): 1499–503*

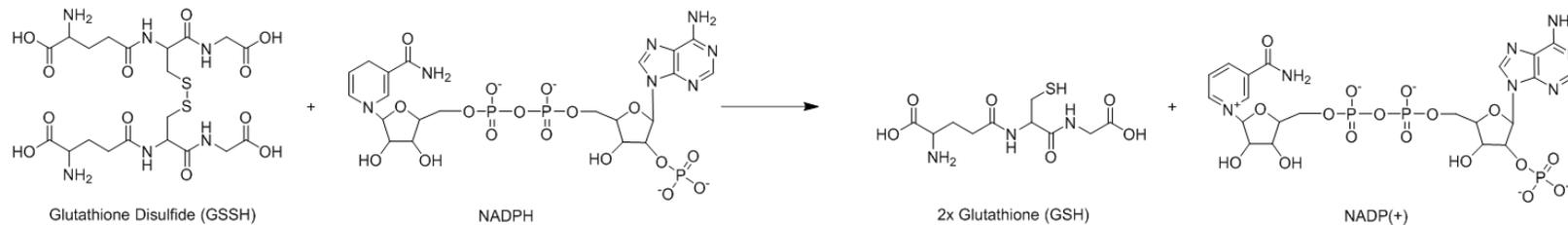
It is a **tripeptide** with a gamma peptide linkage between the carboxyl group of the glutamate side chain and the amine group of cysteine, and the carboxyl group of cysteine is attached by normal peptide linkage to a glycine.

Source: MeSH

Record Name: Glutathione

URL: <https://www.ncbi.nlm.nih.gov/mesh/68005978>

Once **oxidized**, glutathione can be reduced back by glutathione reductase, using NADPH and FAD as an electron donor.*



*Lu SC (May 2013). "Glutathione synthesis". *Biochimica et Biophysica Acta*. 1830 (5): 3143–53.

The **ratio** of reduced glutathione to oxidized glutathione within cells is often used as a measure of cellular oxidative stress.*

*Lu SC (May 2013). "Glutathione synthesis". *Biochimica et Biophysica Acta*. 1830 (5): 3143–53.

In healthy cells and tissue, more than 90% of the total glutathione pool is in the reduced form (GSH) and less than 10% exists in the disulfide form (GSSG). An increased **GSSG-to-GSH ratio** is considered indicative of oxidative stress.*

*Halprin KM, Ohkawara A (1967). "The measurement of glutathione in human epidermis using glutathione reductase". *The Journal of Investigative Dermatology*. 48 (2): 149–52.

Functions of Glutathione

1. Maintains levels of glutathione peroxidase.*
2. Major endogenous antioxidant and maintains Vitamin C and E in their reduced active forms.**

•Grant CM (2001). "Role of the glutathione/glutaredoxin and thioredoxin systems in yeast growth and response to stress conditions". *Molecular Microbiology*. 39 (3): 533–41.

•** Dringen R (December 2000). "Metabolism and functions of glutathione in brain". *Progress in Neurobiology*. 62 (6): 649–71.

3. Regulates **Nitric Oxide cycle** by enhancing the function of **citrulline**.*

4. It is used in metabolic and biochemical reactions such as **DNA synthesis** and repair, protein synthesis, prostaglandin synthesis, amino acid transport, and enzyme activation.

• Ha SB, Smith AP, Howden R, Dietrich WM, Bugg S, O'Connell MJ, Goldsbrough PB, Cobbett CS (June 1999)..

Thus, every system in the body can be affected by the state of the **glutathione system**, especially the immune system, the nervous system, the gastrointestinal system, and the lungs.

• *Ha SB, Smith AP, Howden R, Dietrich WM, Bugg S, O'Connell MJ, Goldsbrough PB, Cobbett CS (June 1999)..*

5. It has roles in progression of the cell cycle, including cell death.*

GSH levels regulate redox changes to nuclear proteins necessary for the initiation of cell differentiation.

•8 Lu SC (May 2013). "Glutathione synthesis". *Biochimica et Biophysica Acta*. 1830 (5): 3143–53.

6. GSH is known as a substrate in conjugation reactions, which is catalyzed by **glutathione S-transferase** enzymes in cytosol, microsomes, and mitochondria. However, GSH is also capable of participating in non-enzymatic conjugation with some chemicals.

**7. Glutathione (GSH)
inhibits leukotriene synthesis
from arachidonic acid and
transforming inflammatory
molecules (leukotriene C4 to
leukotriene D4)*.
It is a cofactor for the
enzyme glutathione peroxidase.**

***Gamma-glutamyl transferase and cardiovascular disease
Gjin Ndrepepa and Adnan Kastrati**

8. It is also important as a hydrophilic molecule that is added to **lipophilic toxins** and waste in the liver during biotransformation before they can become part of the bile.*

*Source: Human Metabolome Database (HMDB)
Record Name: Glutathione
URL: <http://www.hmdb.ca/metabolites/HMDB0000125>

9. Glutathione, along with oxidized glutathione (GSSG) and S-nitrosoglutathione (GSNO), have been found to bind to the glutamate recognition site of the NMDA and AMPA receptors (via their γ -glutamyl moieties), and may be endogenous neuromodulators.*

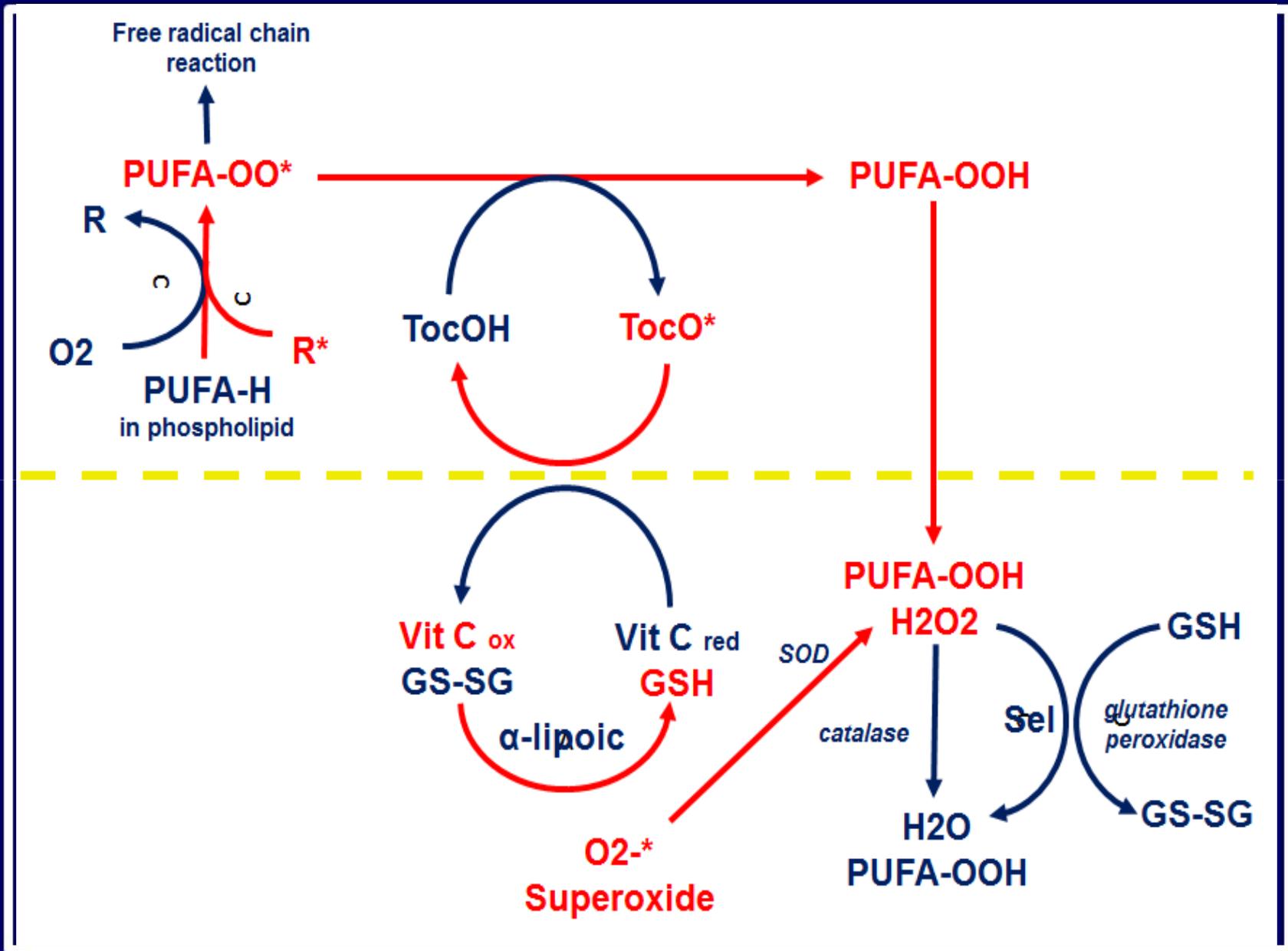
*Steullet P, Neijt HC, Cuénod M, Do KQ (February 2006). "Synaptic plasticity impairment and hypofunction of NMDA receptors induced by glutathione deficit: relevance to schizophrenia". *Neuroscience*. 137 (3): 807–19.

10. Other antioxidants such as **Vitamin C** and compounds such as **N-acetylcysteine (NAC)*** and **alpha Lipoic acid** may also work synergistically with glutathione, preventing depletion of either.

**"Acetylcysteine Monograph for Professionals - Drugs..com"*

The **glutathione-ascorbate cycle**, which works to detoxify hydrogen peroxide (H_2O_2), is one very specific example of this phenomenon.*

*Steullet P, Neijt HC, Cuénod M, Do KQ (February 2006). "Synaptic plasticity impairment and hypofunction of NMDA receptors induced by glutathione deficit: relevance to schizophrenia". *Neuroscience*. 137 (3): 807–19.



11. Calcitriol (1,25-dihydroxyvitamin D₃), the active metabolite of vitamin D₃, after being synthesized from 25 OH Vit D₃ in the kidney, increases glutathione levels in the brain and appears to be a catalyst for glutathione production. * takes 10 days.

*Garcion E, Wion-Barbot N, Montero-Menei CN, Berger F, Wion D (April 2002). "New clues about vitamin D functions in the nervous system". *Trends in Endocrinology and Metabolism*. 13 (3): 100–5.

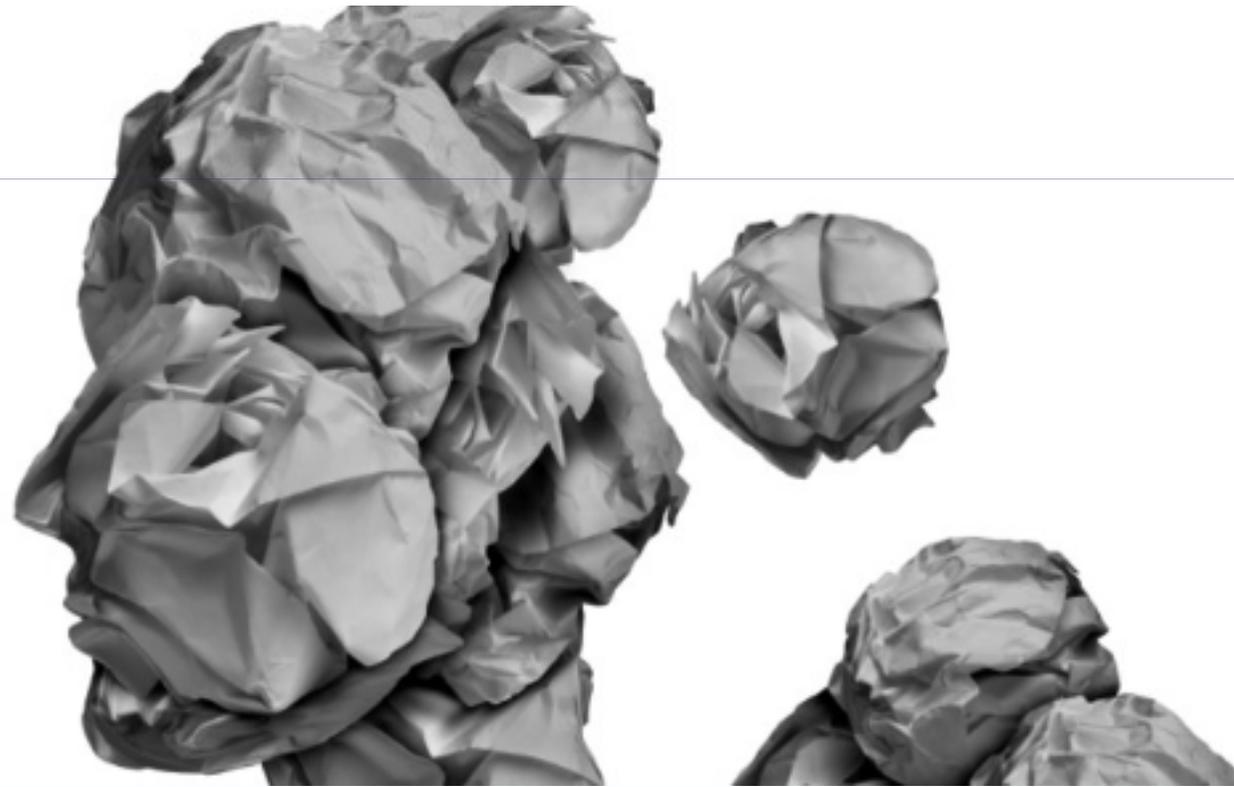
Lower vitamin D levels linked to Parkinson's Disease symptoms, study suggests

By Will Chu

12-Aug-2019 - Last updated on 09-Aug-2019 at 13:45 GMT



Falls in vitamin D levels correlate with falls and non-motor symptoms in patients with Parkinson's disease (PD), a new study finds as researchers suggest supplementation as a potential remedy.



12. S-Adenosylmethionine (SAMe),
a co-substrate involved in methyl
group transfer, has also been
shown to increase cellular
glutathione content in persons
suffering from a disease-related
glutathione deficiency.*

*Lieber CS (November 2002). "S-adenosyl-L-methionine: its role in the treatment of liver disorders". *The American Journal of Clinical Nutrition*. 76 (5):

Glutathione

Detoxifies most xenobiotics such as aromatic disulfides, naphthalene, anthracene, phenanthracin compounds, aliphatic disulfides and the regeneration of endogenous thiols from disulfides. and toxic metals.

Harper's Illustrated Biochemistry 29th Edition Pub Lange. Page 679

Hayes JD, Flanagan JU, Jowsey IR (2005). "Glutathione transferases". *Annu. Rev. Pharmacol. Toxicol.* 45: 51–88. doi:10.1146/annurev.pharmtox.45.120403.095857. PMID 15822171

GGT 20q 397nm

22p 399nm

Cysteine

Glutamic acid

ATP

γ-glutamylcysteine ligase

Mg, Mn, Zn

1p 370nm*

ADP

γ-Glutamylcysteine

GPX

1p 370nm*

3p 374nm

5p 377nm

6p 378nm

14p 387nm**

19p 394nm

Glycine

ATP

glutathione synthetase

Mg, S, 20q 397nm

α-Lipoic, Broccoli

ADP

GST

1p 370nm *

1q 371nm

4q 376nm

6p 378nm

7q 380nm

10q 383nm

11p 384nm

12q 385nm

22q 399nm

GSSG

GR

8p 381nm

GSH

Glutathione

Xenobiotics

Toxic metals

GST 40%

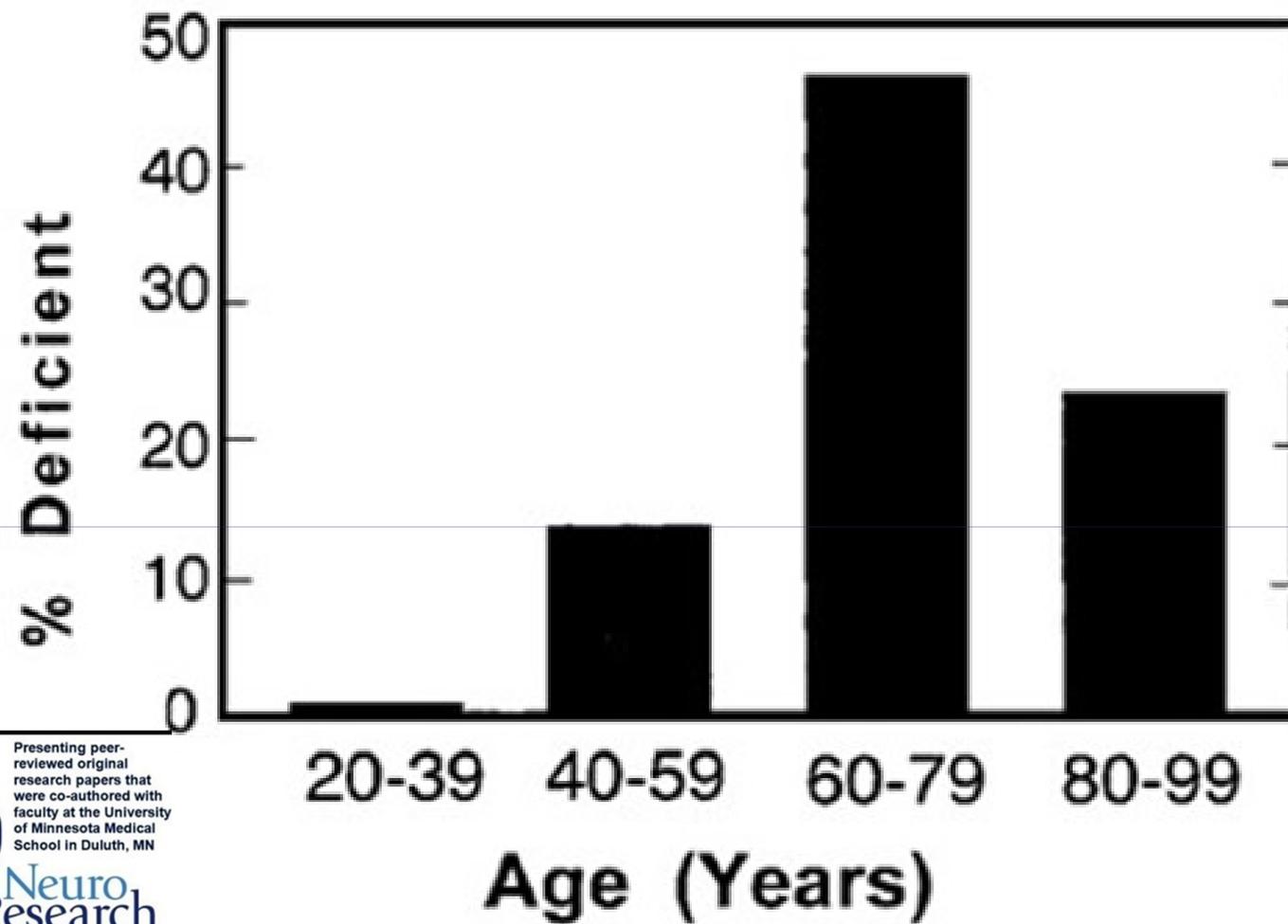
**Common diseases associated
with chronic intracellular
deficiencies.**

Alzheimer's – Zinc

Type 1 Diabetes – Manganese

Multiple sclerosis - Sulphur

Parkinson's – Magnesium



Presenting peer-reviewed original research papers that were co-authored with faculty at the University of Minnesota Medical School in Duluth, MN

Neuro Research
A Medical Education Company

FIG. 9. Glutathione-deficient subjects increase with age.

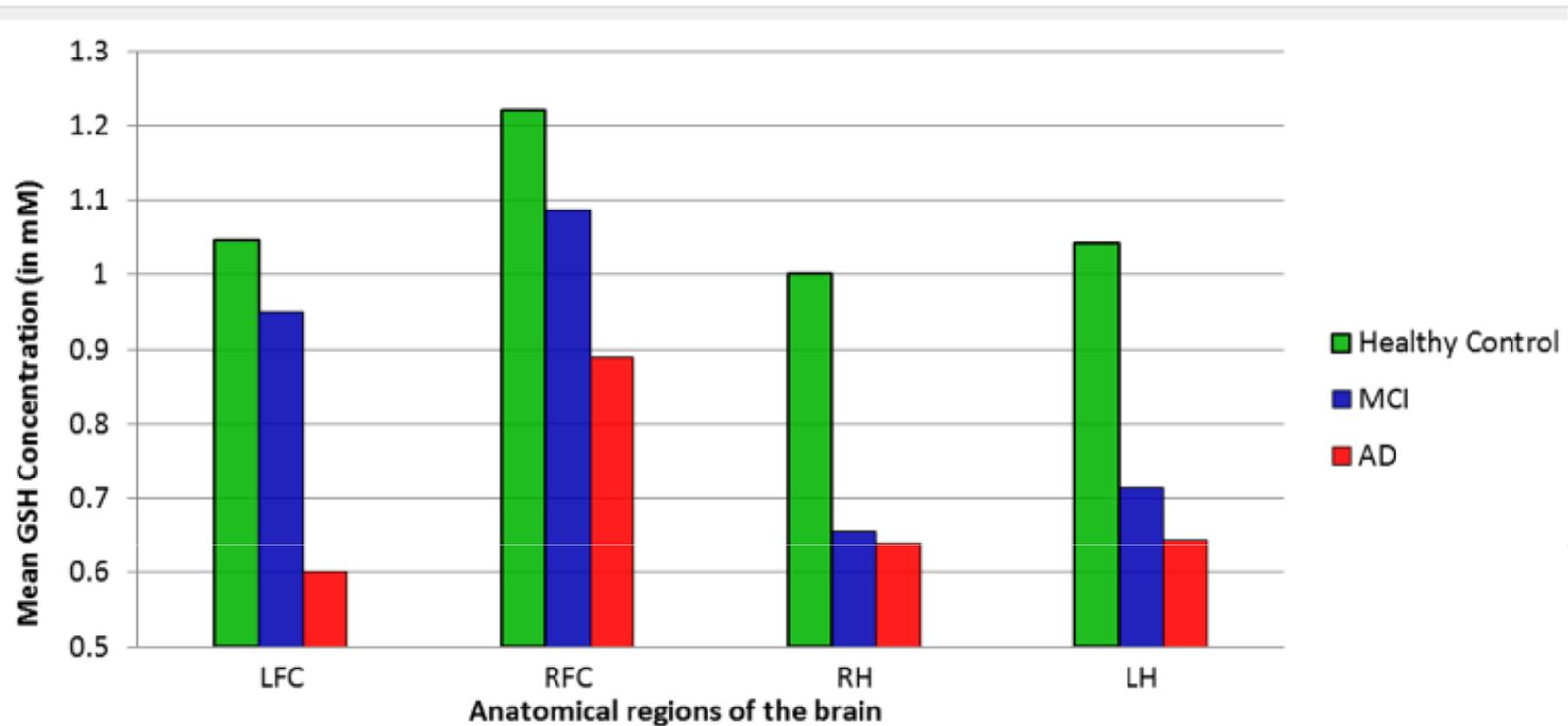


Fig.1. Glutathione levels plummet with Alzheimer's progression

LFC: Left frontal cortex; RFC: Right frontal cortex; RH: Right hippocampus; LH: Left hippocampus

Note the decrease in **deficiency after age 80**. The article formulated the hypothesis that those with severe glutathione deficiency do not live past 80 years and only those not suffering from severe glutathione deficiency reach the age of those living longer than 80 years.*

*Neuro Research article Nov 2018

Identification of about **1,200 fat-soluble neurotoxins** has occurred. Glutathione protects the brain against fat-soluble neurotoxins.

Glutathione does not cross the blood-brain barrier?

Consider the fact that **ALL** patients with chronic disease suffer from glutathione depletion.

*Neuro Research article Nov 2018

Liposomal Glutathione

Glutathione/Ribose stimulates glutathione. Ribose inhibits GGT

NAC stimulates glutathione.

Vitamin C helps recycle Glutathione

Yarrow stimulates the Glutathione pathway.

α -Lipoic acid, Broccoli stimulates Glutathione synthesis

Vitamin E

Cod – an excellent source of glutathione



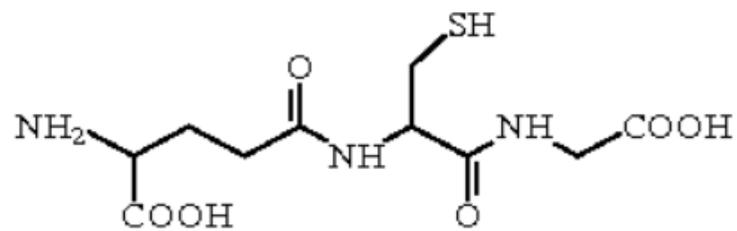
Thiol related diseases

Alzheimer disease	Depression	Lupus
Arthritis	Dementia	Mood disorders
Asthma	Epilepsy	Multiple sclerosis
Bipolar	Glaucoma	Obesity
Cancer	Heart disease	Osteoporosis
COPD	High blood pressure	Parkinson's disease
Crohn disease	Hypothyroidism	Schizophrenia
Cystic fibrosis	Kidney disease	Stroke
Diabetes	HIV/AIDS	Ulcerative colitis

Glutathione-s-transferase

catalyzes the conjugation of the reduced form of glutathione (GSH) to xenobiotic substrates and lipid peroxides for the purpose of detoxification. The conjugation products are converted into mercapturic acids and excreted via the urine or bile.*

**Josephy PD (June 2010). "Genetic variations in human glutathione transferase enzymes: significance for pharmacology and toxicology". Human Genomics and Proteomics. 2010:*

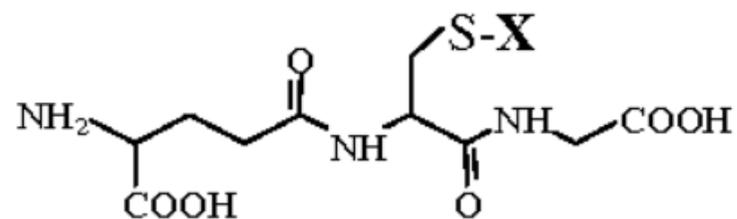


+

Xenobiotic (X)

Glutathione

GST



Glutathione-S-Conjugate

The detoxification reactions comprise the first four steps of **mercapturic acid** synthesis,* with the conjugation to GSH serving to make the substrates more soluble and allowing them to be removed from the cell by transporters.

*Hayes JD, Flanagan JU, Jowsey IR (2005). "Glutathione transferases". *Annual Review of Pharmacology and Toxicology*. 45: 51–88.

After export, the conjugation products are converted into **mercapturic acids** and excreted via the urine or bile.*

*Josephy PD (June 2010). "Genetic variations in human glutathione transferase enzymes: significance for pharmacology and toxicology". Human Genomics and Proteomics. 2010:

Glutathione-S-transferase adducts lose glutamate and glycine portions, and are acetylated to form **mercapturic acids**, which are excreted.

Hence the reason NAC is such an effective chemical detoxifier.

DRUG INTERACTION WITH GLUTATHIONE

GLUTAMIC ACID---CYSTEINE---GLYCINE

Glutathione-S-transferase $D + SH$

1. GLUTAMIC ACID---CYSTEINE---GLYCINE
20q 397nm 22p 399nm
Gamma glutamyl peptidase **GGT** $D-SH$ (S-substituted glutathione conjugate)

2. CYSTEINE---GLYCINE
16q 390nm
Cysteinyl glycinase **Zn** $D-SH$ Cysteine-glycine conjugate

3. CYSTEINE
23x 400nm
N-acetylase $D-SH$ Cysteine conjugate

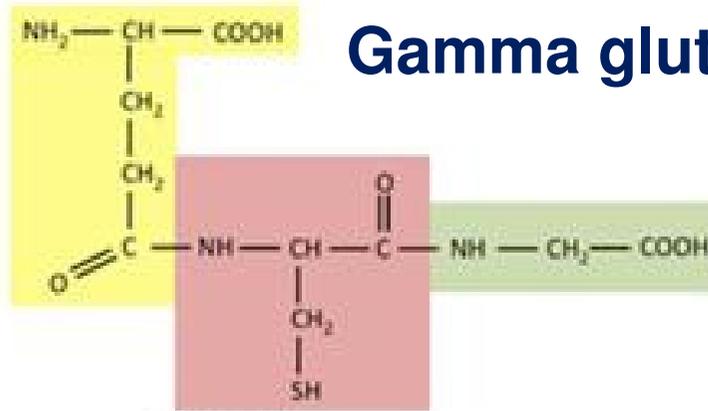
4. ACETYL-N-CYSTEINE
 $D-SH$ mercapturate
metabolite of drug

Gamma glutamyltransferase (GGT)

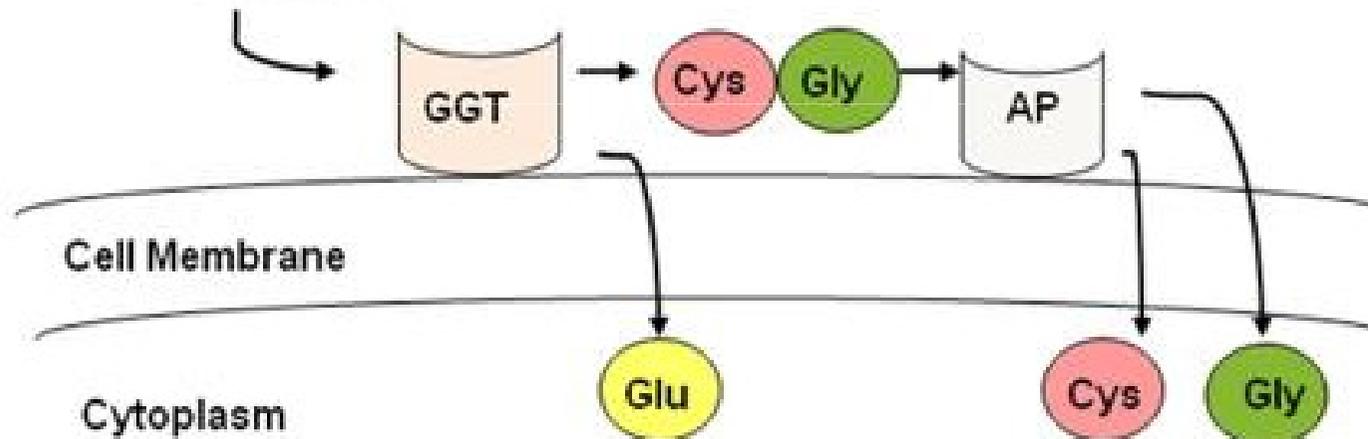
Gamma glutamyltransferase (GGT)

20q 397nm

22p 399nm



Glutathione



Hydrolysis of extracellular glutathione by GGT. GGT releases glutamate and cysteinyl-glycine. Cysteinyl-glycine hydrolysed by aminopeptidase (AP) releasing cysteine and glycine. All three amino acids can then be taken up into the cell to synthesise glutathione but process not very efficient. Glutathione cannot be taken up intact in most cells.

Gammaglutamyltransferase (GGT)

is a transferase enzyme that catalyzes the transfer of gamma-glutamyl functional groups from molecules such as glutathione to an acceptor that may be an amino acid, a peptide or water (forming glutamate).*

**Tate SS, Meister A (1985). "gamma-Glutamyl transpeptidase from kidney". Methods in Enzymology. 113: 400–19*

Research indicates that GGT can also exert a **pro-oxidant role**, with regulatory effects at various levels in cellular signal transduction and cellular pathophysiology.*

** Dominici S, Paolicchi A, Corti A, Maellaro E, Pompella A (2005). "Prooxidant reactions promoted by soluble and cell-bound gamma-glutamyltransferase activity". *Methods in Enzymology*. 401: 484–501.*

GGT is present in the cell membranes of many tissues, including the kidneys, bile duct, pancreas, gallbladder, spleen, heart, brain, prostate and seminal vesicles. Smaller amounts are found in the lungs, testis, and thyroid gland.*

* Raulf M, Stüning M, König W (May 1985). "Metabolism of leukotrienes by L-gamma-glutamyl-transpeptidase and dipeptidase from human polymorphonuclear granulocytes". *Immunology*. 55(1): 135–47.

It is involved in the transfer of amino acids across the cellular membrane and **leukotriene metabolism***.

* Raulf M, Stüning M, König W (May 1985). "Metabolism of leukotrienes by L-gamma-glutamyl-transpeptidase and dipeptidase from human polymorphonuclear granulocytes". *Immunology*. 55(1): 135–47.

GGT alone does not directly cause a particular disease or disorder. High levels of GGT may contribute to disease by acting a **pro-oxidant**. GGT may increase oxidative stress, starting with the breakdown of glutathione (and production of cysteinylglycine). Other toxic molecules are then formed, leading to tissue, cellular, and DNA damage .*

*Human Atherosclerotic Plaques Contain Gamma-Glutamyl Transpeptidase Enzyme Activity
Aldo Paolicchi, Michele Emdin

GGT is present in plaques because it attaches itself to circulating fats (LDL). Once in the plaque, GGT can become pro-oxidant, injuring blood vessels (via **oxidative stress**), and contribute to heart disease.*

*Human Atherosclerotic Plaques Contain Gamma-Glutamyl Transpeptidase Enzyme Activity Aldo Paolicchi, Michele Emdin

Gamma-glutamyltransferase (GGT)

High in

**Alcohol abuse, Barbituates, NSAIs,
Aspirin, St John's Wort.**

Biliary, Liver and Pancreas diseases

CVD and Atherosclerosis

**Metabolic syndrome. High body mass
index is associated with type 2
diabetes only in persons with high
serum GGT.**

Lim JS, Lee DH, Park JY, Jin SH, Jacobs DR (June 2007). "A strong interaction between serum gamma-glutamyltransferase and obesity on the risk of prevalent type 2 diabetes: results from the Third National Health and Nutrition Examination Survey". Clinical Chemistry. 53 (6): 1092–8. doi:10.1373/clinchem.2006.079814. PMID 17478563.

Serum elevated gamma glutamyltransferase levels may be a marker for oxidative stress in Alzheimer's disease

Burcu Balam Yavuz,¹ Bunyamin Yavuz,² Meltem Halil,¹
Mustafa Cankurtaran,¹ Zekeriya Ulger,¹
Eylem Sahin Cankurtaran,³ Kudret Aytemir⁴
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¹Hacettepe University Faculty of Medicine, Department of Internal Medicine, Division of Geriatric Medicine, Ankara, Turkey

²Kecioren Research Hospital, Department of Cardiology, Ankara, Turkey

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⁴Hacettepe University Faculty of Medicine, Department of Cardiology, Ankara, Turkey

ABSTRACT

Background: Gamma glutamyltransferase (GGT) plays a role in cellular glutathione uptake, which is an important element of antioxidant mechanisms. An increase in serum GGT is thought to be an early and sensitive marker of oxidative stress. Oxidative stress has a role in the pathogenesis of Alzheimer's disease (AD). The aim of this study was to investigate the GGT levels in AD

High GGT can cause

Liver disease

Biliary tract disease

CHD

CVA

Arteriosclerosis

Heart failure

High BP

Cardiac arrhythmias

Diabetes

**Metabolic-
syndrome**

Cancer

Kidney disease

Alzheimer's

Thyroid

Bone density loss

To lower GGT levels

Decrease alcohol

Avoid pollutants

More fruit and veg

High protein

More coffee

Less red meat

Moderate exercise

Cloves

Curcumin

Vitamin C

Vitamin D

Vitamin E

Fish/Flax/DHA

Milk thistle

Magnesium

Zinc

Glutathione

What are ORAC Units?

The ORAC (Oxygen Radical Absorbance Capacity) unit, ORAC value, or “ORAC score” is a method of measuring the *in vitro* antioxidant capacity of different foods and supplements.

ORAC Values*

^National Institute on Aging (NIA) at
the National Institutes of Health (NIH).

Astaxanthin	2822200
Cloves	290283
Oregano	175295
Rosemary	165280
Peppermint	160820
Thyme	157380
Cinnamon	131420
Turmeric	127068
Sage	119929
Allspice	100400

High and Low Hemoglobin Tied to Long-Term Dementia Risk

Megan Brooks

August 06, 2019



Medscape Monday, August 12, 2019

Abnormal hemoglobin levels — both low and high — are associated with an increased risk of developing subsequent dementia, new research shows.

The latest results from the Rotterdam Study — a large, longitudinal population-based study — show individuals with anemia were 41% more likely to develop [Alzheimer's disease](#) (AD) and 34% more likely to develop any dementia type compared with individuals without anemia. The investigators also found that those with high hemoglobin were also at greater risk of developing dementia.

"[Low hemoglobin](#) levels, including anemia, could directly lead to neuronal damage due to reduced oxygen delivery, or via concomitant vascular or metabolic changes, for example changes in binding to amyloid-beta-42, which is an important marker of Alzheimer pathology," study investigator Frank J. Wolters, PhD, Department of Epidemiology and Neurology, Erasmus Medical Center, Rotterdam, the Netherlands, told *Medscape Medical News*.

Selenium dependant enzymes

1. **Glutathione peroxidases** 1p 370nm, 3p 374nm, 5p 377nm, 6p 378nm, 14p 387nm, 19p 394nm
2. **Deiodinases** 1p 370nm, 14q 387nm, 9p 382nm
3. **Thioredoxin reductase** 12q 385nm, 22q 399nm, 3p 374nm
4. **Selenoprotein P (antioxidant)** 5p 377nm
5. **Selenoprotein W (in muscle)** 19q 395nm
6. **Selenophosphate synthetase** 10p 383nm
7. **Methionine-R-sulfoxide reductase** 12q 385nm
8. **Sep15 (redox function)** 5p 377nm
9. **Selenoprotein V (spermatogenesis)** 19q 394nm
10. **Selenoprotein S (inflammation & immune)** 15q 388nm
11. **Selenoprotein O (redox)** 22q 399nm

Selenium

1. Converts T4>T3 slows Krebs cycle > Anaerobic respiration.

2. Low GPX > High ROS especially in the mitochondria between complex III and IV where glutathione is concentrated due to high ROX production.

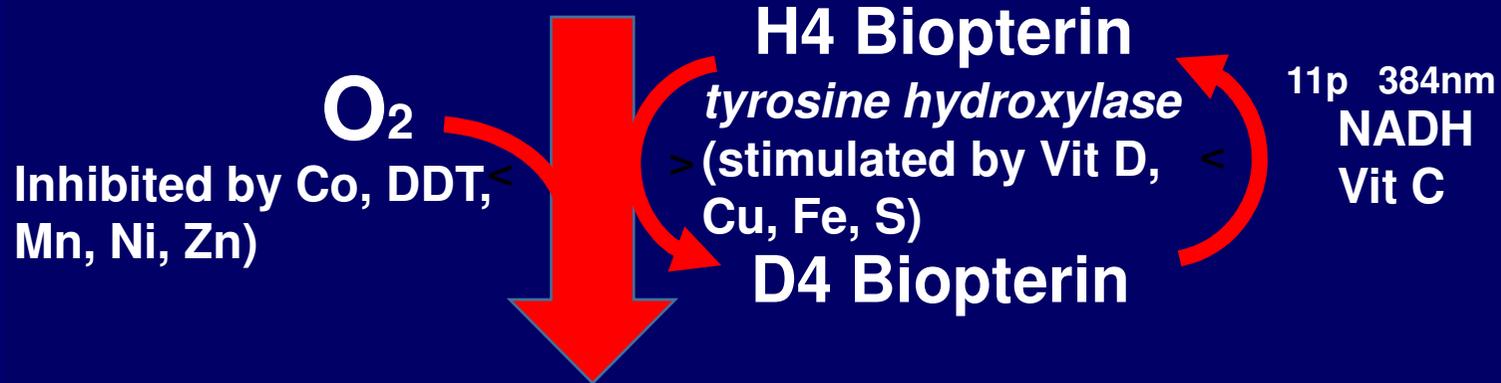
Selenium

3. Deficiency leads to high amounts of toxic metals and xenobiotics due to low glutathione recycling.

4. Inhibits virus replication.



TYROSINE



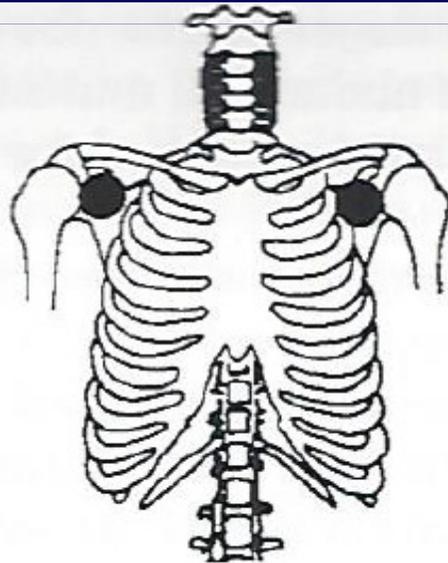
L.DOPA



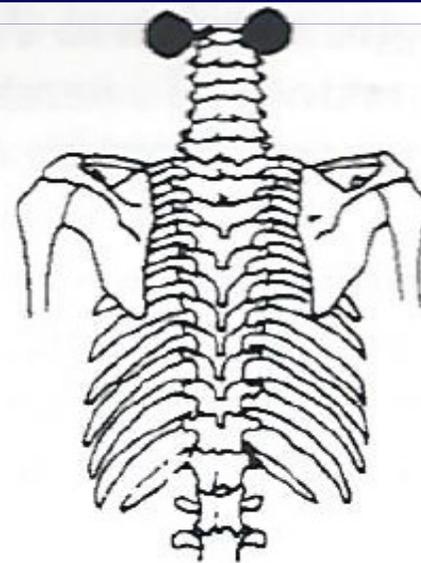
DOPAMINE

Rub the **Neurolymphatic reflexes** for Supraspinatus to increase Dopamine and relieve anxiety and depression.

Scott Walker 2016



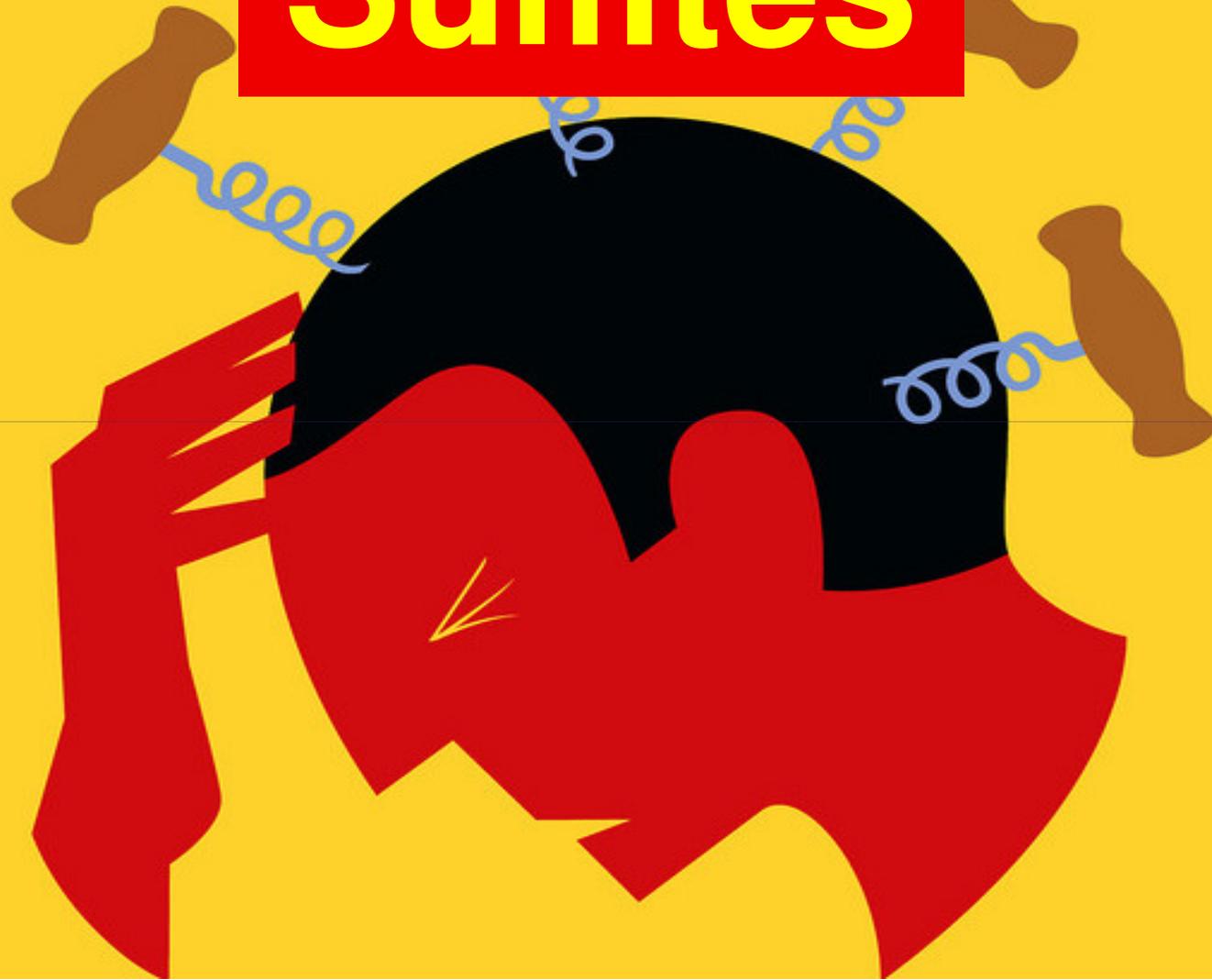
Anterior



Posterior

Sulfite oxidase

Sulfites





One third of Americans are allergic to **sulfites** – some fatally – leading to asthma, gastrointestinal and skin irritations.*

*What is natural wine? By Katy Severson, Huffpost

Sulfites are found naturally in some foods, which presents an additional challenge to sensitive individuals. Peanuts, eggs, black tea, vinegar and other fermented foods contain natural sulfites. So do some otherwise healthy vegetables, including broccoli, cabbage, cauliflower, kale, garlic, onions, chives and leeks.

Sulphites

Wine, beer, cocktail mixes, soft drinks, instant tea

Cookies, crackers, dried fruit or vegetables

Dried citrus fruit beverage bases

Horseradish, pickled onions, pickles, olives, wine vinegar

White sugar from sugar beet

Anti-emetics, CVS drugs, antibiotics, tranquilizers, muscle relaxants, analgesics, steroids, bronchial dilators.

Canned clams; fresh, frozen, canned or dried shrimp; frozen lobster; scallops; dried cod.

Fruit fillings, flavoured and unflavoured gelatine, pectin jelling agents.

Cornstarch, modified food starch, spinach pasta, gravies, breadings, batters, noodle/rice mixes.

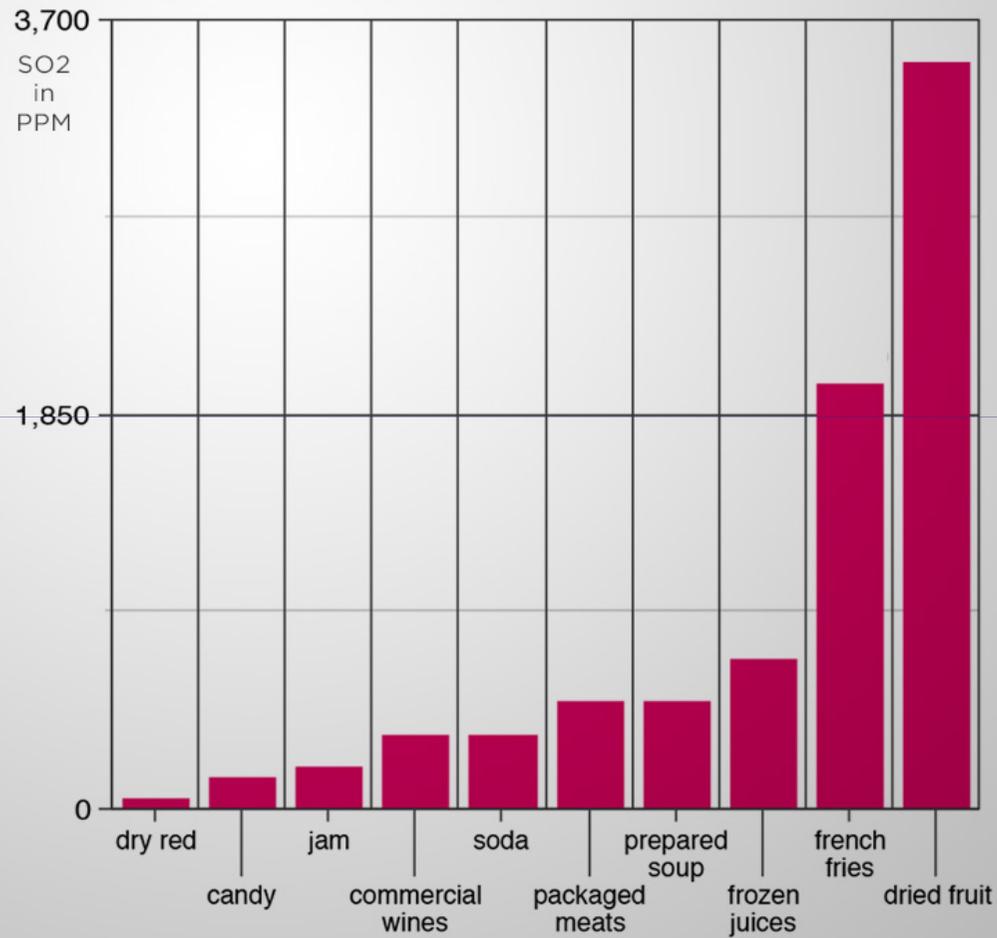
Jams, jellies, shredded coconut

Canned, bottled or frozen fruit juices (including lemon, lime, grape and apple); dried fruit; canned, bottled or frozen dietetic fruit or fruit juices; maraschino cherries and glazed fruit.

Vegetable juice, canned vegetables (including potatoes), pickled vegetables (including sauerkraut), dried vegetables, instant mashed potatoes, frozen potatoes and potato salad.

MEASURING UP

Sulfites in Wine



Sulfites are generally found at higher levels in the cask wine than bottled wine, and are at much higher concentrations in white wine than red wine, which is preserved by natural tannins.



Symptoms of a sulfite sensitivity include:



Hives and itchiness.

**Upset stomach, diarrhoea,
and vomiting.**

Trouble swallowing.

Flushing.

Dizziness.

Drop in blood pressure.

Trouble breathing. Snoring.

Sulfites can cause allergy like reactions (intolerances), most commonly asthma symptoms in those with underlying asthma, sometimes allergic rhinitis (hay fever) like reactions, occasionally urticaria (hives) and very rarely, anaphylaxis (severe allergic reactions). Wheezing is the most common reaction.

Sulfites can inhibit the production of positive GUT flora bacteria. They have been shown to deplete glutathione levels which aid in the metabolism of alcohol. EU labelling laws require winemakers to label “contains sulfites” on any wines that contain more than 10mg per litre.

*What is natural wine? By Katy Severson, Huffpost

The **WHO** recommends an intake of no more than 70mcg per kilo of body weight meaning that an average sized man can safely drink less than a third of a bottle of conventional white wine per day. *



*What is natural wine? By Katy Severson, Huffpost

[PLoS One](#). 2017; 12(10): e0186629.

PMCID: PMC5646858

Published online 2017 Oct 18. doi: [\[10.1371/journal.pone.0186629\]](https://doi.org/10.1371/journal.pone.0186629)

PMID: [29045472](https://pubmed.ncbi.nlm.nih.gov/29045472/)

Sulfites inhibit the growth of four species of beneficial gut bacteria at concentrations regarded as safe for food

[Sally V. Irwin](#), Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Writing – original draft, Writing – review & editing,^{#*} [Peter Fisher](#), Formal analysis, Methodology, Software, Supervision, Writing – review & editing,[#] [Emily Graham](#), Data curation, Formal analysis, Investigation, Validation, Writing – review & editing,[#] [Ashley Malek](#), Data curation, Formal analysis, Investigation, Software, Validation, Writing – review & editing,[#] and [Adriel Robidoux](#), Data curation, Formal analysis, Investigation, Validation, Writing – review & editing[#]

damage beneficial bacteria in the human gut and this damage has been associated with several diseases. In the present study, bactericidal and bacteriostatic effects of two common food preservatives, sodium bisulfite and sodium sulfite, were tested on four known beneficial bacterial species common as probiotics and members of the human gut microbiota. *Lactobacillus* species *casei*, *plantarum* and *rhamnosus*, and *Streptococcus thermophilus* were grown under optimal environmental conditions to achieve early log phase at start of experiments. Bacterial cultures were challenged with sulfite concentrations ranging between 10

Sulfur dioxide (SO₂) protects wine from not only oxidation, but also from bacteria. Without sulfites, grape juice would quickly turn to vinegar.*

* Spencer B. "Sulfur in Wine Demystified"

Wine

Sulfites occur naturally in all wines to some extent.* Sulfites are commonly introduced to arrest fermentation at a desired time, and may also be added to wine as preservatives to prevent spoilage and oxidation at several stages of the winemaking.

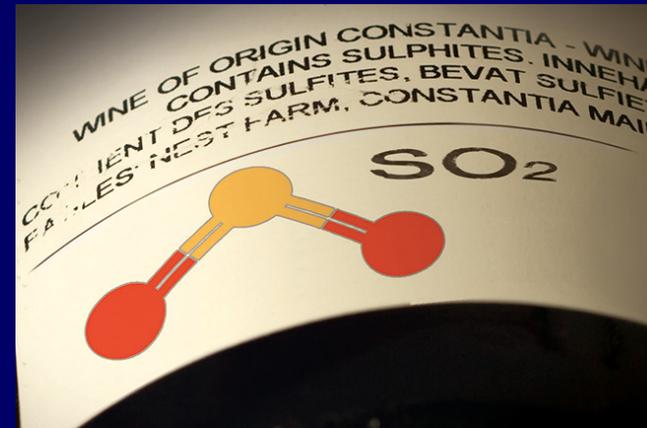
**Zacharkiw B (July 15, 2008). "Can't hold the sulphites". Montreal Gazette.*

<https://www.bonappetit.com/drinks/wine/article/sulfite-free-wine>.

<https://www.thekitchn.com/the-truth-about-sulfites-in-wine-myths-of-red-wine-headaches-100878>.

Organic wines are not necessarily sulfite-free, but generally have lower amounts and regulations stipulate lower maximum sulfite contents for these wines. In general, white wines contain more sulfites than red wines and sweeter wines contain more sulfites than drier ones.*

*McCarthy E, Ewing-Mulligan M (2012). *Wine for dummies* (5th ed.). Hoboken, N.J.: Wiley. ISBN 978-1-118-28872-6



In the **United States**, wines bottled after mid-1987 must have a label stating that they contain sulfites if they contain more than 10 parts per million.*

*Breton F. "Many organic wines contain sulfites". *French Scout*.

In the **European Union** an equivalent regulation came into force in November 2005.* In 2012, a new regulation for organic wines came into force.** In the United Kingdom, similar laws apply.



* *"Food Labeling - Community Legislation". European Commission. Retrieved 2007-09-10.*

** *"Commission Implementing Regulation (EU) No 203/2012". Official Journal of the European Union. 8 March 2012.*

Bottles of wine that contain over 10 mg/l sulfites are required to bear "contains sulphites**" on the label. This does not differ whether sulfites are naturally occurring or added in the winemaking process.***

*Safonov D. "7 Myths of Natural Wines with no sulphites added". Organic Wine Club.

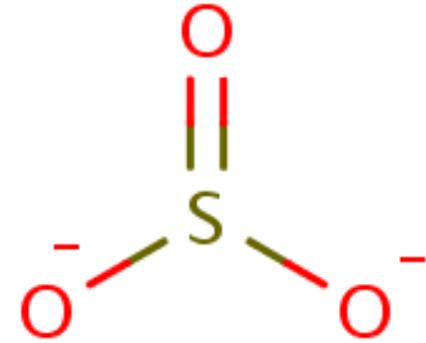
Considerations for the diagnosis and management of sulphite sensitivity

[Justine Bold](#)[✉]

▸ [Author information](#) ▸ [Copyright and License information](#) [Disclaimer](#)

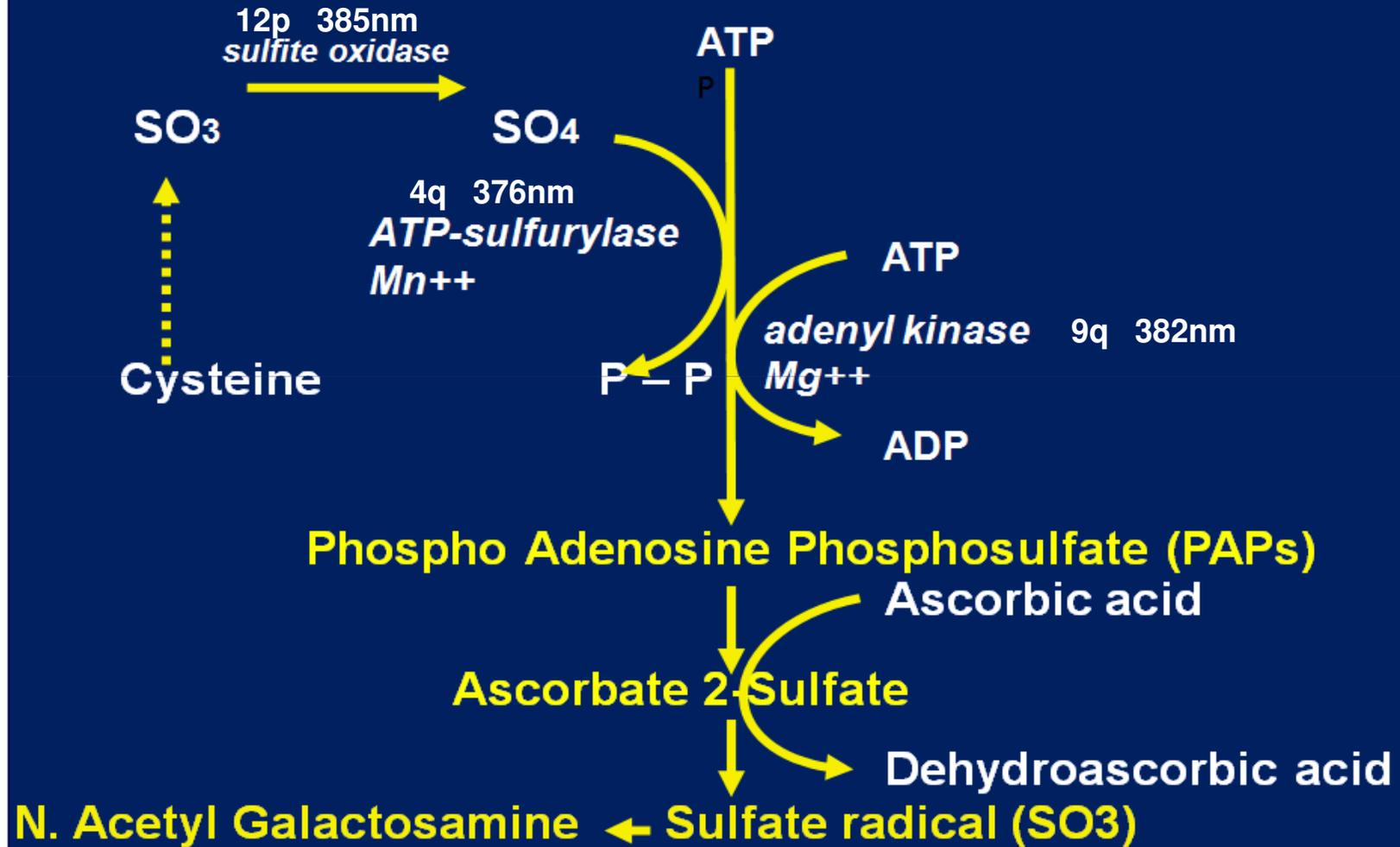
The review article by Vally and Misso (1) published in the current edition of this journal outlines the broad range of signs and symptoms associated with sulphite sensitivity. These include bronchoconstriction, wheezing, dyspnea, nausea, stomach cramps, diarrhoea, urticaria/angiodema, diaphoresis, hives, laryngeal oedema, generalised itching and swelling, tingling sensations, flushing, hypotension, cyanosis, shock and loss of consciousness (2). Many of the symptoms mirror those of anaphylaxis. Indeed reactions to sulphites can be life threatening, as a number of fatal cases have been reported (3, 4). In many areas of the world, sulphites are now one of the potential allergens (along with the likes of peanuts, fish, crustaceans, gluten and milk) that have to be labelled on food and drink products. In the European Union (EU), levels in foods and drinks above 10 mg/kg or 10 mg per litre have to be labelled. Warning labels are now commonplace,

A SO₂ metabolite (glutathione S-sulfonate) has been demonstrated in studies on rat liver, lung and human lung cells to be a competitive inhibitor of the liver enzyme glutathione S-transferase (GST) (15). Researchers suggested that SO₂ may have a detrimental effect on the general detoxification of xenobiotic compounds generally detoxified in the glutathione conjugation pathway, involving GST (15). They suggest it may deplete glutathione supply and it could be a contributory factor in sulphite sensitivity. Obviously, further studies would be required to validate this.



Sulfite oxidase

ACTIVATED SULFATE

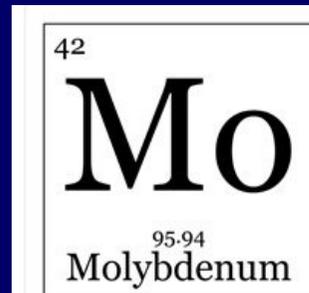


Sulfite oxidase (Chromosome 12q – 385nm) is an enzyme in the mitochondria of all eukaryotes.

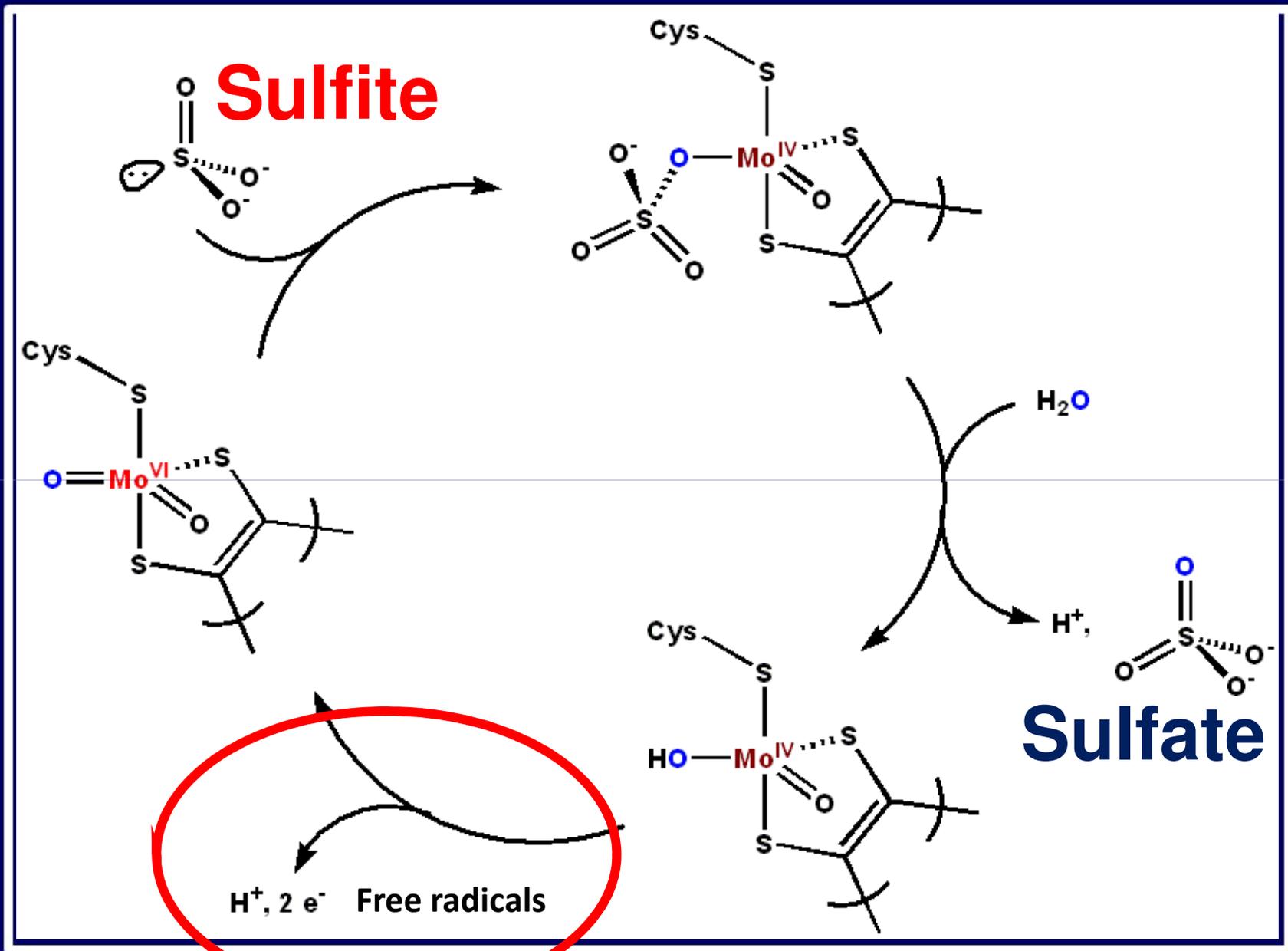
It oxidizes sulfite to sulfate.

In mammals, the expression levels of **sulfite oxidase** is high in the liver, kidney, and heart, and very low in spleen, brain, skeletal muscle, and blood.

The active site of sulfite oxidase contains a molybdopterin cofactor.



Sulfite oxidase produces free radicals which, when under a strict physiological control, act as a natural antifungal.



Sulphites

Detoxified by Sulfite oxidase
(heme dependant enzyme)

Co-factored by – Fe, Mol,
Vitamin C.

Natural Antidote “Sulfite Clear”



Use 1 drop of 3% H₂O₂ per glass of wine.

6 drops to a 75cl bottle of wine.

3 drops to a pint of beer.

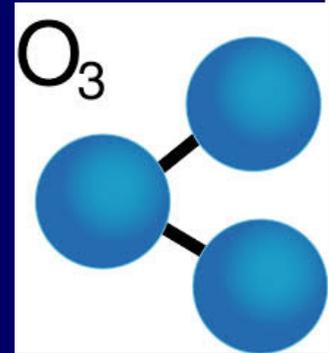
Alternatives to Sulfites

Replacing sulfites in wine with other natural compounds so that the wine is still protected without the need for added SO₂.

It's important to note that SO₂/sulfites are naturally occurring in grapes and wine, and the SO₂/sulfites here are ADDED sulfites.

Some examples of **alternatives** to SO₂ that have been studied include (but are certainly not limited to); high pressure treatment, natural plant extracts, resveratrol, pulsed electric fields, ultrasound, other chemical treatments, and ozone.

Results of study seem to suggest that **ozone** treatment of grapes after harvest may be a viable alternative to using SO_2 in winemaking.



Ozone treatment did not affect sugars, titratable acidity, or pH of grapes.

Ozone treatment increased anthocyanins and skin tannins.

Based on these results, it may also suggest that **ozone treatment could be better not only for reducing the populations of microbial organisms, but may improve the overall taste and quality of the finished wines.**

Postharvest ozone fumigation of Petit Verdot grapes to prevent the use of sulfites and to increase anthocyanin in wine

A. Bellincontro , C. Catelli, R. Cotarella, F. Mencarell

Laboratory studies have shown that plant

polyphenol extracts

(eucalyptus leaves extract, almond skins extract) can be effective in slowing or stopping the growth of lactic acid bacteria in wine, though to date no study has been done on a larger, real world scale.



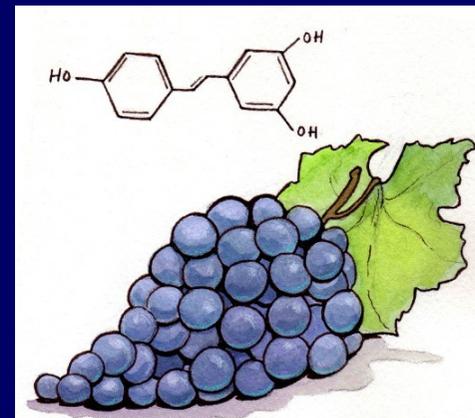
In the lab, using natural **plant polyphenols** have been shown to be as effective as SO_2 in protecting wine against bacterial infection, and has been shown to be an even better performer when used in concert with lower levels of SO_2 .

A winery-scale trial of the use of antimicrobial plant phenolic extracts as preservatives during wine ageing in barrels. Eva M. González-Rompinelli Juan José Rodríguez-Bencomo Almudena García-Ruiz Fernando Sánchez-Patán Pedro J. Martín-Álvarez Begoña Bartolomé M. Victoria Moreno-Arribas

In 2013, an excavation near **Nahariya, Israel** led to the discovery of a wine cellar, said to be almost 4,000 years old. The evidence obtained from the cellar indicated that ancient wine was infused with mint, cedar, cinnamon, bark, honey and tree resins.

Antonia Blumberg, HuffPost US

A new pilot study, published in the *Journal of Life Sciences*, aimed to test a way to replace added sulfites in wine by using added **resveratrol**, a well-studied naturally-occurring polyphenol in wine with antioxidant and antimicrobial properties.



More research needs to be done to determine if added **resveratrol can protect the wine in the same way that added sulfites does over time, but preliminary results of this pilot study are promising.**

Enrichment of Resveratrol in Wine through a New Vinification Procedure
Raul Francisco Pastor, Magdalena Raquel Gargantini, Marcelo Murgo, Sebastián Prieto, Humberto Manzano, Carla Aruani, Claudia Inés Quini, Maria-Isabel Covas and Roberto Héctor Iermoli

John Chapter 2, the first miracle that Jesus performed was to turn water into wine at the wedding of Cana. And, in fact, it was such good wine that at the end of this wedding feast, the guest came to the master of the feast and said, 'Usually you save the bad wine for last, but you've saved the best wine for last,' and this was Jesus' first miracle.

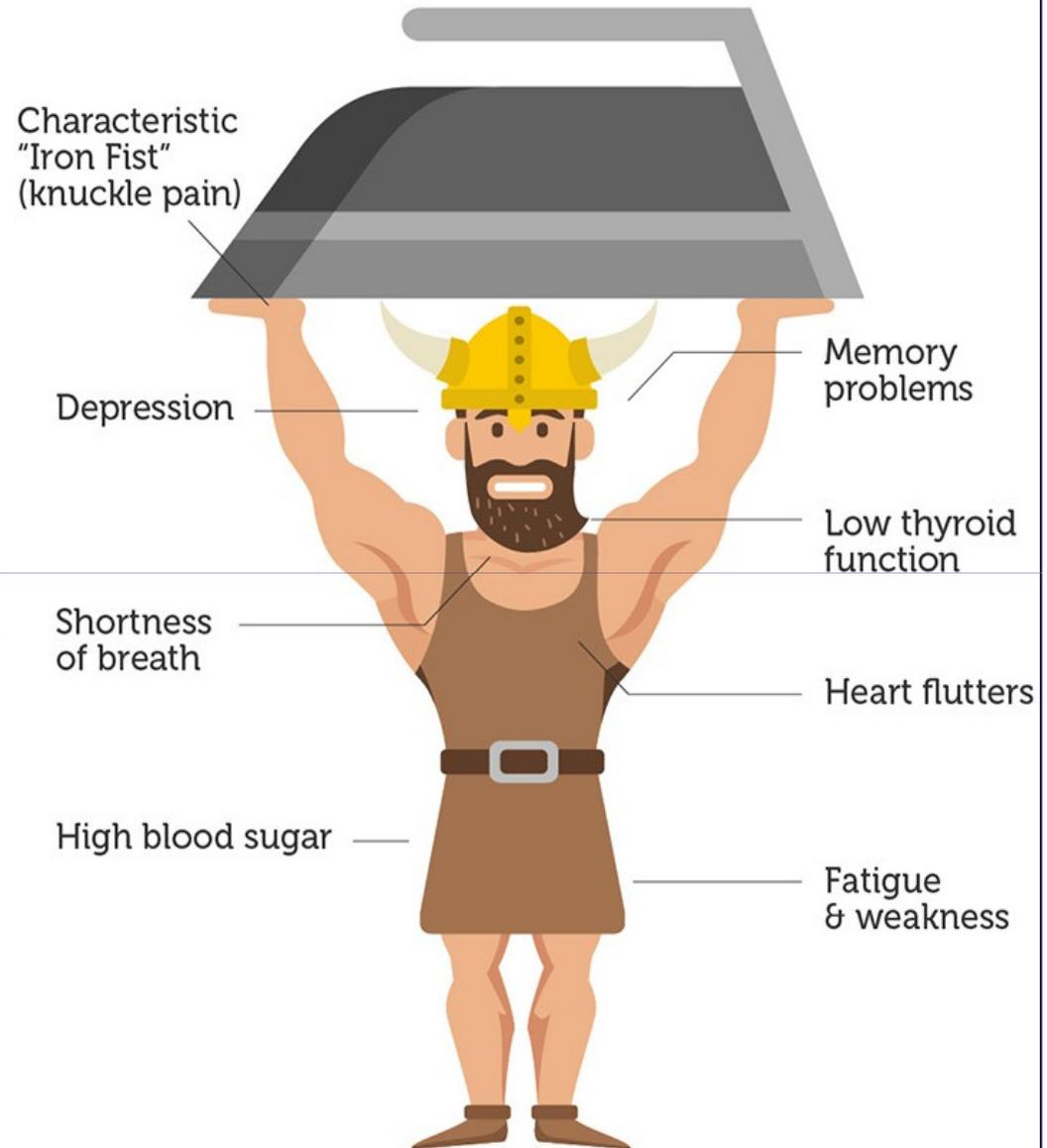
*Jesus
Drank Wine*



BE LIKE JESUS

Hemachromatosis (iron overload)

DO YOU HAVE THE "VIKING GENE"?



Two types

Hereditary

Chromosome	1q	371nm
	2q	373nm
	6p	378nm
	7	380nm
	19q	395nm

Acquired

Blood transfusions

Supplements

Symptoms

Chronic liver disease and cirrhosis.

Heart failure, irregular rhythm.

Diabetes, Hypogonadism.

Arthritis – 2-3 m/p joints.

Bronzing of the skin.*

* John Murtagh (2007). *General Practice*. McGraw Hill Australia.

People of Celtic (Irish, Scottish, Welsh, Cornish, Breton etc.), English, and Scandinavian origin have a particularly high incidence, with about 10% being carriers of the principal genetic variant and 1% having the condition.*

***"Hemachromatosis". Encyclopædia Britannica.com. Retrieved 17 April 2017.**

Serum **ferritin** up.* But can be also in infection, inflammation, fever, liver disease, kidney disease, and cancer.

Transferritin saturation is a more specific test.

Andrea Duchini. "Hemochromatosis Workup". Medscape. Retrieved 2016-07-14. Updated: Jan 02, 2016

Treatments.

**Phlebotomy / venesection:
routine treatment consists of
regularly scheduled
phlebotomies.**

**Low heme iron diet - red meat
such as beef, venison, lamb,
buffalo, and fish such as bluefin
tuna.**

Non-heme iron is not as easily absorbed in the human system and is found in plant-based foods like grains, beans, vegetables, fruits, nuts, and seeds.*

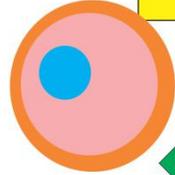
*"Welcome". *Hemochromatosis.org - An Education Website for Hemochromatosis and Too Much Iron*. Retrieved 2018-04-11.

Chelating agents – a-Lipoic acid

Iron Overload
(Hemochromatosis)
Cured by Cabbage -
The People's
Pharmacy

Alkaline Phosphatase

Alkaline phosphatase



Present in cell membrane or cell

High concentration in:



- ① Bile duct (Liver)
- ② Bone (osteoblastic cells)
- ③ Intestinal epithelium
- ④ Placenta
- ⑤ Kidney tubules (proximal tubules)
- ⑥ Granulocytes
- ⑦ Lactating mammry ducts

Alkaline phosphatase(ALP) is an enzyme found in high amounts in bone and liver.

Smaller amounts of ALP are found in the placenta of women who are pregnant, and in the intestines.

Each of these body parts makes different forms of ALP.

The different forms are called isoenzymes all co-factored by **Zn and Mg**. Due to its widespread prevalence in these areas, its concentration in the bloodstream is used by diagnosticians as a biomarker in helping determine diagnoses such as hepatitis or osteomalacia.*

**"Alkaline Phosphatase Level Test (ALP)". Healthline. Retrieved 2017-05-07.*

The levels of this enzyme in the blood depend on factors such as age, sex, blood type.*

Abnormal levels of alkaline phosphatase in the blood could indicate issues relating to the liver, gall bladder or bones.

*Dhruv L, Savio J (22 October 2017). "Alkaline Phosphatase". StatPearls.

Kidney tumours, infections as well as malnutrition have also shown abnormal level of alkaline phosphatase in blood.*

Chromosome 1p 370nm
Chromosome 2q 373nm

("Alkaline Phosphatase Level Test (ALP)". Healthline. Retrieved 2017-05-15.

Altered AP expression has been implicated in chronic inflammatory diseases such as inflammatory bowel disease. It also seems to regulate lipid absorption and bicarbonate secretion.*.

***Bilski J, Mazur-Bialy A, Wojcik D, Zahradnik-Bilska J, Brzozowski B, Magierowski M, Mach T, Magierowska K, Brzozowski T (2017). "The Role of Intestinal Alkaline Phosphatase in Inflammatory Disorders of Gastrointestinal Tract". *Mediators of Inflammation*. 2017: 9074601.**

High levels

Biliary obstruction

Bone conditions

Osteoblastic bone tumors

Osteomalacia

Osteoporosis*

Hepatitis, Cirrhosis

Acute cholecystitis

Myelofibrosis

Leukemoid reaction, Lymphoma

Paget's disease

Sarcoidosis

Hyperthyroidism

Hyperparathyroidism

Myocardial infarction

Pregnancy

*Foucault P, Foucault MH, Kucharewicz B, Bureau F, Alix M, Drosdowsky MA (1991). "[Value of the study of total alkaline phosphatases and bone isoenzyme in a population of subjects with osteoporosis]". *Annales de Biologie Clinique*. 49 (9): 477–81.

Low levels

Hypophosphatasia, an autosomal recessive disease

Inability to dephosphorylate P-5-P

Postmenopausal women receiving estrogen therapy because of aging

Men with recent heart surgery, malnutrition, magnesium deficiency, or severe anemia

Children with achondroplasia and cretinism

Children after a severe episode of enteritis

Pernicious anemia

Aplastic anemia

Wilson's disease

Hypothyroidism

In addition, oral contraceptives have been demonstrated to reduce alkaline phosphatase.*

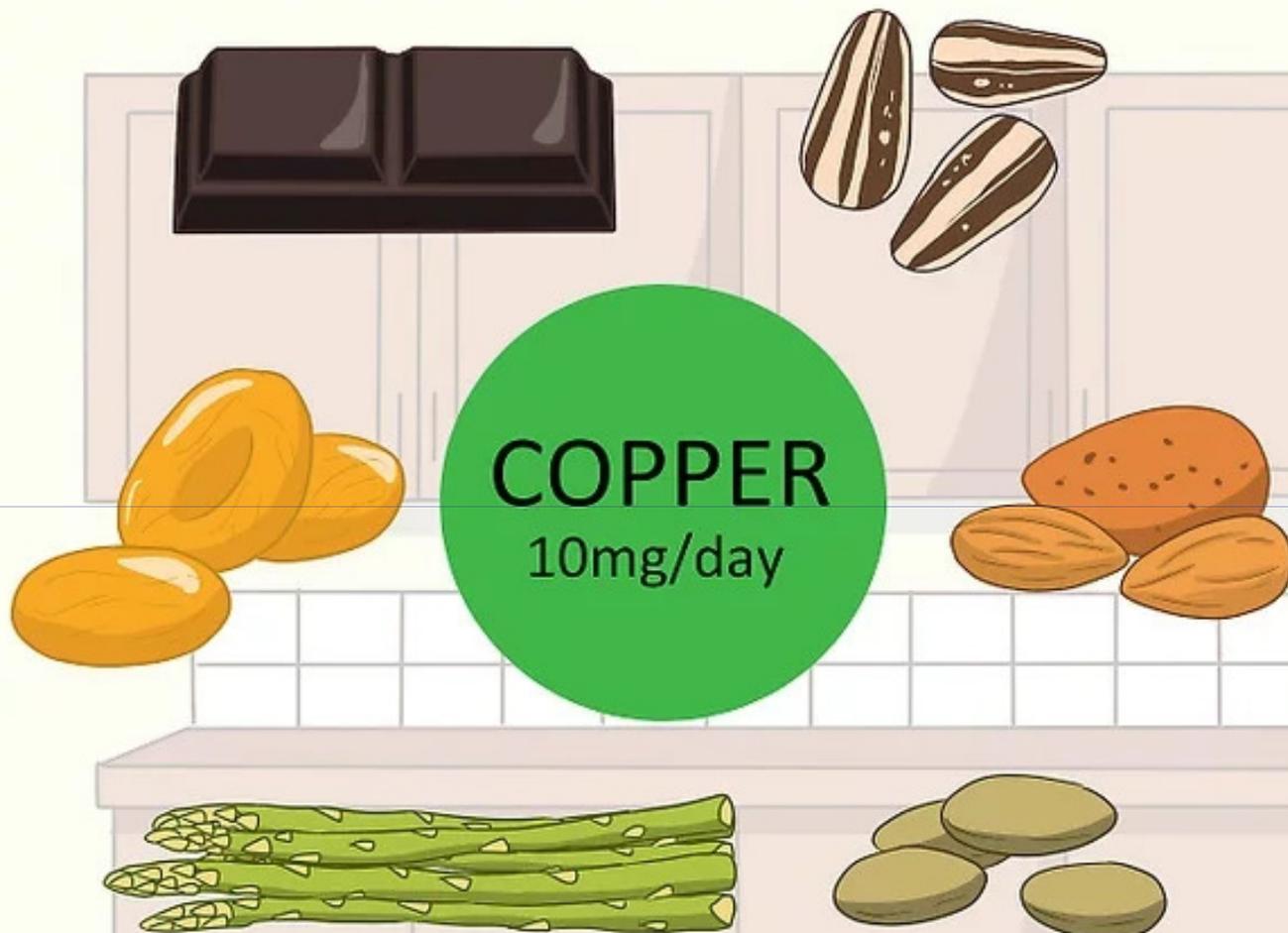
*Schiele F, Vincent-Viry M, Fournier B, Starck M, Siest G (November 1998). "Biological effects of eleven combined oral contraceptives on serum triglycerides, gamma-glutamyltransferase, alkaline phosphatase, bilirubin and other biochemical variables". *Clinical Chemistry and Laboratory Medicine*. 36 (11): 871–8

Treatment for high ALP



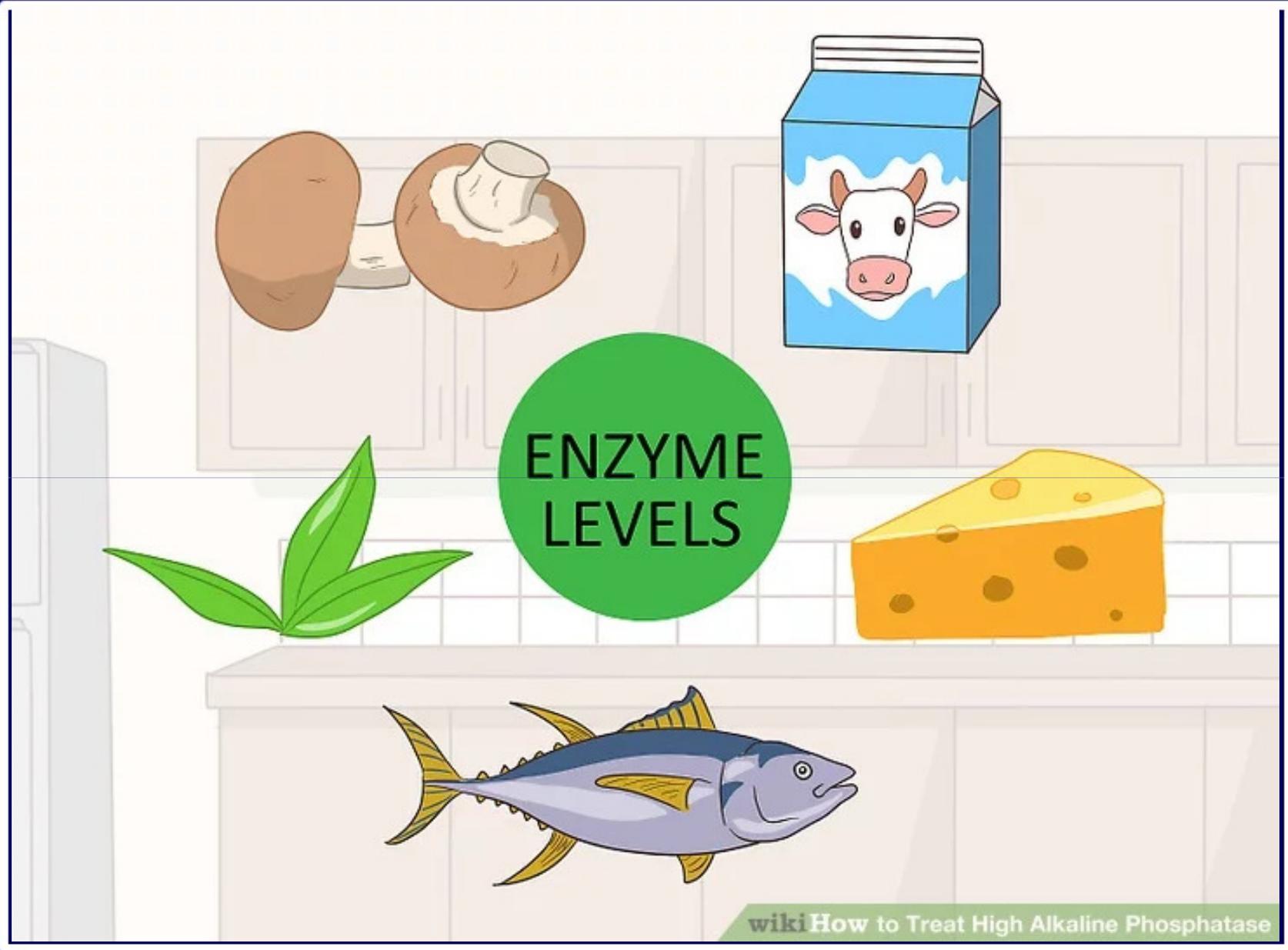
20
minutes

wikiHow



COPPER
10mg/day

Avoid Zinc





Common Volatile Organic Compounds

Inherited disorders of metabolism

Disorder

Phenylketonuria
Isovaleric acidemia
Maple syrup disease
Methionine malabsorption
Hypermethionineamia
Trimethylaminuria*
Tyrosineamia
3-Methylcrotonylglycinuria
Cystinuria*

VOC

Phenylacetic acid
Isovaleric acid
Short chain fatty acids
a-Hydroxybutyric acid
Dimethylsulphide
Trimethylamine*
b-Hydroxyphenylpyruvic acid
3-Hydroxyisovaleric acid
Cadaverine, Putrasine*

Common Volatile Organic Compounds

Disorder

Diabetes

Uremia / Kidney failure*

Breast cancer

Schizophrenia

Asthma

Hepatic encephalopathy

Liver disease

VOC

Acetone, Other ketones

Dimethylamine, Trimethylamine*

2-Propanol,

2,3-Dihydro-1-phenyl-4-quinazolinone,

1-Phenyl-ethanone, Heptanal,

Carbon disulphide, Pentane

Pentane, Ethane, 8-Isoprostane

3-Methylbutanol

C2-C5 Aliphatic acids

Methylmercaptan

Trimethylamine

Trimethylamine (TMA) is an organic compound with the formula $\text{N}(\text{CH}_3)_3$. This colourless, hygroscopic, and flammable tertiary amine has a strong "fishy" odour in low concentrations and an ammonia-like odour at higher concentrations.

In humans it is synthesized exclusively by gut microbiota from dietary nutrients such as **choline and carnitine.***

It is the substance mainly responsible for the odour often associated with **rotting fish**, some infections, bad breath and can be a cause of vaginal odour due to bacterial vaginosis.

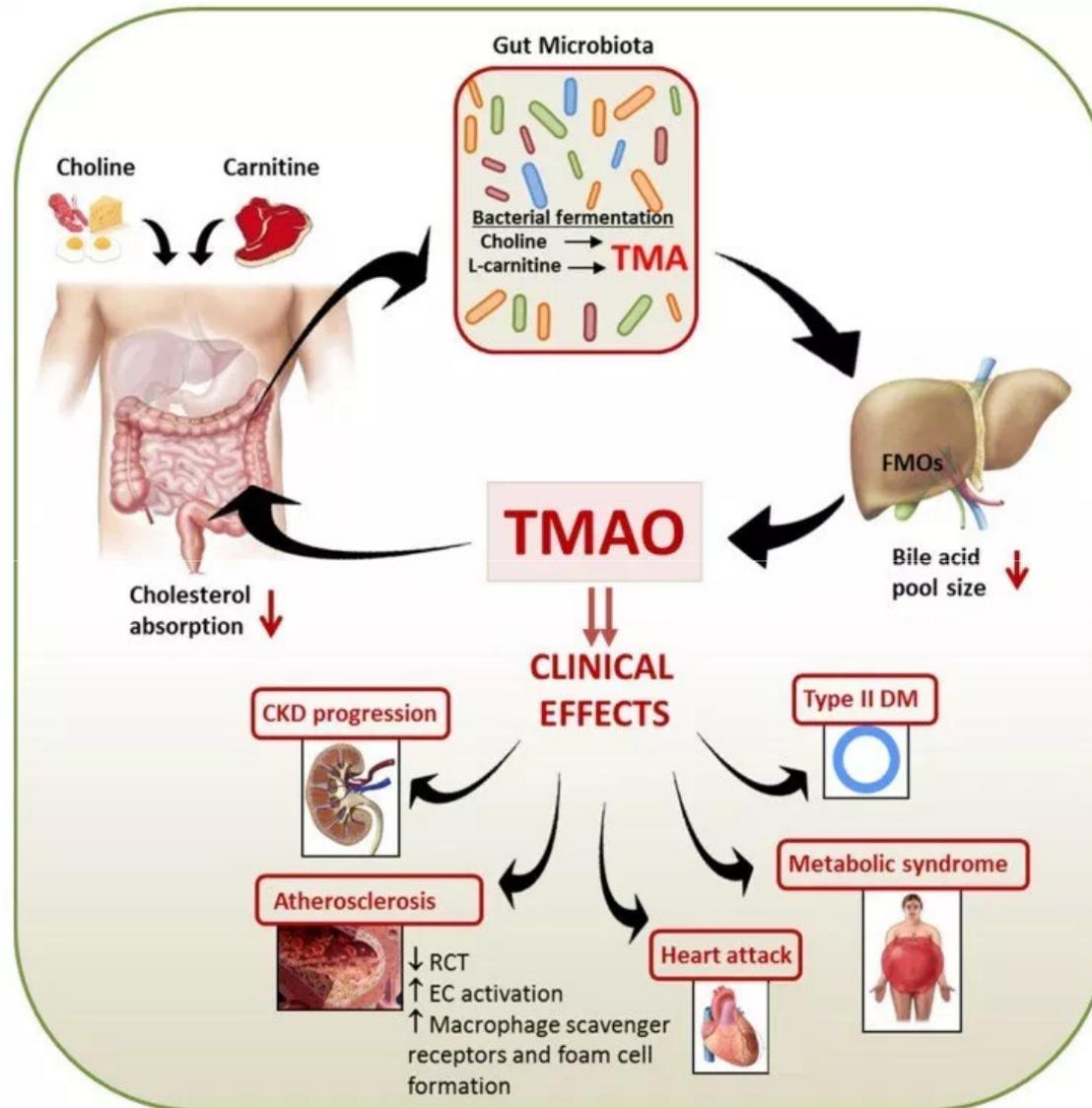


* Falony G, Vieira-Silva S, Raes J (2015). "Microbiology Meets Big Data: The Case of Gut Microbiota-Derived Trimethylamine". *Annu. Rev. Microbiol.* 69: 305–321.

Trimethylaminuria is an autosomal recessive genetic disorder involving a defect in the function or expression of flavin-containing monooxygenase³ (trimethylamine monooxygenase) which results in poor trimethylamine metabolism.

Individuals with **trimethylaminuria** develop a characteristic fishy odour—the smell of trimethylamine—in their sweat, urine, and breath after the consumption of choline-rich foods. (liver, eggs, wheatgerm, soybeans, scallops, salmon, chicken.) *

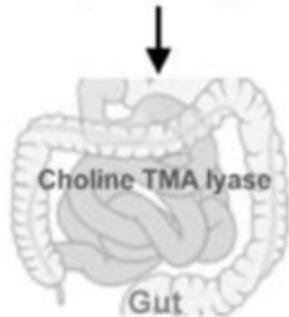
* Linus Pauling Institute » Micronutrient Information Center





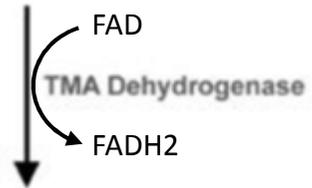
Protein rich diet.

Choline, Carnitine, Betaine



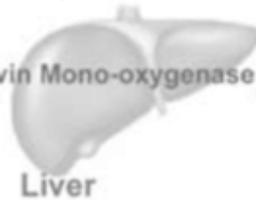
Modulated by Resveratrol

Trimethylamine (TMA)



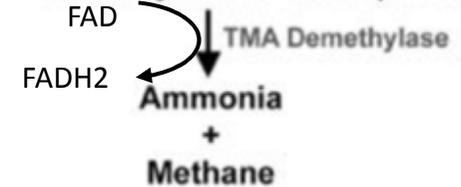
**Formaldehyde
+
Dimethylamine**

Flavin Mono-oxygenase 3



Liver

Trimethylamine oxide (TMAO)



Cardio-metabolic disorders

Renal Disorders

Cancer

Neurological disorders

Bacterial enzymes in red
Human enzymes in blue

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Research Article

Resveratrol Attenuates Trimethylamine-*N*-Oxide (TMAO)-Induced Atherosclerosis by Regulating TMAO Synthesis and Bile Acid Metabolism via Remodeling of the Gut Microbiota

Ming-liang Chen, Long Yi, Yong Zhang, Xi Zhou, Li Ran, Jining Yang, Jun-dong Zhu, Qian-yong Zhang, Man-tian Mi

Federico Rey, *Invited Editor*, Caroline S. Harwood, *Editor*

DOI: 10.1128/mBio.02210-15 [Check for updates](#)

The gut microbiota is found to be strongly associated with atherosclerosis (AS). Resveratrol (RSV) is a natural phytoalexin with anti-AS effects; however, its mechanisms of action remain unclear. Therefore, we sought to determine whether the anti-AS effects of RSV were related to changes in the gut microbiota. We found that RSV attenuated trimethylamine-*N*-oxide (TMAO)-induced AS in ApoE^{-/-} mice. Meanwhile, RSV decreased TMAO levels by inhibiting commensal microbial trimethylamine (TMA) production via gut microbiota remodeling in mice. Moreover, RSV increased levels of the genera *Lactobacillus* and *Bifidobacterium*, which increased the bile

Trimethylamine *N*-oxide (TMAO)
is a product of the oxidation
of trimethylamine.

**A study published in 2013,
assessing 513 adults with a
history of major adverse
cardiovascular events ---**

an average age of 68, and 69% of whom previously or currently smoke, may indicate that high levels of **TMAO in the blood are associated with an increased risk of additional cardiovascular events.**

*Tang, W.H. Wilson; Zeneng Wang; Bruce S. Levison; Robert A. Koeth; Earl B. Britt; Xiaoming Fu; Yuping Wu; Stanley L. Hazen (April 25, 2013).

The concentration of **TMAO in the blood increases after consuming foods containing carnitine or lecithin if the bacteria that convert those substances to TMAO are present in the gut. ***

*Gina Kolata (April 24, 2013). "Eggs, Too, May Provoke Bacteria to Raise Heart Risk". *The New York Times*. Retrieved April 25,2013.

High concentrations of **carnitine** are found in red meat, some energy drinks, and some dietary supplements; **lecithin** is found in soy, eggs*, as an ingredient in processed food and is sold as a dietary supplement.

*Gina Kolata (April 24, 2013). "Eggs, Too, May Provoke Bacteria to Raise Heart Risk". *The New York Times*. Retrieved April 25, 2013.

Some types of gut bacteria (e.g. species of *Acinetobacter*) in the human microbiome convert dietary carnitine to TMAO. TMAO alters cholesterol metabolism in the intestines, in the liver, and in artery walls.*

Connection between the GUT and CVD?

*Hazen, Stanley. "New Research On Red Meat And Heart Disease". *The Diane Rehm Show (Transcript)*. WAMU 88.5 American University Radio. Retrieved 10 April 2013.

In the presence of **TMAO**, there is increased deposition of cholesterol in, and decreased removal of cholesterol from peripheral cells such as those in artery walls.*

*Hazen, Stanley. "New Research On Red Meat And Heart Disease". *The Diane Rehm Show (Transcript)*. WAMU 88.5 American University Radio. Retrieved 10 April 2013.

It has been suggested that **TMAO** may be involved in the regulation of arterial blood pressure and etiology of hypertension and thrombosis (blood clots) in atherosclerotic disease.*

*Tilg, Herbert (2016-06-22). "A Gut Feeling about Thrombosis". *New England Journal of Medicine*. 374 (25): 2494–2496.

A 2017 meta-analysis found higher circulating **TMAO was associated with 23% higher risk of cardiovascular events and a 55% higher risk of mortality.***

*Qi, Jiaqian; You, Tao; Li, Jing; Pan, Tingting; Xiang, Li; Han, Yue; Zhu, Li (2018). "Circulating trimethylamine N-oxide and the risk of cardiovascular diseases: a systematic review and meta-analysis of 11 prospective cohort studies". *Journal of Cellular and Molecular Medicine*. 22 (1): 185–194.

Heart attacks: all in our genes?

Humans are far more prone to heart attacks than any other animal – and scientists have discovered that an ancient genetic mutation may be to blame. Cardiovascular disease in humans is usually caused by atherosclerosis, the clogging of arteries with fatty deposits. But on the relatively rare occasions when our closest genetic relatives, such as chimps

The two most common forms of sialic acid found in mammalian cells are N-acetylneuraminic acid (Neu5Ac) and its hydroxylated derivative, N-glycolylneuraminic acid (Neu5Gc). Studies of sialic acid distribution show that Neu5Gc is not detectable in normal human tissues although it is an abundant sialic acid in other mammals. Neu5Gc is, in actuality, immunogenic in humans.

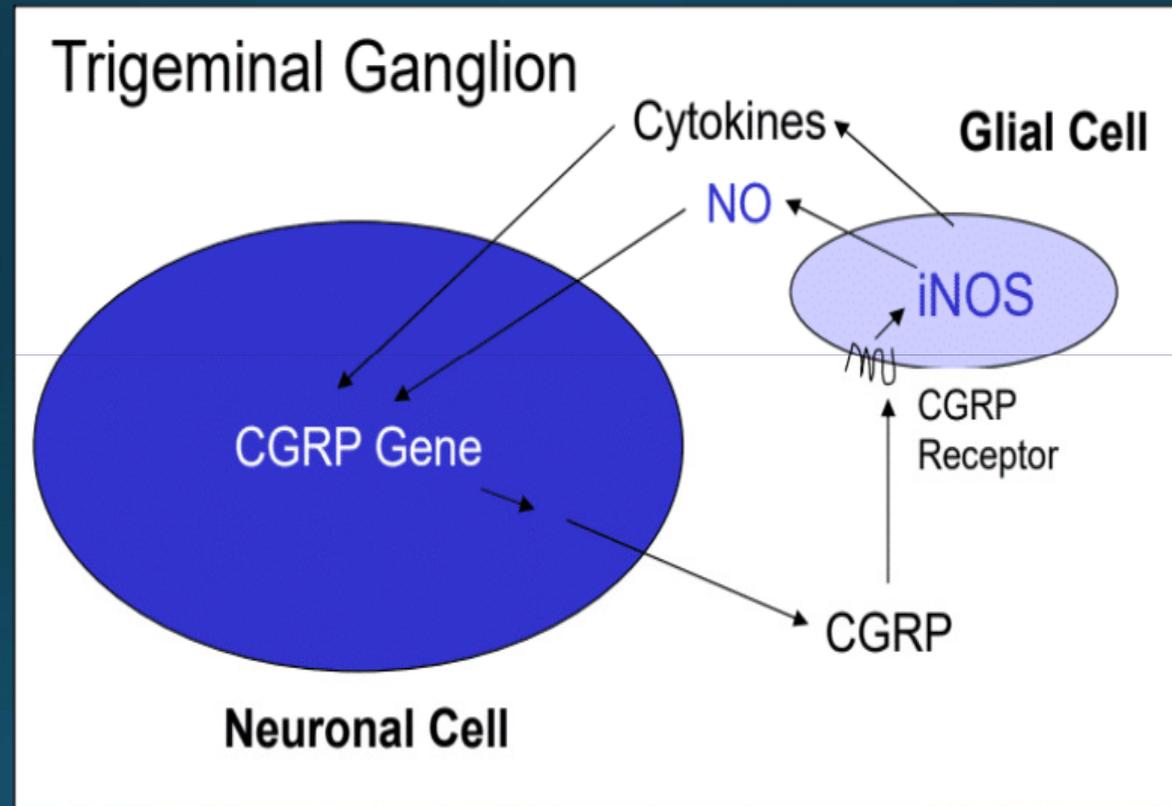
and other apes, have heart attacks, these are caused not by arterial clogging but by tearing of the heart muscle. Moreover, even when primates lead sedentary lifestyles, and have a high-cholesterol diet, they become no more susceptible to the attacks. Scientists think this could be because two to three million years ago our ancestors lost a gene called CMAH, which made them deficient in molecules called sialic acids. Suspecting that it's the absence of these that makes us vulnerable to atherosclerosis, a team at the University of California San Diego genetically modified mice to have a human-like sialic acid deficiency. Sure enough, the mice became significantly more likely to develop atherosclerosis. "This is a permanent mutation in humans – we can't reverse it," said Prof Ajit Varki, who led the research. But he stressed that its effect isn't all bad: it's also behind the human ability to run long distances, among other things.

Calcitonin Gene-Related Peptide (CGRP)

Calcitonin gene-related peptide (CGRP) is a member of the calcitonin family of peptides. α -CGRP is a 37-amino acid peptide and is formed from a gene located on chromosome 11.*

*Amara SG, Jonas V, Rosenfeld MG, Ong ES, Evans RM (July 1982). "Alternative RNA processing in calcitonin gene expression generates mRNAs encoding different polypeptide products". *Nature*. 298 (5871): 240–4.

CGRP Release from Neuronal Cell Body Promotes Peripheral Sensitization by Initiating an Inflammatory Loop



Thalakoti, Srikanth, Vinit V. Patil, Srikanth Damodaram, Carrie V. Vause, Lauren E. Langford, Stacy E. Freeman, and Paul L. Durham. "Neuron-glia signaling in trigeminal ganglion: implications for migraine pathology." *Headache: The Journal of Head and Face Pain* 47, no. 7 (2007): 1008-1023.

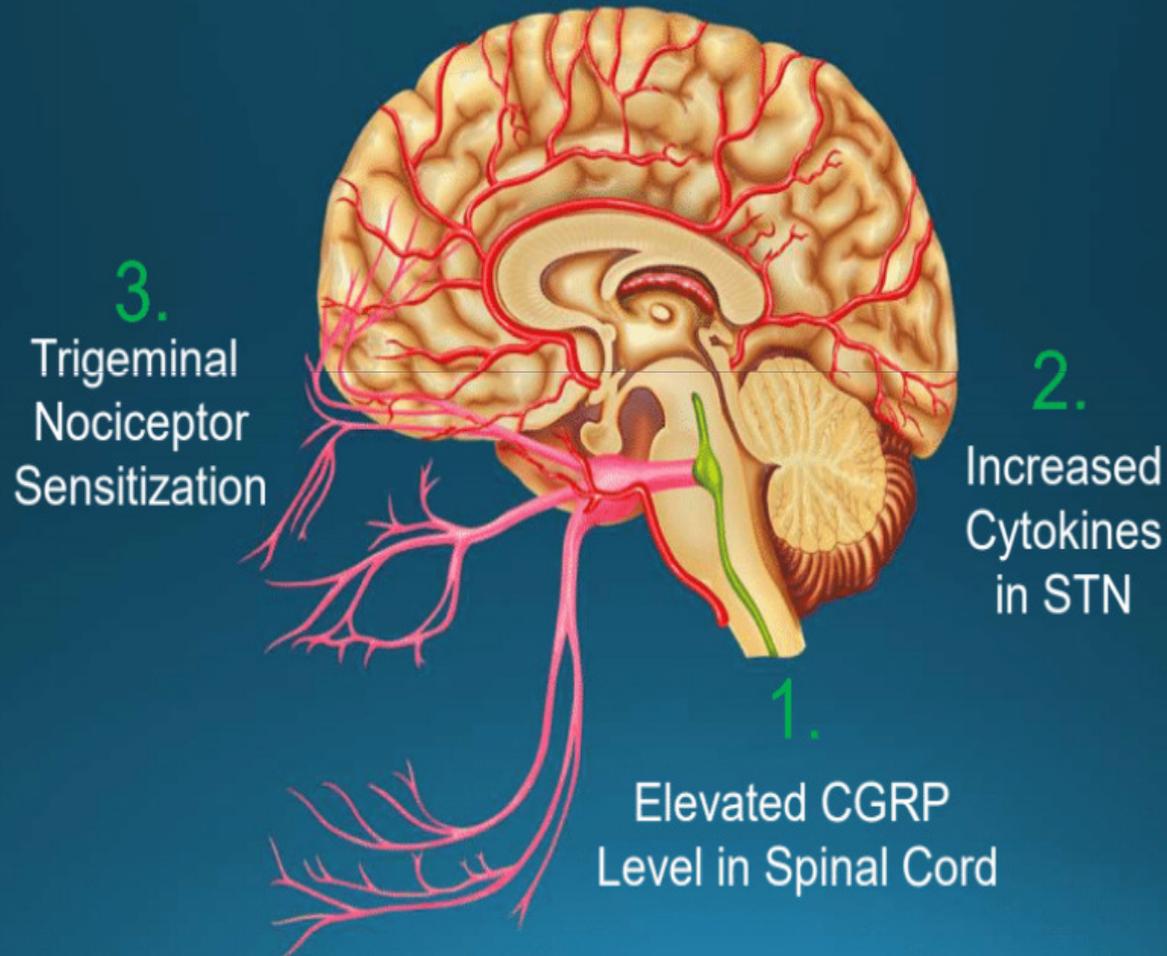
Watkins LR, Maier SF. Beyond neurons: evidence that immune and glial cells contribute to pathological pain states. *Physiological reviews*. 2002 Jan 10;82(4):981-1011.

CGRP is produced in both peripheral and central neurons. It is a potent peptide vasodilator and can function in the transmission of nociception.*

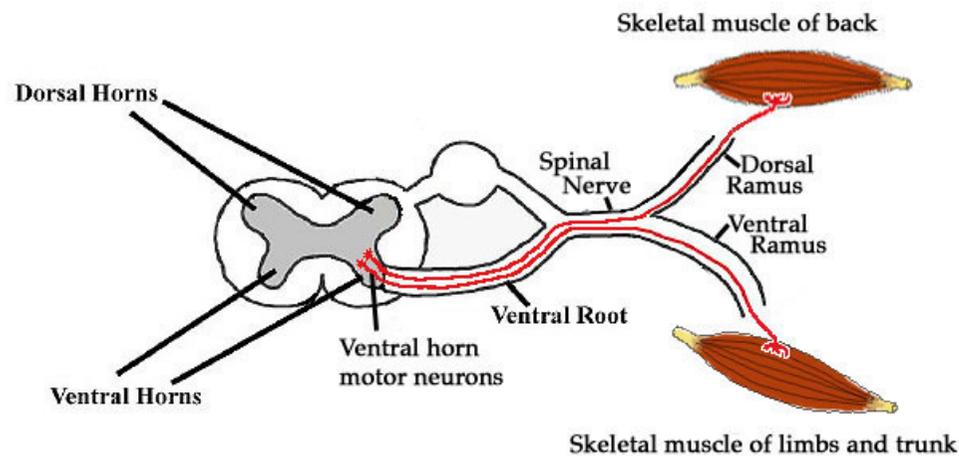
In the spinal cord, the function and expression of **CGRP** may differ depending on the location of synthesis.

*Brain SD, Williams TJ, Tippins JR, Morris HR, MacIntyre I (1985). "Calcitonin gene-related peptide is a potent vasodilator". *Nature*. 313(5997): 54–6.

Elevated Levels of CGRP in Spinal Cord Promote Peripheral Sensitization of Primary Trigeminal Nociceptors



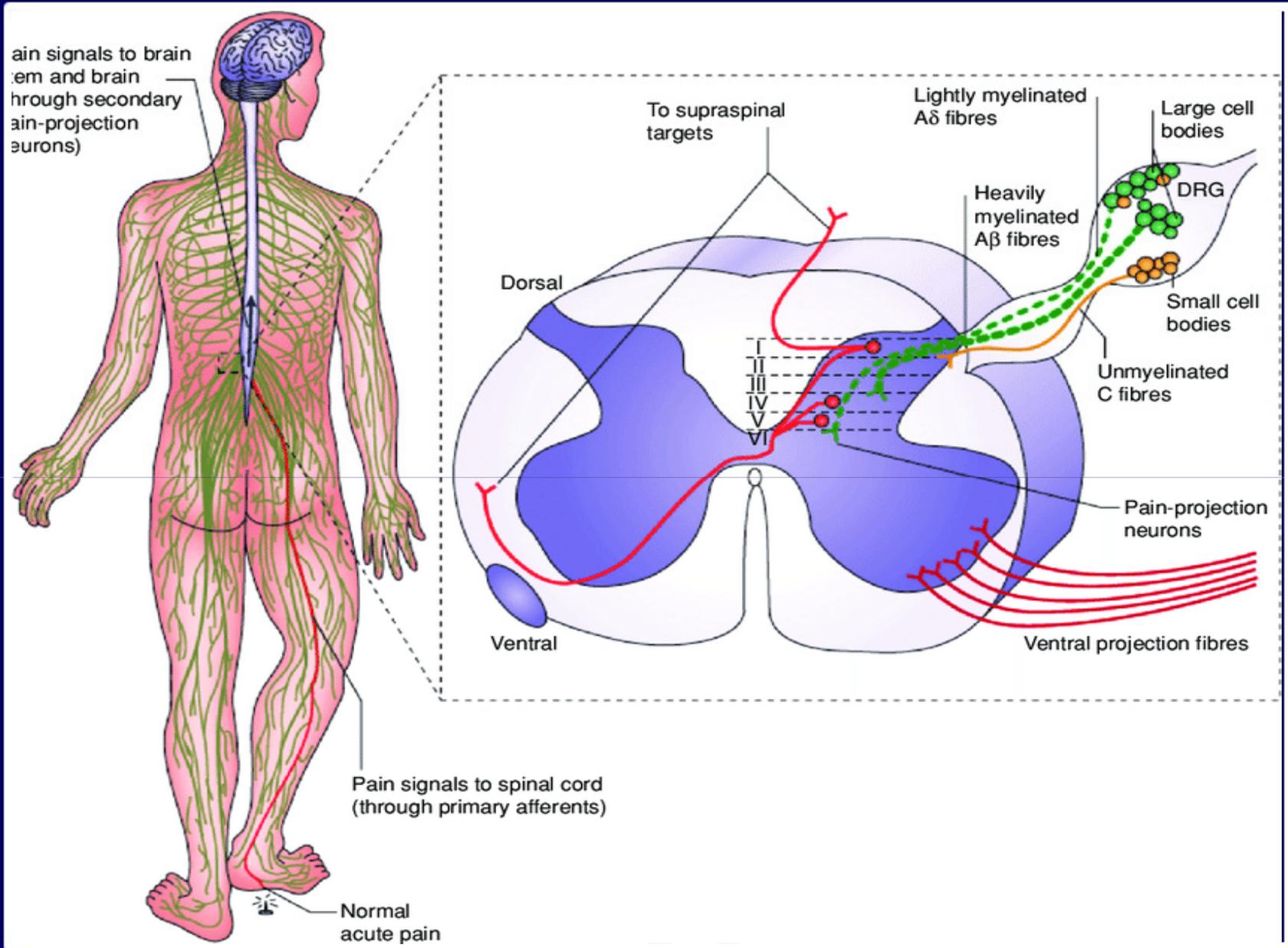
CGRP is derived mainly from the cell bodies of motor neurons when synthesized in the ventral horn of the spinal cord and may contribute to the regeneration of nervous tissue after injury.



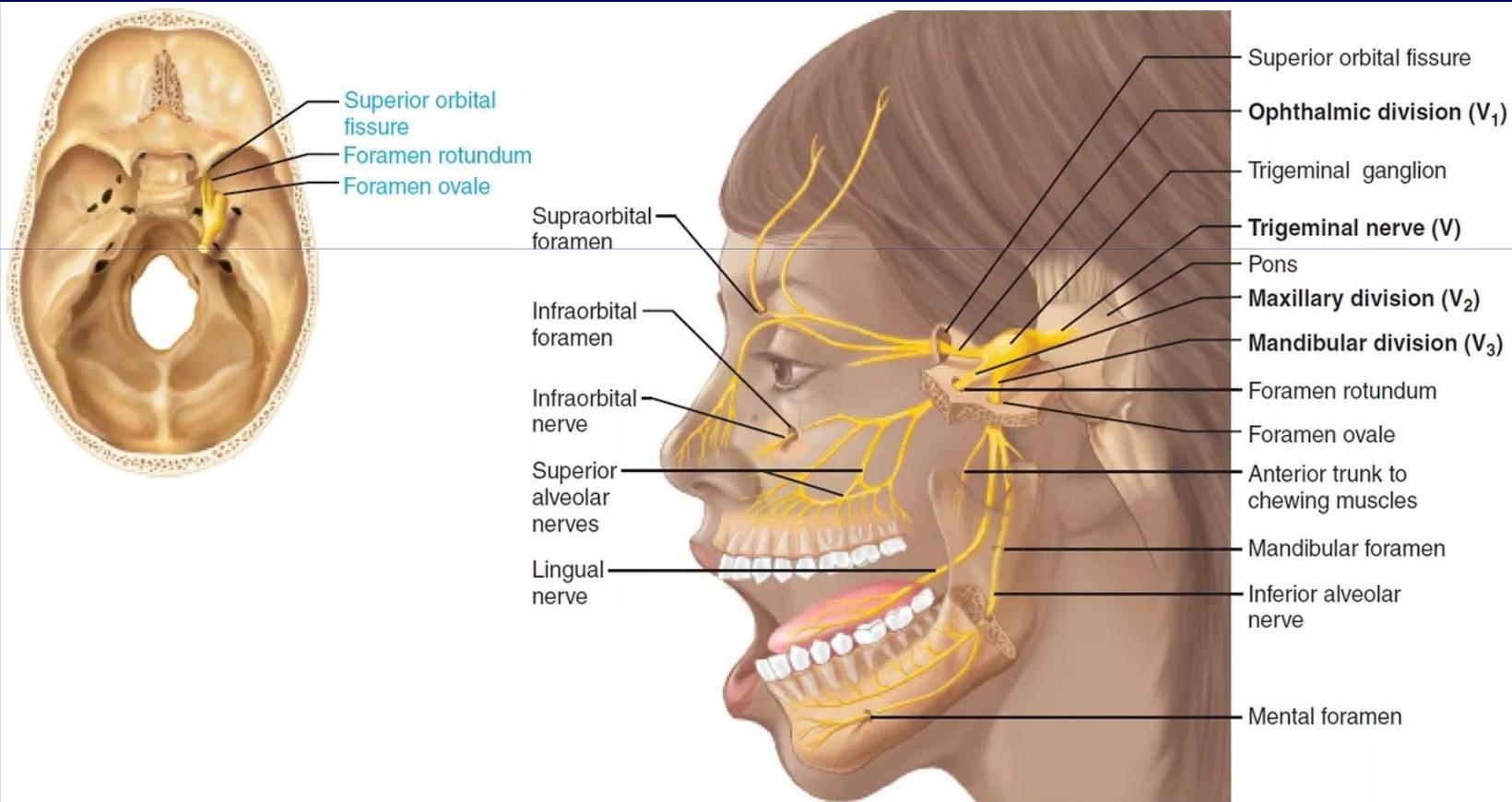
Conversely, **CGRP** is derived from dorsal root ganglion when synthesized in the dorsal horn of the spinal cord and may be linked to the transmission of pain.*

*Chen LJ, Zhang FG, Li J, Song HX, Zhou LB, Yao BC, Li F, Li WC (January 2010).

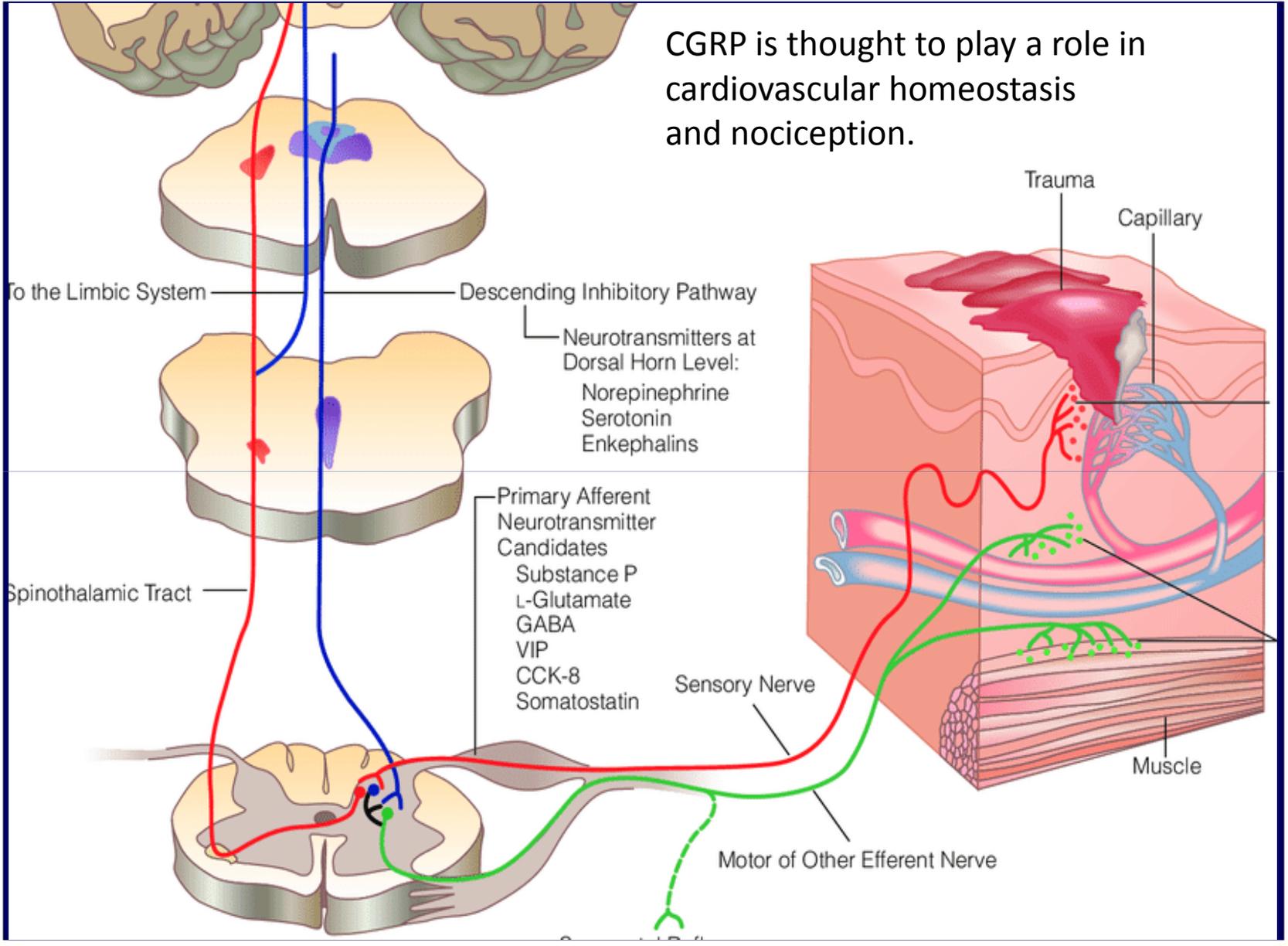
"Expression of calcitonin gene-related peptide in anterior and posterior horns of the spinal cord after brachial plexus injury". *Journal of Clinical Neuroscience*. 17 (1): 87–91.



In the trigeminal vascular system, the cell bodies on the trigeminal ganglion are the main source of **CGRP**.



CGRP is thought to play a role in cardiovascular homeostasis and nociception.

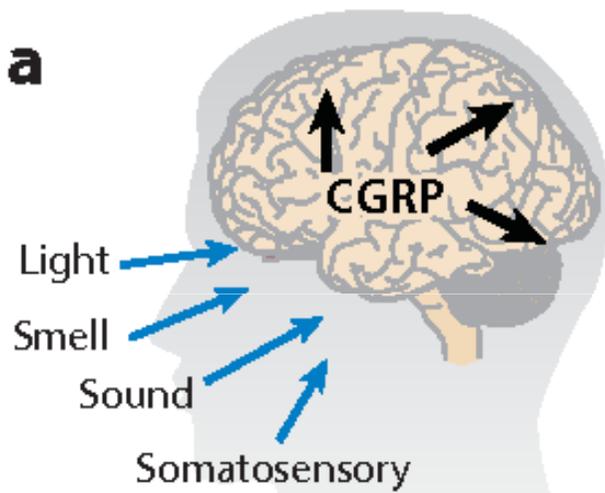


CGRP receptors are found throughout the body, suggesting that the protein may modulate a variety of physiological functions in all major systems (e.g., respiratory, endocrine, gastrointestinal, immune, and cardiovascular)*.

*Arulmani U, Maassenvandenbrink A, Villalón CM, Saxena PR (October 2004).

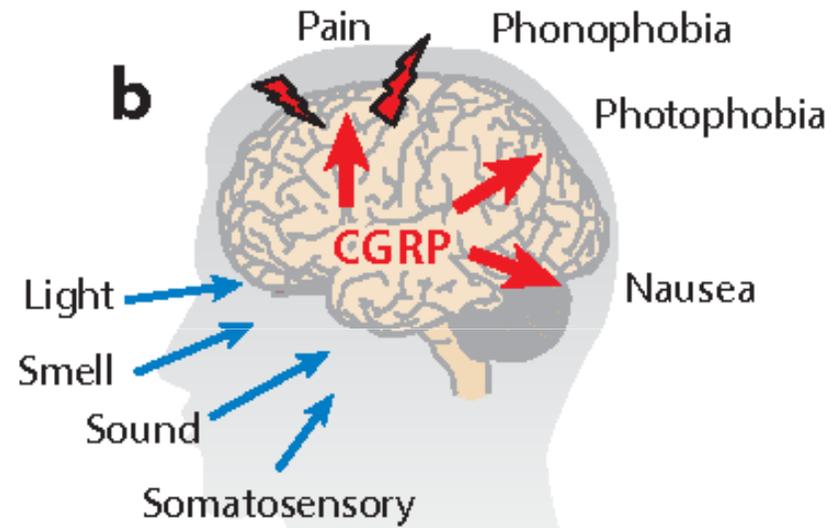
"Calcitonin gene-related peptide and its role in migraine pathophysiology". *European Journal of Pharmacology*. 500(1–3): 315–30.

a



Normal CGRP

b

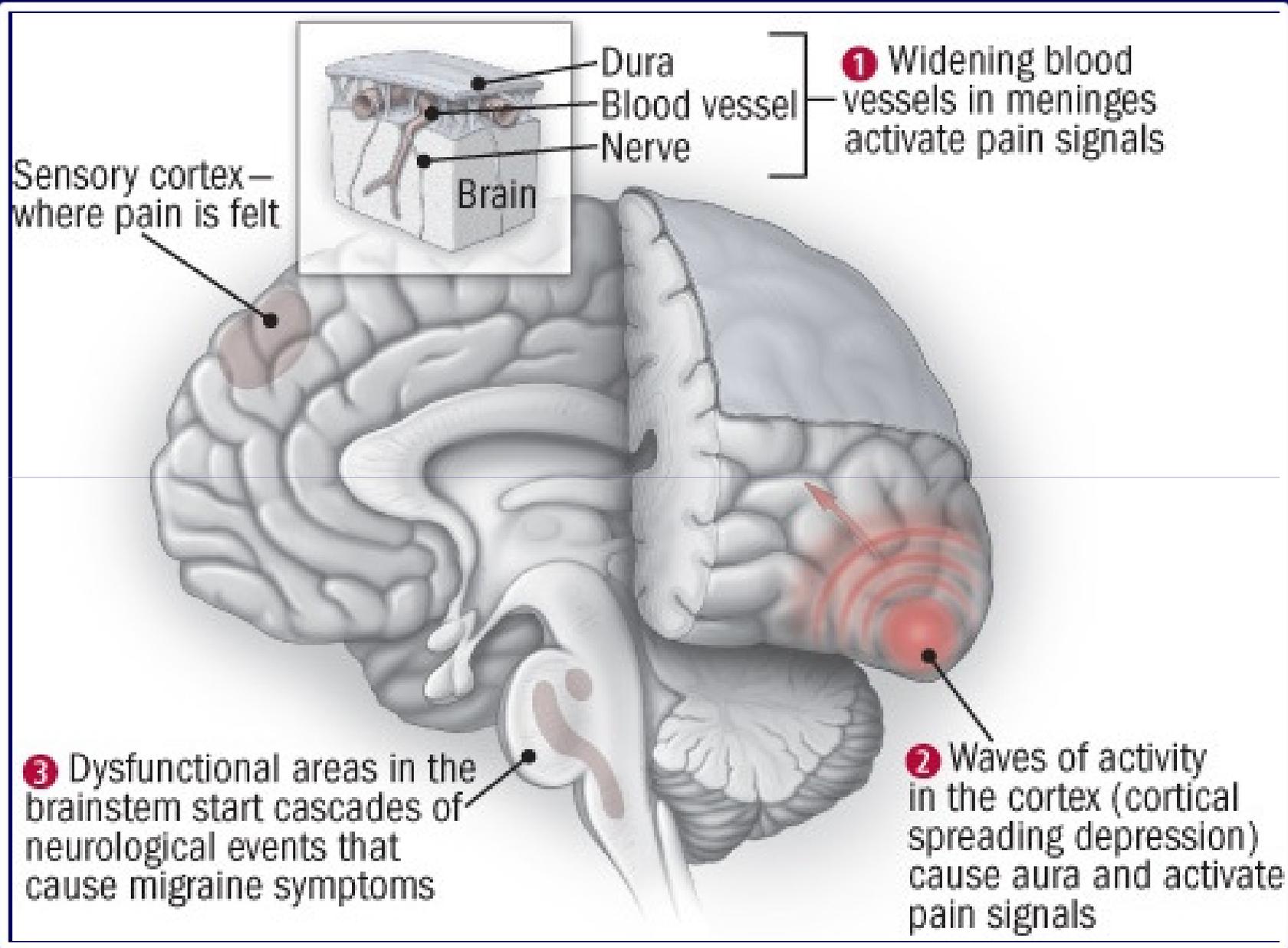


High CGRP



Increased levels of CGRP have been reported in migraine and temporomandibular joint disorder patients as well as a variety of other diseases such as cardiac failure, hypertension, and sepsis.*

*Buzzi MG, Bonamini M, Moskowitz MA (1995). "Neurogenic model of migraine". *Cephalalgia*. 15 (4): 277–80



Preclinical evidence suggests that, during a migraine, activated primary sensory neurons (meningeal nociceptors) in the trigeminal ganglion release **CGRP from their peripherally projecting nerve endings located within the meninges.***

*Durham PL (June 2006). "Calcitonin gene-related peptide (CGRP) and migraine". *Headache*. 46 Suppl 1 (Suppl 1): S3–8

This **CGRP** then binds to and activates **CGRP receptors** located around meningeal vessels, causing vasodilation, mast cell degranulation, and plasma extravasation.*

*Edvinsson L (2006). "Neuronal signal substances as biomarkers of migraine". *Headache*. 46 (7): 1088–94.

During some migraine attacks, increased concentrations of **CGRP** can be found in both saliva and plasma drawn from the external jugular vein.

*Edvinsson L (2006). "Neuronal signal substances as biomarkers of migraine". *Headache*. 46 (7): 1088–94.

Treatment

**Grape seed extract
(Proanthocyanidins) 600mg**

Cocoa extract

Chicken bone broth

**Palmitoylethanolamide
(PEA)**

Palmitoylethanolamide (PEA) is an endogenous fatty acid amide, belonging to the class of nuclear factor agonists. PEA has been demonstrated to bind to a receptor in the cell-nucleus (a nuclear receptor) and exerts a great variety of biological functions related to chronic pain and inflammation.*

**"palmidrol - Compound Summary". PubChem Compound. USA: National Center for Biotechnology Information. 25 March 2005. Identification. Retrieved 26 June 2012.*

Group

Name

Ligand

0. Dosage Sensitive Sex Reversal	DAX1*	Anti testis
1. Thyroid receptors	Thyroid hormone receptor TR	Thyroxin
	Retinoic acid receptor RAR	Vitamin A
	Peroxisome Proliferator-Activating Receptor (PPAR)	Fatty acids and Prostaglandins
	Rev-ErbA*	Heme
	RAR related orphan receptor	Cholesterol
	Liver X Receptor LXR	All trans Retinoic acid
	Vitamin D receptor VDR	Oxysterols (Oxidised cholesterol)
		Vitamin D
		Xenobiotics
		Androstane (Androstadione, Androstenadiol)
	NRs with two DNA binding domains	???????
	Farnasoid X Receptor FXR``	Bile salts
	Pregnane X receptor PXR Xenobiotics	
	Androstane receptor (CAR)	Endobiotics and Xenobiotics

Group

Name

Ligand

2.	Retinoid x receptor	Hepatocyte Nuclear factor HNF4 Retinoid X Receptor RXR Testicular Receptor TR2* TLX/ PNR* COUP*/ EAR	Fatty acid Retinoids Androgens / Estrogens Photoreceptor ?????
3.	Estrogen receptor	Estrogen Receptor ER α and β Estrogen Related Receptor ERR 3-Ketosteroid receptors GC MR PR AR	Estrogen Energy production Cortisol, Borage Andosterone, Progesterone, Testosterone ??????
4.	Nerve growth factor receptor	NGF1B*	??????
5.	Sterogenic receptor	SF1* Liver Related Homologue 1 LRH1*	Phosphatidylinositol PC Cholesterol, Steroidogenesis
6.	Germ cell nuclear factor receptor	GCFN*	?????? Propionic acid?
7.	Miscellaneous receptors	DAX* / SHP*	??????

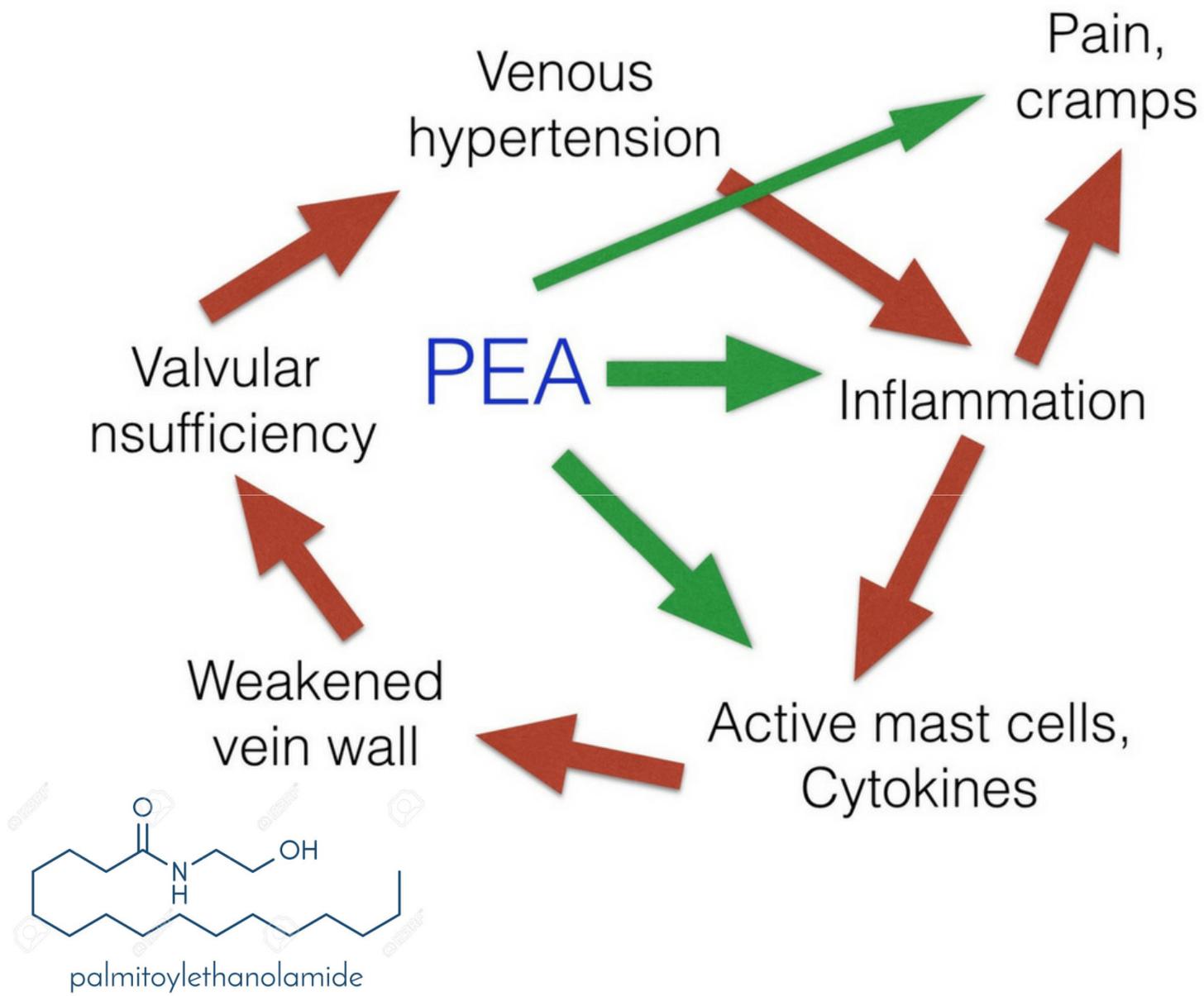
*

= Orphan Nuclear Receptor

PEA has been shown to have anti-inflammatory, anti-nociceptive*, neuroprotective**, and anticonvulsant properties.

*Calignano a, L. R. G. (2001). "Antinociceptive activity of the endogenous fatty acid amide, palmitylethanolamide". *Eur J Pharmacol.* 419

**Koch, M.; Kreutz, S.; Böttger, C.; Benz, A.; Maronde, E.; Ghadban, C.; Korf, H. W.; Dehghani, F. (2010). "Palmitoylethanolamide Protects Dentate Gyrus Granule Cells via Peroxisome Proliferator-Activated Receptor-Alpha". *Neurotoxicity Research.* 19 (2): 330–340.



**An Italian study published in 2011
found that PEA reduced the
raised intraocular
pressure of **glaucoma**.***

*Gagliano, C.; Ortisi, E.; Pulvirenti, L.; Reibaldi, M.; Scollo, D.; Amato, R.; Avitabile, T.; Longo, A. (2011). "Ocular Hypotensive Effect of Oral Palmitoyl-ethanolamide: A Clinical Trial". *Investigative Ophthalmology & Visual Science*. 52 (9): 6096–6100.

Its activity as an inhibitor of inflammation counteracts reactive astrogliosis induced by beta-amyloid peptide, in a model relevant for neuro-degeneration. In models of **stroke and other CNS trauma, PEA exerted neuroprotective properties.***

*Hansen, H. S. (2010). "Palmitoylethanolamide and other anandamide congeners. Proposed role in the diseased brain". *Experimental Neurology*. 224 (1): 48–55.

PEA inhibits the release of both preformed and newly synthesised mast cell mediators, such as histamine and TNF-alpha. PEA, as well as its analogue adelmidrol (di-amide derivative of azelaic acid), can both down-regulate mast cells.*

*De Filippis, D.; d'Amico, A.; Cinelli, M. P.; Esposito, G.; Di Marzo, V.; Iuvone, T. (2009). "Adelmidrol, a palmitoylethanolamide analogue, reduces chronic inflammation in a carrageenin-granuloma model in rats". *Journal of Cellular and Molecular Medicine*. 13 (6): 1086–1095.

PEA reduces the expression
of cyclooxygenase-2 (COX-2)
and inducible nitric oxide
synthase.*

**Darmani, N. A.; Izzo, A. A.; Degenhardt, B.; Valenti, M.; Scaglione, G.; Capasso, R.; Sorrentini, I.; Di Marzo, V. (2005). "Involvement of the cannabimimetic compound, N-palmitoyl-ethanolamine, in inflammatory and neuropathic conditions: Review of the available pre-clinical data, and first human studies". Neuropharmacology. 48 (8): 1154–1163.*

In a model of visceral pain (inflammation of the urinary bladder) PEA was able to attenuate the viscerovisceral hyper-reflexia induced by inflammation of the urinary bladder, one of the reasons why PEA is currently explored in the painful bladder syndrome.*

*Jaggar, S. I.; Hasnie, F. S.; Sellaturay, S.; Rice, A. S. (1998). "The anti-hyperalgesic actions of the cannabinoid anandamide and the putative CB2 receptor agonist palmitoylethanolamide in visceral and somatic inflammatory pain". *Pain*. 76 (1–2): 189–199.

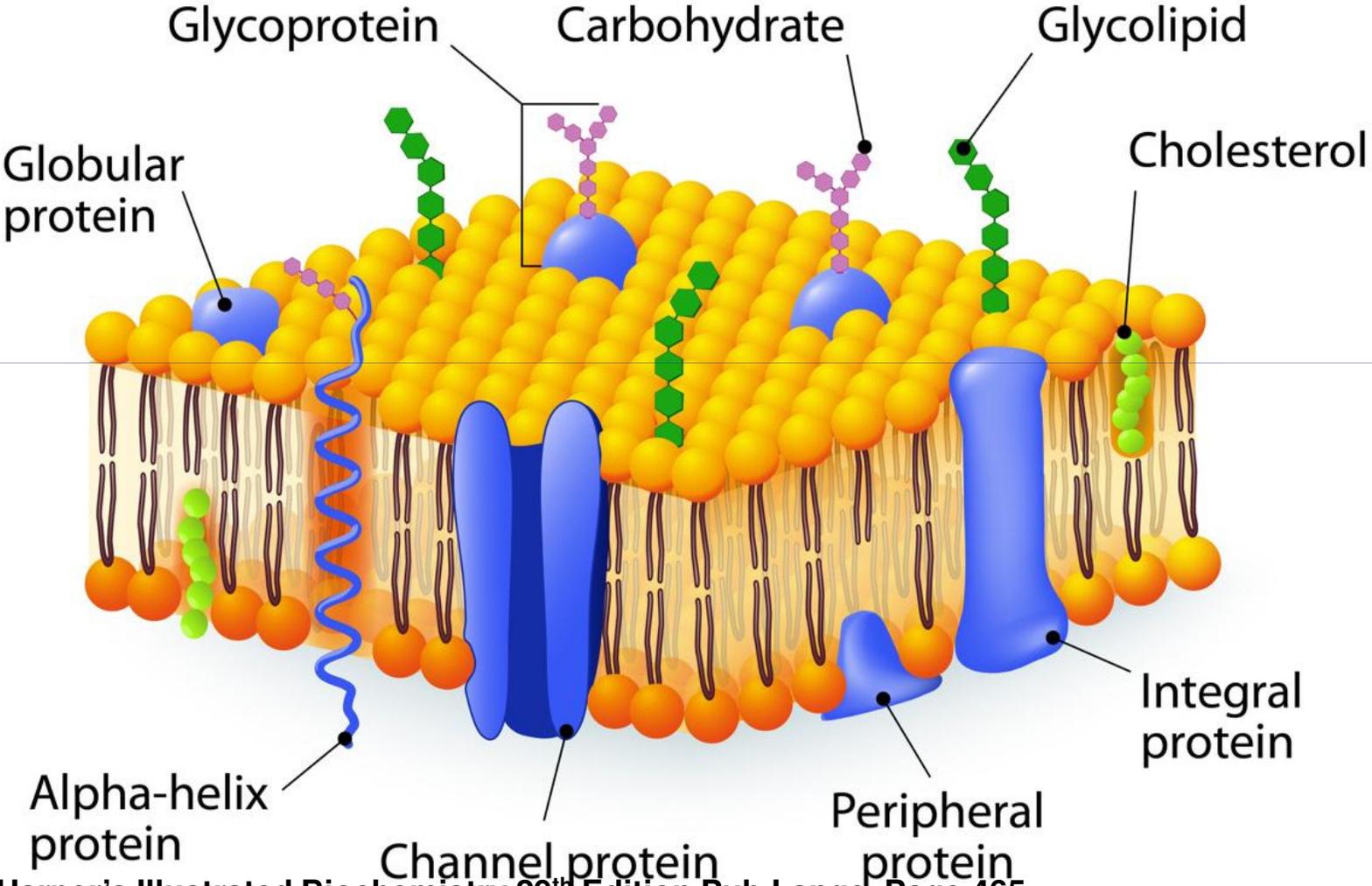
From a clinical perspective the most important and promising indications for **PEA are linked to neuropathic and chronic pain states, such as diabetic neuropathic pain, sciatic pain, CRPS, pelvic pain and entrapment neuropathic pain states and atopic eczema.***

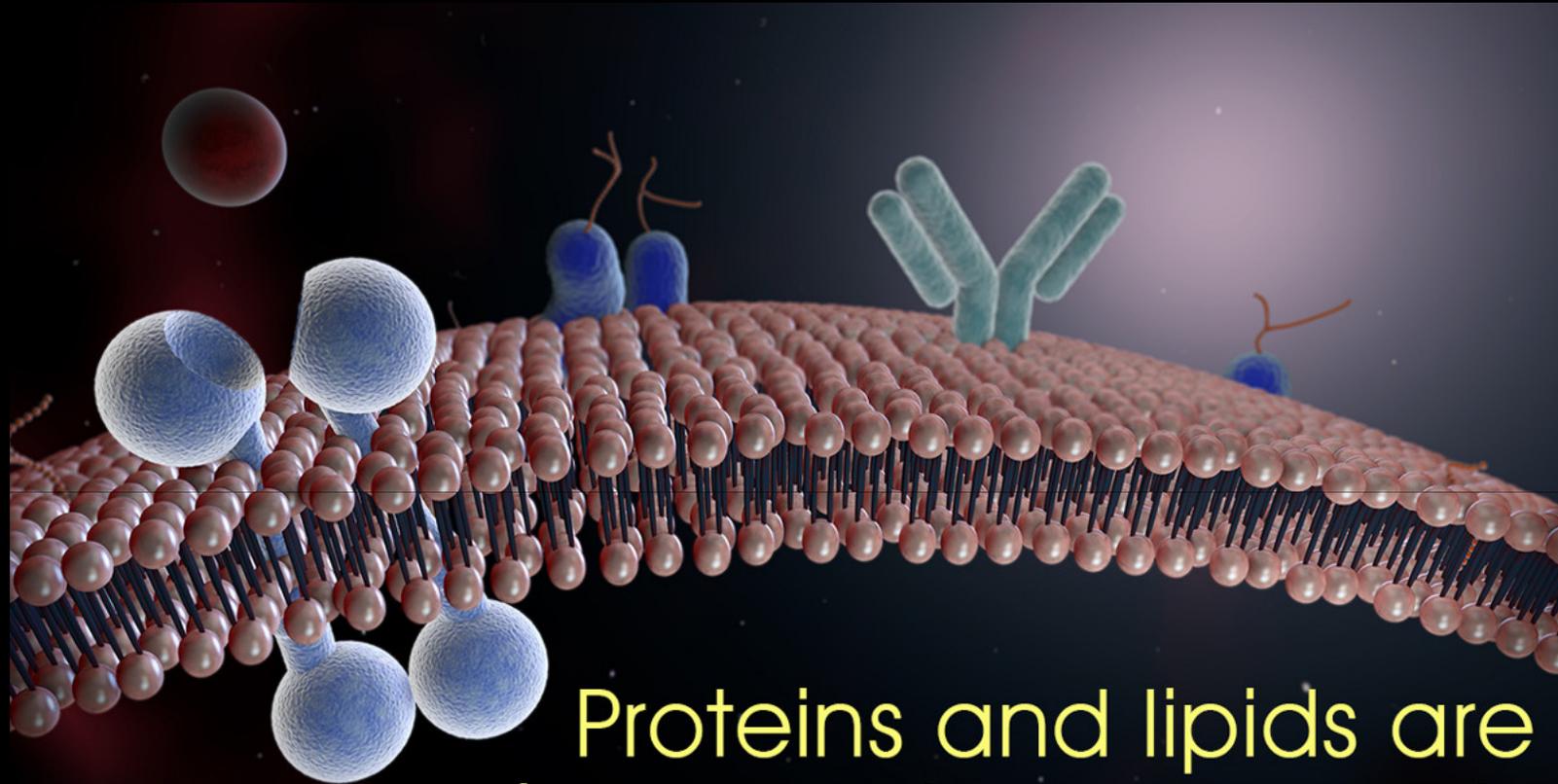
Di Paola, R.; Impellizzeri, D.; Mondello, P.; Velardi, E.; Aloisi, C.; Cappellani, A.; Esposito, E.; Cuzzocrea, S. (2012). "Palmitoylethanolamide Reduces Early Renal Dysfunction and Injury Caused by Experimental Ischemia and Reperfusion in Mice". *Shock*. 38 (4): 356–66.

Mitochondrial Disorders

Phospholipids

Cell Membranes





Proteins and lipids are important components that form the cell membrane.

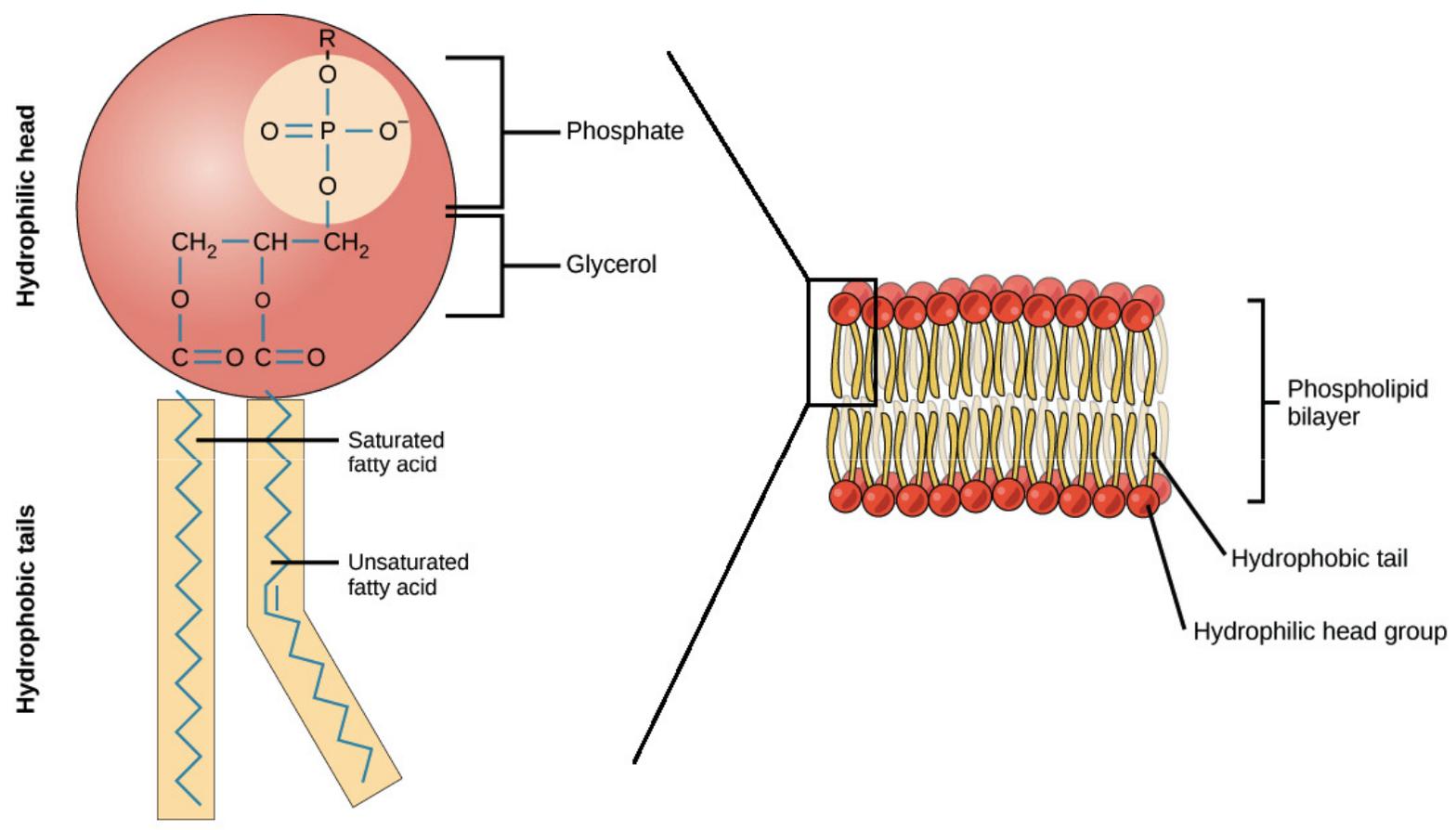
Cell membrane structure

For a typical human cell proteins account for about 50 percent of the composition by mass, lipids (of all types) account for about 40 percent, and the remaining 10 percent comes from carbohydrates.

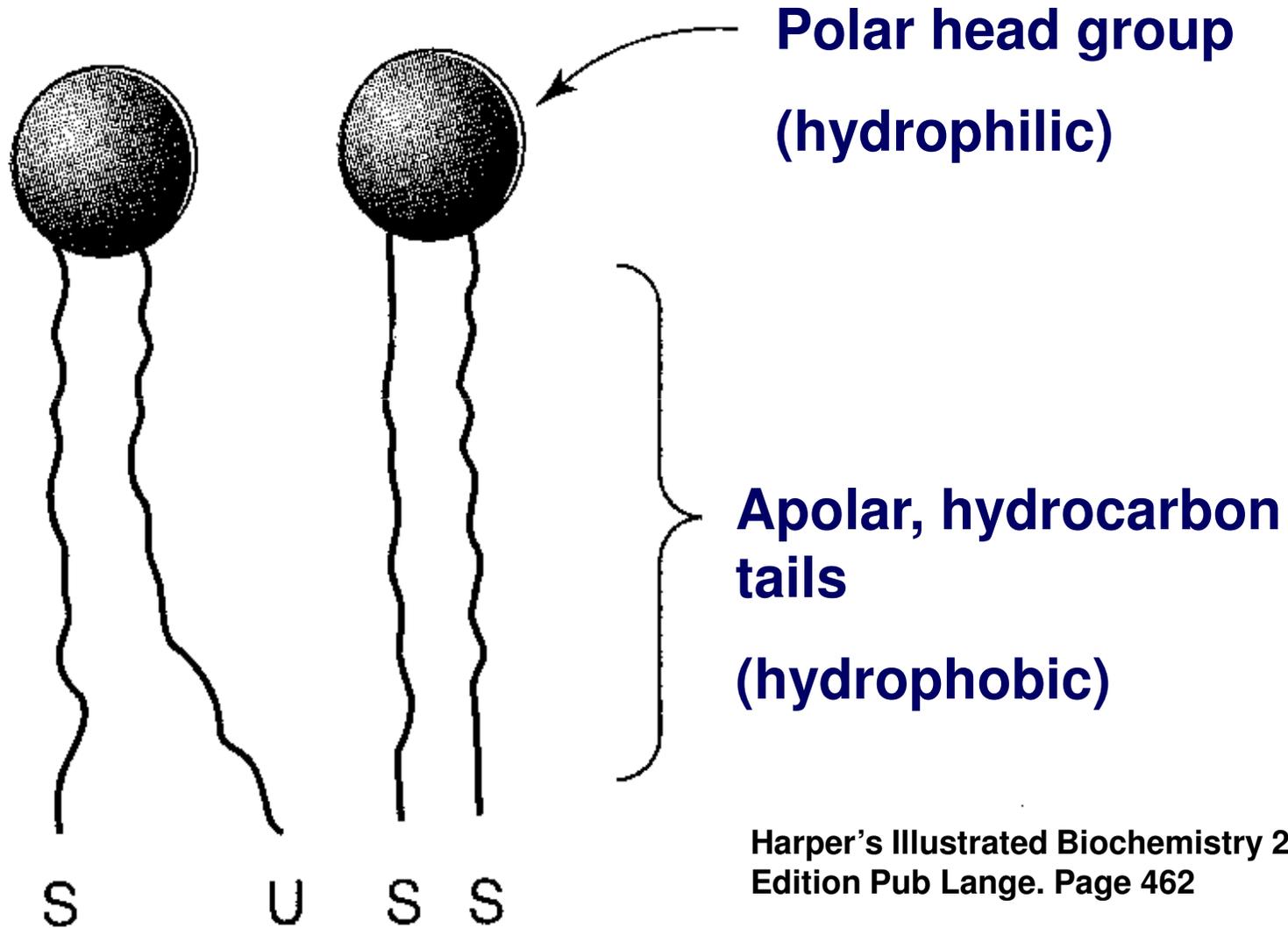
The components of the plasma membrane

Component	Location
Phospholipids	Main fabric of the membrane
Cholesterol	Tucked between the hydrophobic tails of the membrane phospholipids
Integral proteins	Embedded in the phospholipid bilayer; may or may not extend through both layers
Peripheral proteins	On the inner or outer surface of the phospholipid bilayer, but not embedded in its hydrophobic core
Carbohydrates	Attached to proteins or lipids on the extracellular side of the membrane (forming glycoproteins and glycolipids)

Table modified from OpenStax Biology.

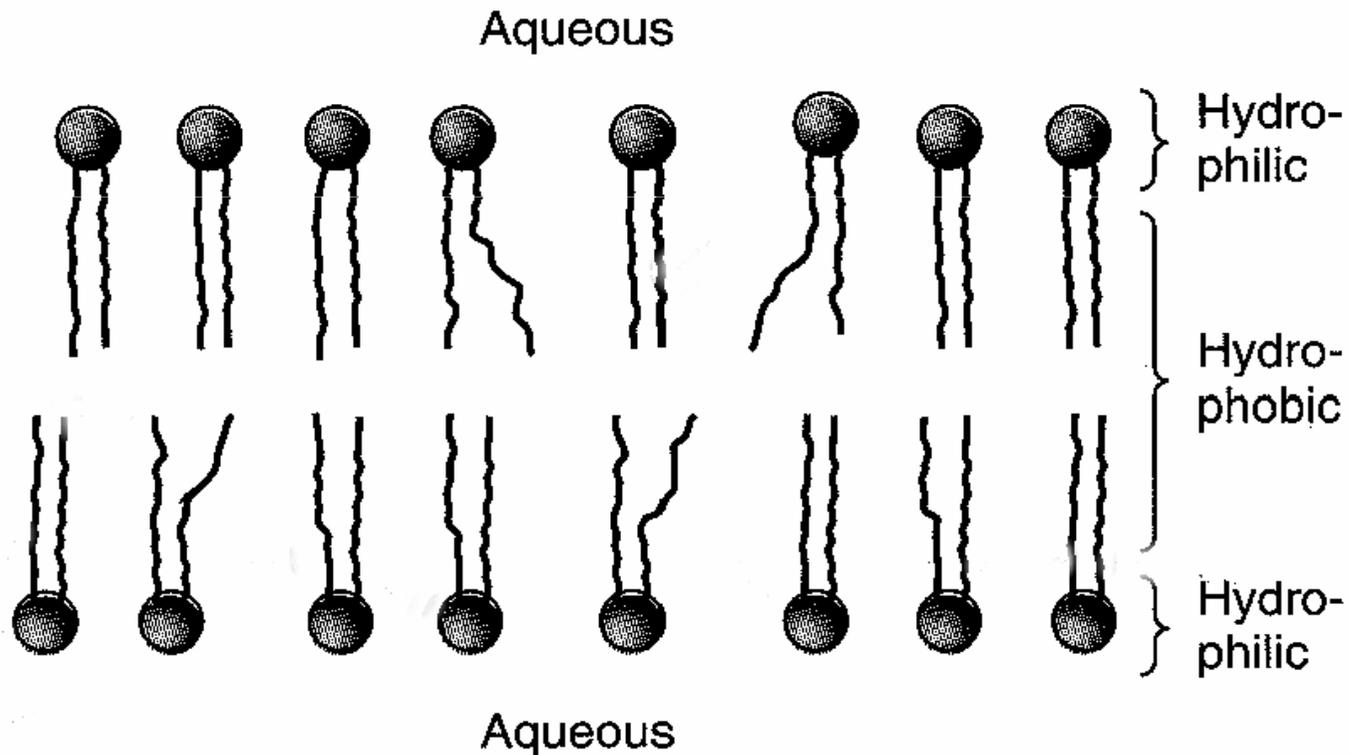


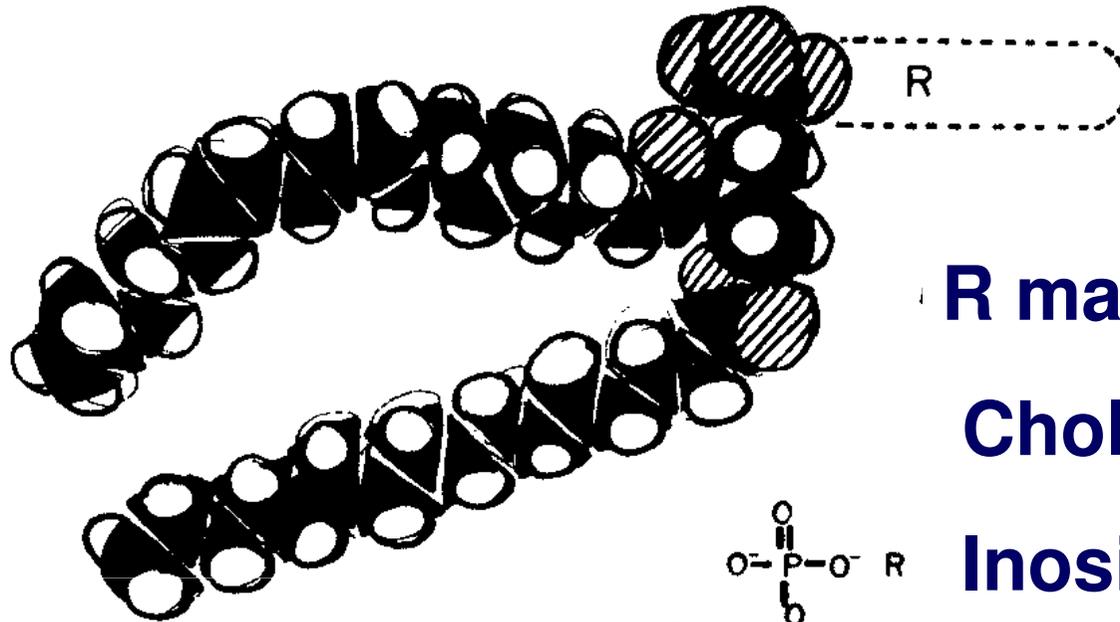
A Phospholipid



Harper's Illustrated Biochemistry 29th
Edition Pub Lange. Page 462

The unsaturated fatty acid tails are kinked and lead to more spacing between the polar heads and hence more movement.





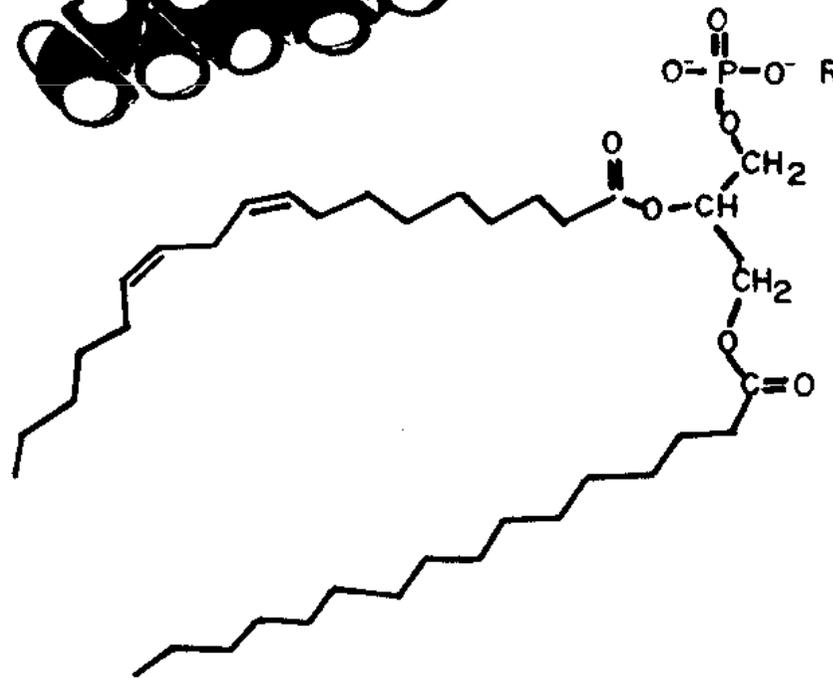
R maybe

Choline

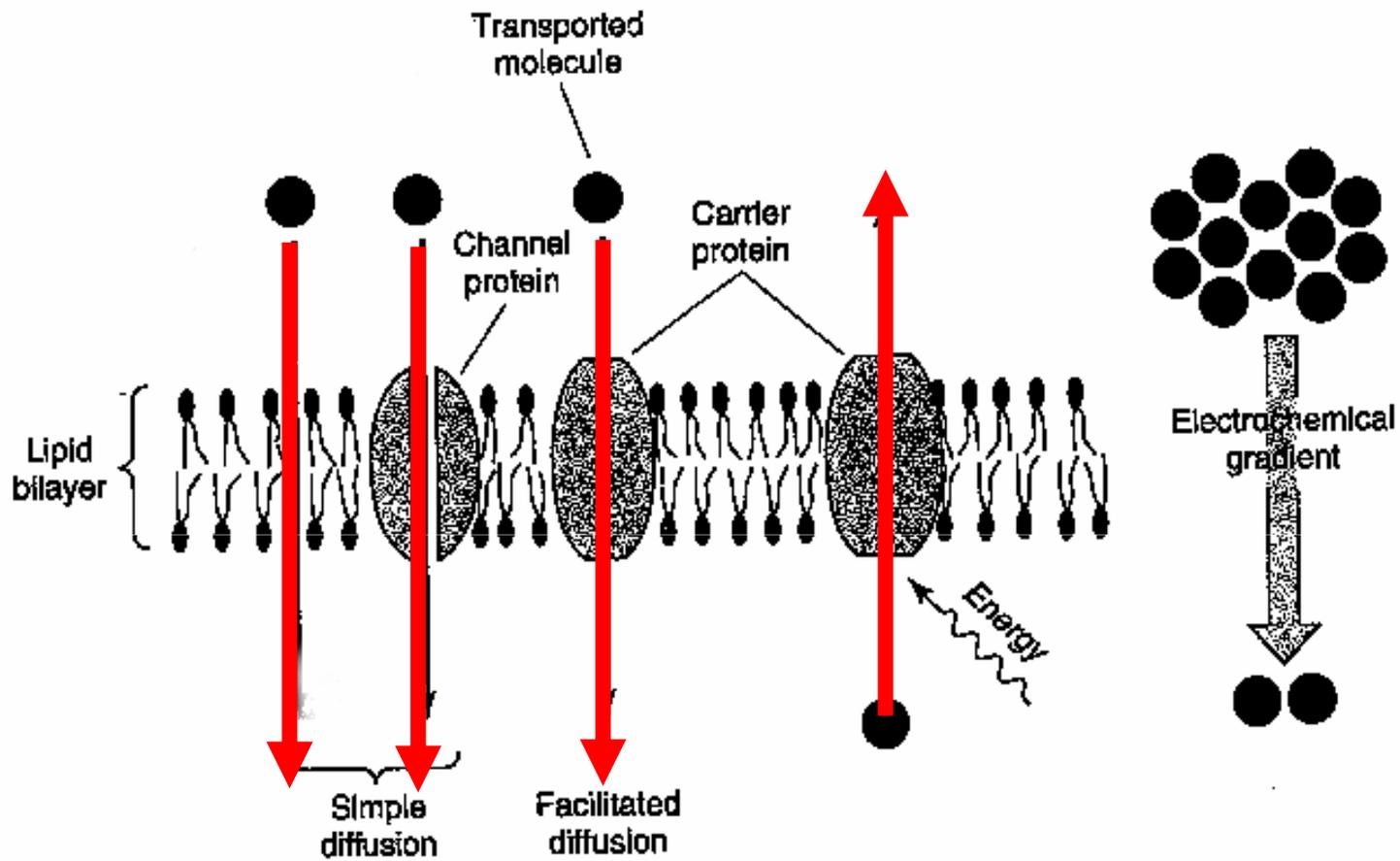
Inositol

Ethanolamine

Serine



The integral cell membrane proteins act as a **conduit to allow nutrients to get into the cell from outside and waste products to be eliminated.**



Passive transport

Active transport

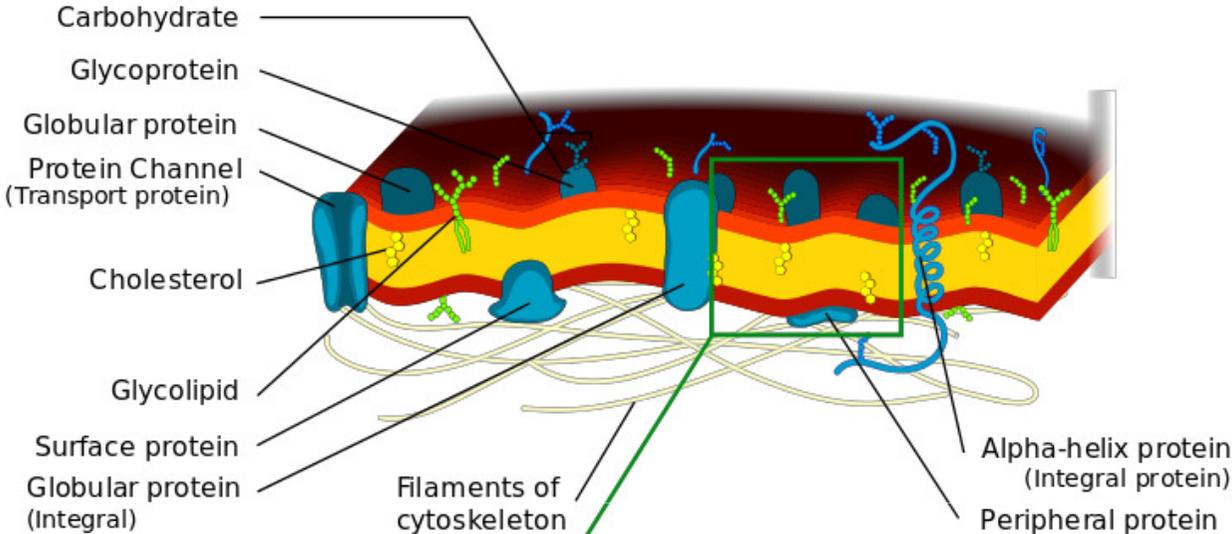
Plasma membranes consist of both lipids and proteins. The fundamental structure of the membrane is the **phospholipid bilayer**, which forms a stable barrier between two aqueous compartments. In the case of the plasma membrane, these compartments are the inside and the outside of the cell.

Plasma membranes of human cells contain four major **phospholipids**

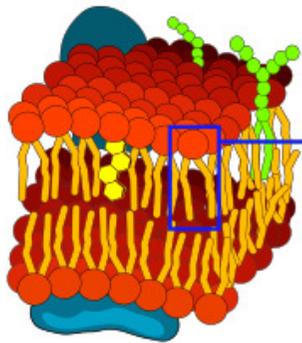
1. Phosphatidylcholine,
2. Phosphatidylethanolamine
3. Phosphatidylserine,
4. Sphingomyelin

which together account for more than half of the lipid in most membranes.

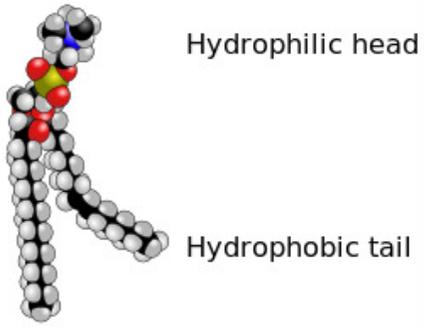
Cell membrane



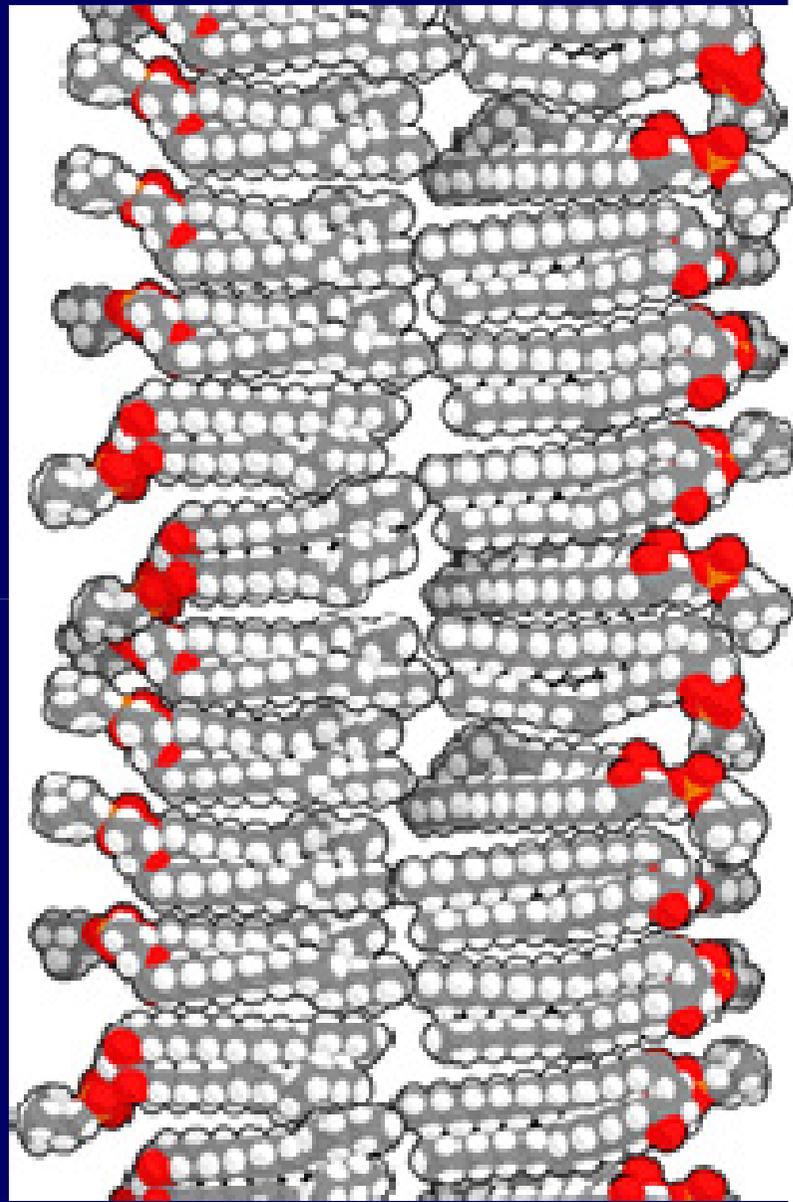
Phospholipid bilayer



Phospholipid (Phosphatidylcholine)



These **phospholipids** in human red blood cells are asymmetrically distributed between the two halves of the membrane bilayer.



The outer leaflet consists mainly of **phosphatidylcholine, sphingomyelin and glycolipids**

Where as **phosphatidylethanolamine and phosphatidylserine** are the predominant phospholipids of the inner leaflet.

A fifth phospholipid, **phosphatidylinositol**, is also localized to the inner half of the plasma membrane.

Although **phosphatidylinositol** is a quantitatively minor membrane component, it plays an important role in cell signalling.

Outside layer

Phosphatidylcholine 50%

Sphingomyelin

Glycolipids

Inner layer

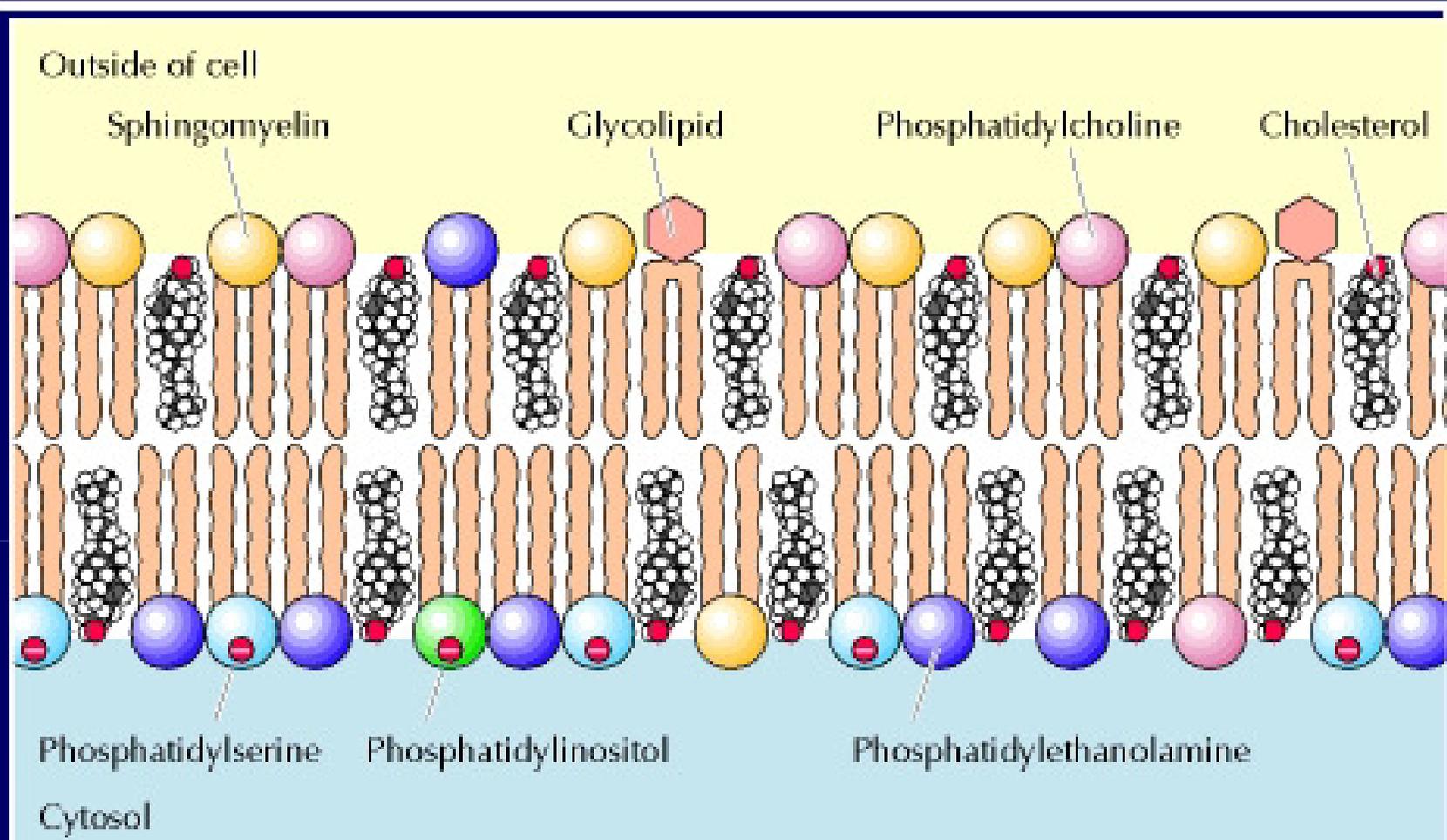
Phosphatidylserine 15-30%

Phosphatidyl ethanolamine 25%

Phosphatidylinositol

Cardiolipin 20%

The head groups of both phosphatidylserine and phosphatidylinositol are **negatively charged**, so their predominance in the inner leaflet results in a net negative charge on the cytosolic face of the plasma membrane.



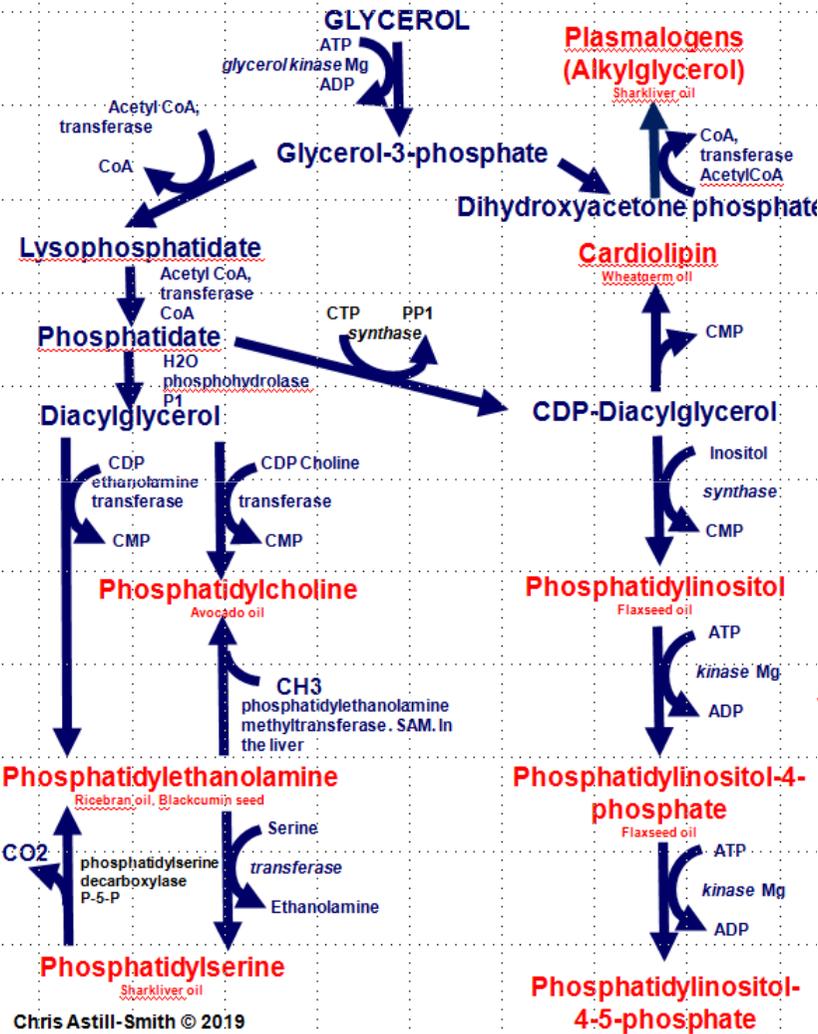
The outer leaflet consists predominantly of phosphatidylcholine, sphingomyelin, and glycolipids, whereas the inner leaflet contains phosphatidylethanolamine, phosphatidylserine, and phosphatidylinositol. Cholesterol is distributed in both leaflets.

In addition to the phospholipids, the plasma membranes of animal cells contain glycolipids and cholesterol. The **glycolipids** are found exclusively in the outer leaflet of the plasma membrane, with their carbohydrate portions exposed on the cell surface.

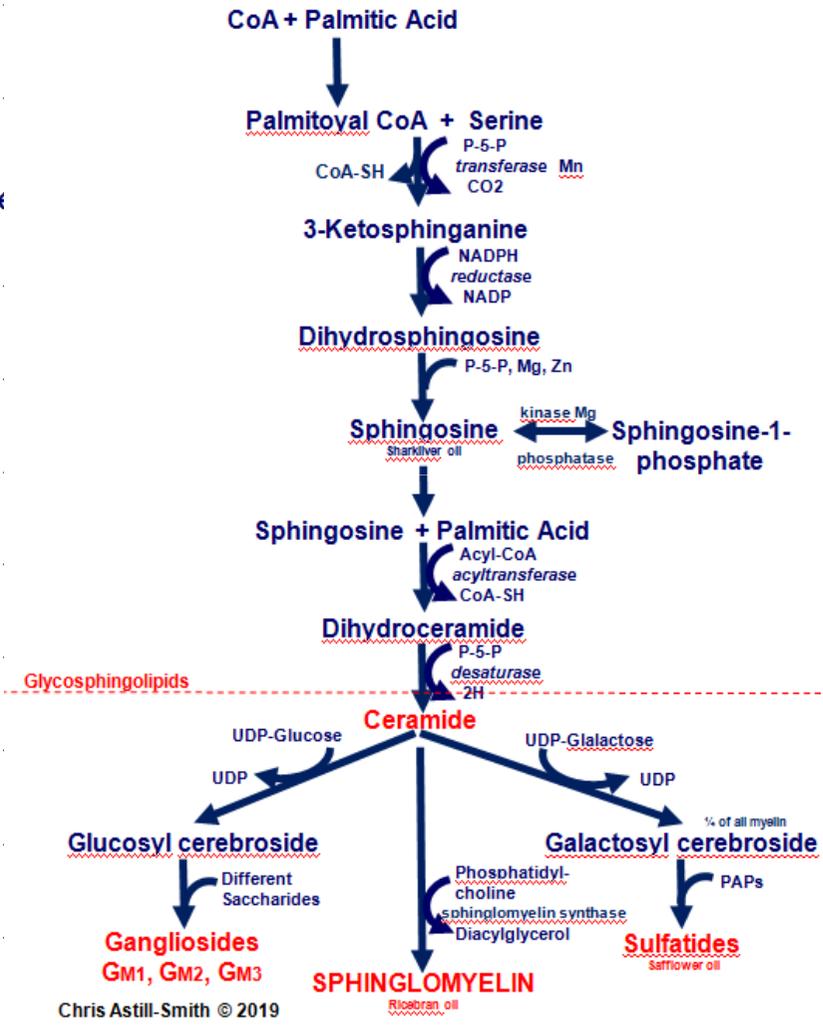
They are relatively minor membrane components, constituting only about 2% of the lipids of most plasma membranes.

Cholesterol is a major membrane constituent of human cells, being present in about the same molar amounts as the phospholipids.

Phospholipid synthesis



Sphingomyelin synthesis



Parkinson's disease and Alzheimer's disease.

Oxidative stress and lipid peroxidation are believed to be contributing factors leading to neuronal loss and mitochondrial dysfunction in the substantia nigra in Parkinson's disease, and may play an early role in the pathogenesis of Alzheimer's.

It is reported that **Cardiolipin** content in the brain decreases with aging, and a recent study on rat brain shows it results from lipid peroxidation in mitochondria exposed to free radical stress.*

*Ruggiero FM, Cafagna F, Petruzzella V, Gadaleta MN, Quagliariello E (1991). "Lipid composition in synaptic and nonsynaptic mitochondria from rat brains and effect of aging". *J Neurochem.* 59 (2): 487–491.

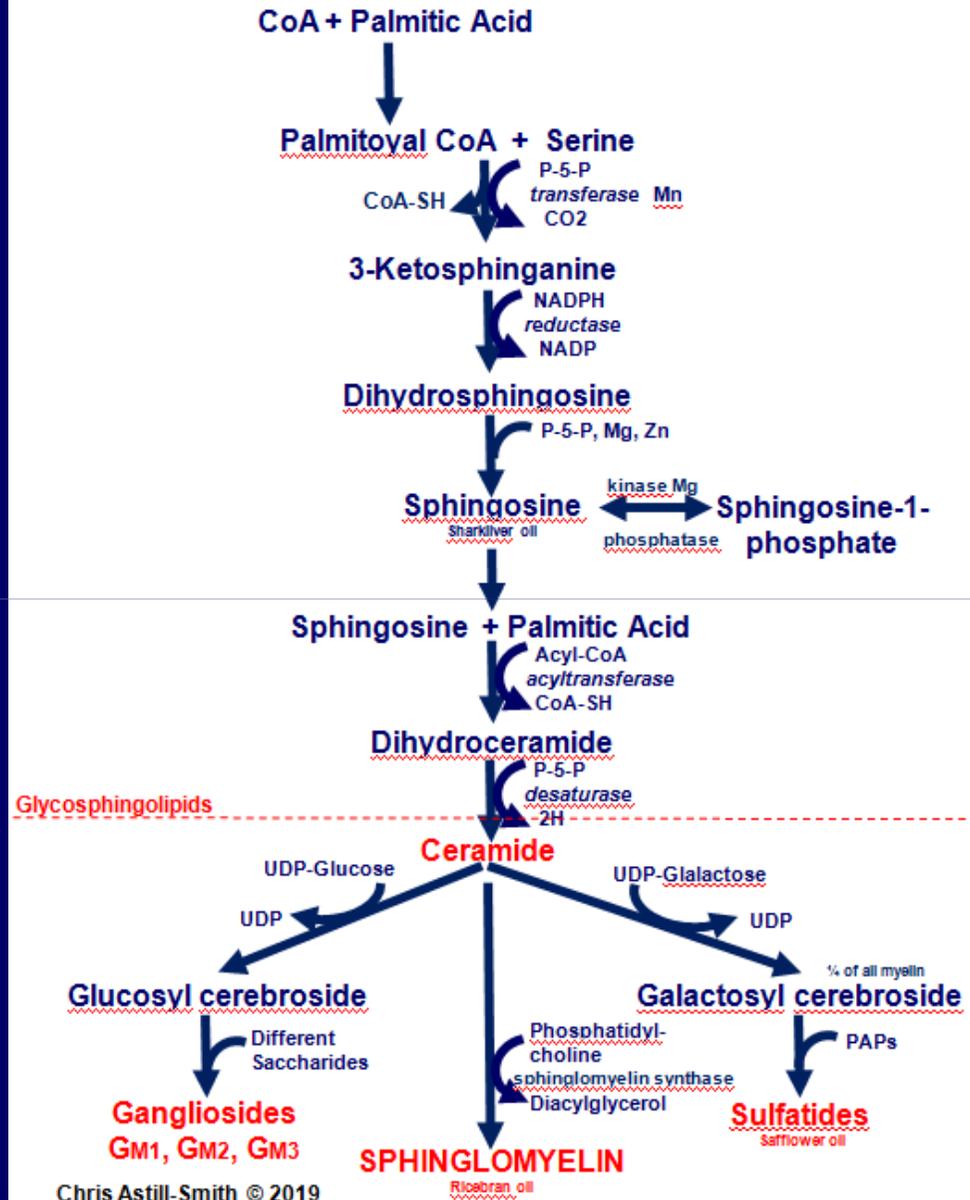
It's also associated with a 15% reduction in linked complex I/III activity of the electron transport chain, which is thought to be a critical factor in the development of Parkinson's disease.*

Supplement with CoQ10?????

*Dawson TM, Dawson VL (2003). "Molecular pathways of neurodegeneration in Parkinson's disease". *Science*. 302 (5646): 819–822

Sphingosine

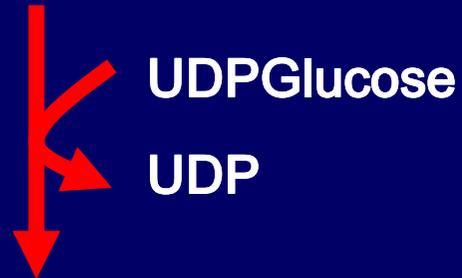
Sphingolipid synthesis



Gangliosides

Glycosphingolipids

Ceramide

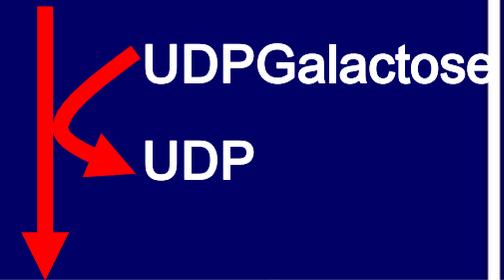


Glucosyl
cerebroside

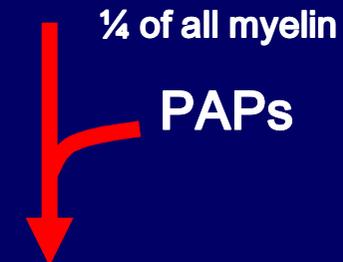


Gangliosides

Ceramide



Galactosyl
cerebroside



Sulfatides

rich in myelin

Gangliosides

The fatty acid maybe Palmitic, Stearic, Behenic or Lignoceric acids or a monounsaturated fatty acid such as Nervonic acid

Ganglioside GM3

Sphingosine +

Fatty acid +

Glucose +

Galactose+

N.A.Neuraminic

Ganglioside GM2

Sphingosine +

Fatty acid +

Glucose +

Galactose+

N.A.Neuraminic +

N.A.Galactosamine

Ganglioside GM1

Sphingosine +

Fatty acid +

Glucose +

Galactose+

N.A.Neuraminic +

N.A.Galactosamine +

Galactose

Saccharides are attached by UDP and CMP carriers

Sphingomyelin

Sphingomyelin is a type of sphingolipid found in cell membranes, especially in the membranous myelin sheath that surrounds some nerve cell axons. Role in signal transduction, cell apoptosis and formation of lipid rafts in the membranes.*

* Li, Z; Zhang, H; Liu, J; Liang, CP; Li, Y; Li, Y; Teitelman, G; Beyer, T; Bui, HH; Peake, DA; Zhang, Y; Sanders, PE; Kuo, MS; Park, TS; Cao, G; Jiang, XC (October 2011). "Reducing plasma membrane sphingomyelin increases insulin sensitivity". *Molecular and Cellular Biology*. 31 (20): 4205–18.

It usually consists of **phosphocholine** and **ceramide**, or a **phosphoethanolamine** head group; therefore, sphingomyelins can also be classified as sphingophospholipids.*

*Donald J. Voet; Judith G. Voet; Charlotte W. Pratt (2008). "Lipids, Bilayers and Membranes". *Principles of Biochemistry, Third edition*. Wiley. p. 252.

The composition allows **sphingomyelin** to play significant roles in signaling pathways: the degradation and synthesis of sphingomyelin produce important second messengers for signal transduction.

As a result of the autoimmune disease **multiple sclerosis (MS)**, the myelin sheath of neuronal cells in the brain and spinal cord is degraded, resulting in loss of signal transduction capability. MS patients exhibit upregulation of certain cytokines in the cerebrospinal fluid, particularly TNF α .

This activates **sphingomyelinase**, an enzyme that catalyzes the hydrolysis of sphingomyelin to ceramide; sphingomyelinase activity has been observed in conjunction with cellular apoptosis.* Hence need for MS patients to take anti inflammatory nutrients.

*Jana, A; Pahan, K (December 2010). "Sphingolipids in multiple sclerosis". *Neuromolecular Medicine*. 12 (4): 351–61.

Sulfatide

Sulfatide, also known as sulfated galactocerebroside, is a class of sulfolipids, specifically a class of sulfoglycolipids, which are glycolipids that contain a sulfate group.* Of all of the galactolipids that are found in the myelin sheath, one fifth of them are sulfatide.

*Eckhardt, Matthias (June 2008). "The Role and Metabolism of Sulfatide in the Nervous System". *Molecular Neurobiology*. 37 (2–3): 93–103.

Sulfatide is primarily found on the extracellular leaflet of the myelin plasma membrane produced by the oligodendrocytes in the central nervous system and in the Schwann cells in the peripheral nervous system.

Aside from being a membrane component, **sulfatide** functions in protein trafficking, cell aggregation and adhesion, neural plasticity, memory, and glial-axon interactions.*

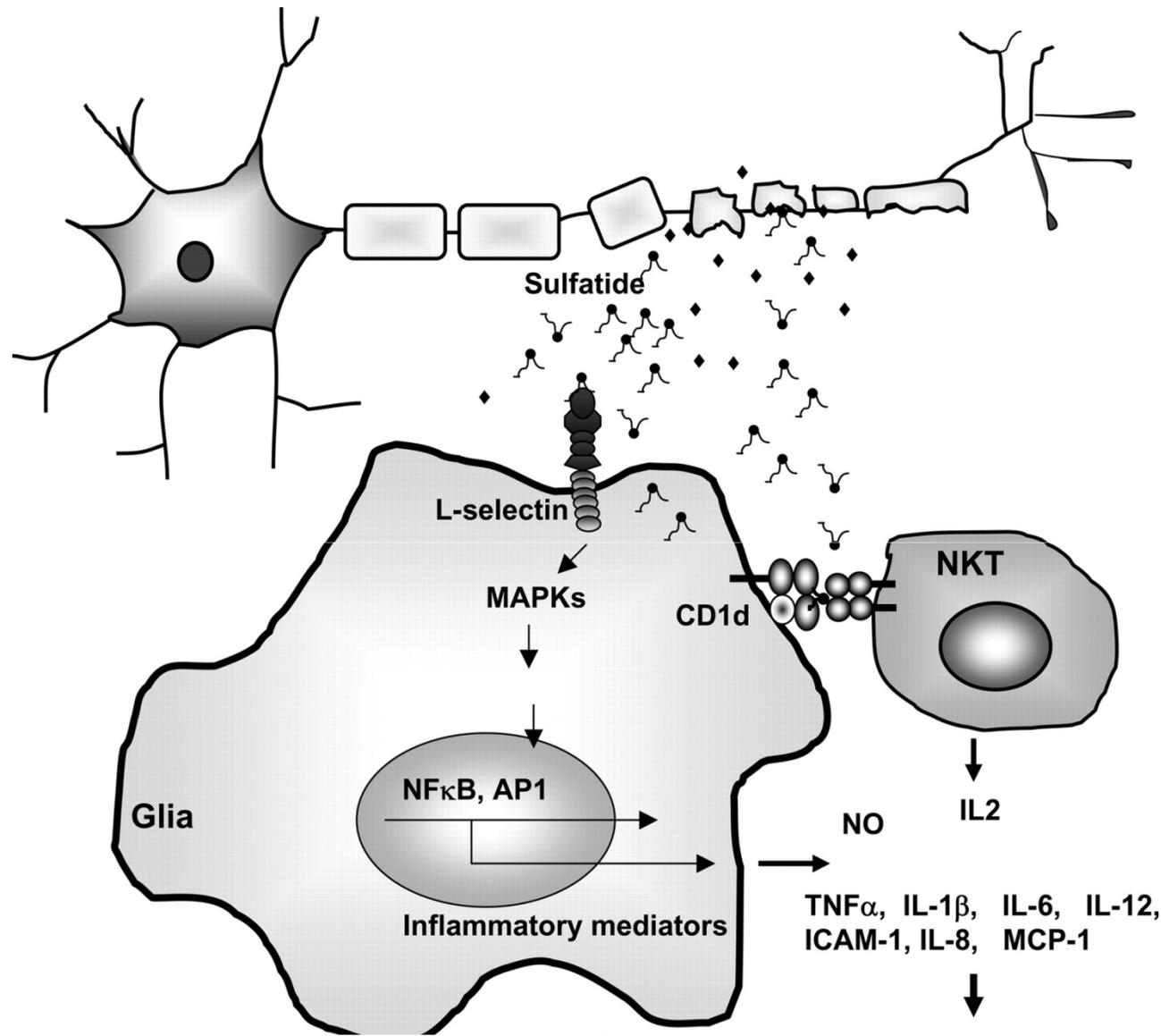
*Xiao, S; Finkielstein, CV; Capelluto, DG (2013). The enigmatic role of sulfatides: new insights into cellular functions and mechanisms of protein recognition. *Advances in Experimental Medicine and Biology*. 991. pp. 27–40.

Sulfatide also plays a role in several physiological processes and systems, including the nervous system, the immune system, insulin secretion, blood clotting, viral infection, and bacterial infection.

As a result, **sulfatide** is associated with, able to bind to, and/or is present in kidney tissues, cancer cells tissues, the surface of red blood cells and platelets, CD1 a-d cells in the immune system, many bacteria cells, several viruses, myelin, neurons, and astrocytes.

In **Alzheimer's disease**, sulfatide in the brain tissue decreases tremendously, starting in the early stages of the disease. In the mild stages of Alzheimer's disease, the loss of sulfatide can be up to 50% in the white matter and up to 90% in the grey matter in the brain.*

*Han, x. (2010). "The Pathogenic Implication of Abnormal Interaction Between Apolipoprotein E Isoforms, Amyloid-beta Peptides, and Sulfatides in Alzheimer's Disease". *Molecular Neurobiology*. 41 (2–3): 97–106.



Inflammatory conditions in the brain

Vitamin K2 has been found to be associated with sulfatide. Not only in animals, but also in bacteria, Vitamin K2 has been observed to influence sulfatide concentrations in the brain.*

*Tsaion, k. (1999). "Vitamin K-dependent Proteins in the Developing and Aging Nervous System". Nutrition Reviews. 57 (8): 231–240

Vitamin K2 in the nervous system is responsible for the activation of enzymes that are essential for the biosynthesis of brain phospholipids, such as sulfatide.*

*Tsaion, k. (1999). "Vitamin K-dependent Proteins in the Developing and Aging Nervous System". Nutrition Reviews. 57 (8): 231–240

Neuronal cell membranes

Glial cells – the C1 position is taken by a saturated fatty acid and C2 by an unsaturated fatty acid

Neurons – in many neurons the C1 position is taken by Arachidonic acid and C2 by DHA.

Retina – both C1 and C2 positions are taken by DHA.

Neuronal cell membranes

Phospholipids

Phosphatidyl Choline

Phosphatidyl Ethanolamine

Phosphatidyl Serine

Phosphatidyl Inositol

Phosphatidyl Inositol 4.5 Diphosphate

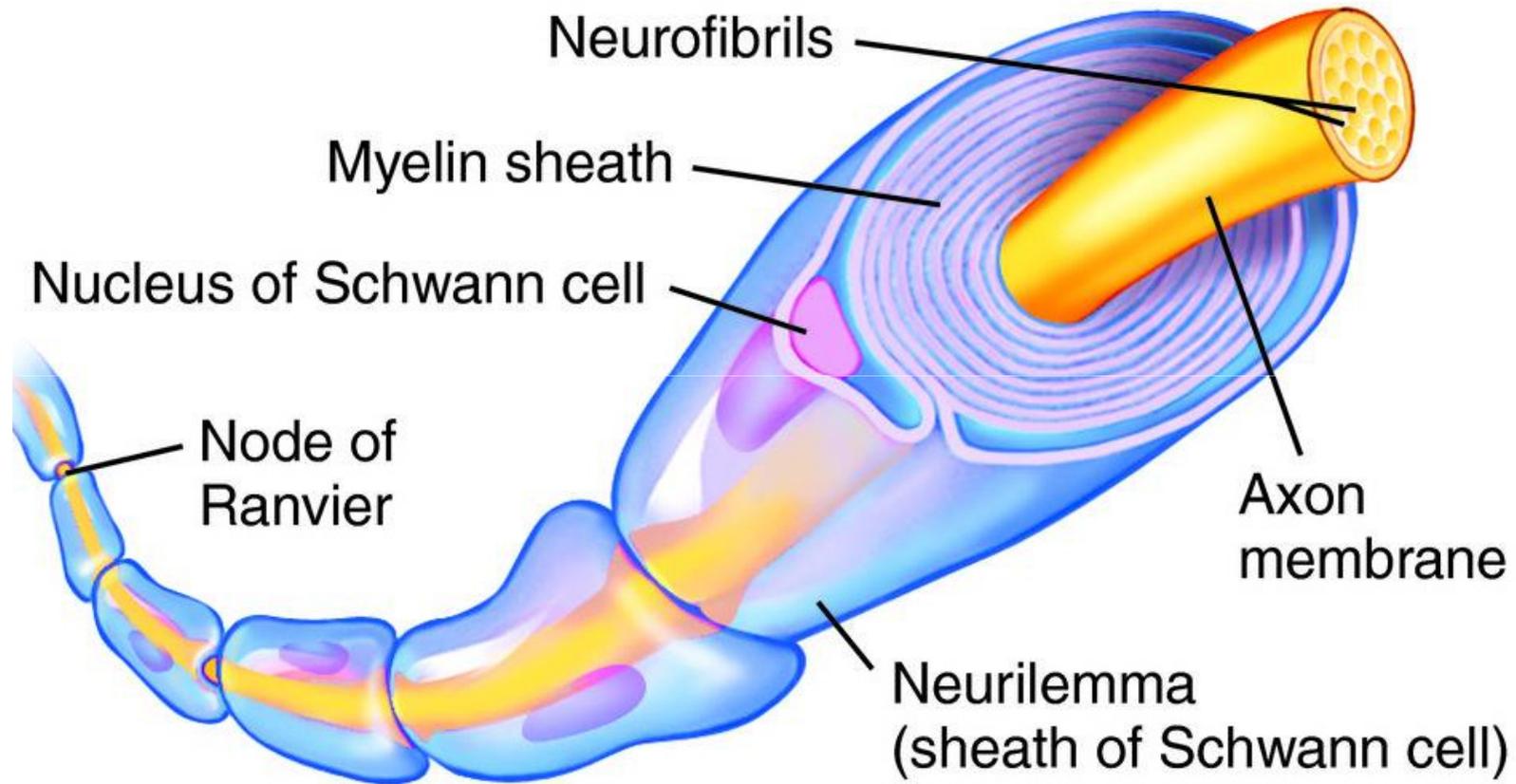
Plasmalogen

Sphinglomyelin

Cerebrosides

Ganglioside GM1

Cholesterol 25% of total brain lipid



Structure of Myelin

A kind of glial cell, the **oligodendrocyte**, has extensions from its cell body, which wrap around the axons (outgoing cell processes) of the neurons to protect and insulate the electric currents that travel through them.

The wrapping is called the "**myelin sheath**". Myelin is produced by these cells and is structured like rolls of concentric layering of cell membrane tissues around the myelinated nerves. There are some glial cell bodies visible between the layers.

Myelin is composed of 30% protein and 70% lipid

Basic protein and proteolipid

Phospholipids and Plasmalogens

Sphingomyelins

Glycosphingolipids

i.e. Cerebrosides and Gangliosides

Cholesterol

High molecular weight proteins

Desmosterol

Polysialo gangliosides

Deacylation-reacylation becomes active

included in myelin
on maturation

eliminated from
myelin on
maturation

Myelin lipids

- 1. Phospholipids (especially Phosphatidylinositol 4,5-Diphosphate, Phosphatidic acid, Phosphatidyl choline, Phosphatidyl ethanolamine, Phosphatidyl serine, Phosphatidyl glycerol and Phosphatidyl inositol), Plasmalogens and Sphingomyelins and Sulfatides (45%),**
- 2. Glycosphingolipids (Galactocerebroside predominantly) and Ganglioside GM1 (27-30%)**
- 3. Cholesterol (25-28%).**

The main lipid found in myelin is galactocerebroside. Other major myelin constituents include myelin basic protein (MBP), proteolipid protein (PLP) and myelin oligodendrocyte glycoprotein (MOG). Within the myelin, there are cross linked hydrocarbon chains composed of sphingomyelin which strengthens the myelin sheath.

Substance ^a	Myelin		White matter	
	Human		Human	Gray matter (human)
Protein	30.0		39.0	55.3
Lipid	70.0		54.9	32.7
Cholesterol	27.7		27.5	22.0
Cerebroside	22.7		19.8	5.4
Sulfatide	3.8		5.4	1.7
Total galactolipid	27.5		26.4	7.3
Ethanolamine phosphatides	15.6		14.9	22.7
Lecithin	11.2		12.8	26.7
Sphingomyelin	7.9		7.7	6.9
Phosphatidylserine	4.8		7.9	8.7
Phosphatidylinositol	0.6		0.9	2.7
Plasmalogens ^b	12.3		11.2	8.8
Total phospholipid	43.1		45.9	69.5

a Protein and lipid figures in percent dry weight; all others in percent total lipid weight.

b Plasmalogens are primarily ethanolamine phosphatides.

CHOLINE + CYTIDINE

for optimising the development of
cell membranes i.e.

Phosphatidylcholine

Cardiolipin

Phosphatidylinositol

Plasmalogen

Increases dopamine receptor densities.

Increases HPA axis hormones – LH, FSH, GH, TSH.

Memory and cognition

Ischemic stroke

Glaucoma

Dietary sources of cytidine include foods with high RNA (ribonucleic acid) content, such as Brewer's yeast which is a pyrimidine-rich food.

During digestion, RNA-rich foods are broken-down into ribosyl pyrimidines (cytidine and uridine), which are absorbed intact. In humans, dietary cytidine is converted into uridine, which is probably the compound behind cytidine's metabolic effects.*

*Wurtman RJ, Regan M, Ulus I, Yu L (Oct 2000). "Effect of oral CDP-choline on plasma choline and uridine levels in humans". *Biochem. Pharmacol.* 60 (7): 989–92.

CHOLINE + URIDINE

**for optimising the development of
receptor sites which are rich in**

Cerebrosides

Sulfatides

Gangliosides GM3, GM2 and GM1

CU Choline

Nutritional yeast (cytidine and uridine)

Choline (from choline bitartrate)

Fatty Acid Ratios

Optimal Ratios

**Linoleic acid (Omega 6) 4 parts
α-Linolenic acid (Omega 3) 1 part**

**Challenge with Omega 6:3 Ratio
vial from strength to weakening.**

The major fatty acids in olive oil triacylglycerols are:

Oleic Acid (C18:1), a monounsaturated omega-9 fatty acid. It makes up 70% of our olive oil.

Linoleic Acid (C18:2), a polyunsaturated omega-6 fatty acid that makes up about 3.5-21% of olive oil.

Palmitic Acid (C16:0), a saturated fatty acid that makes up 7.5 to 20% of olive oil.

Stearic Acid (C18:0), a saturated fatty acid that makes up 0.5 to 5% of olive oil.

Linolenic Acid (C18:3)(specifically alpha-Linolenic Acid), a polyunsaturated omega-3 fatty acid that makes up 0 .6% of olive oil.

Flaxseed oil	% [14]	% European^[15]
Palmitic acid	6.0	4.0–6.0
Stearic acid	2.5	2.0–3.0
Arachidic acid	0.5	0–0.5
Palmitoleic acid	-	0–0.5
Oleic acid	19.0	10.0–22.0
Eicosenoic acid	-	0–0.6
Linoleic acid	24.1	12.0–18.0
Alpha-linolenic acid	47.4	56.0–71.0

**Olive oil at 20% Linoleic acid
70% Oleic acid**

**Flaxseed at 60 % α -Linolenic
24% Linolenic acid**

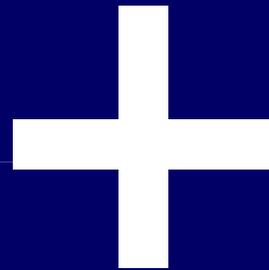
May give good ratio of Omega 3, 6, 9

15ml Olive oil

3 capsules Flaxseed oil



**15ml Olive
oil**



**3 caps
Flaxseed oil**

Oleic acid is the most common monounsaturated fatty acid in human cells. It is incorporated into cell membrane phospholipids, where it is important for proper membrane fluidity.



Hormone responsiveness, infectivity of pathogens, mineral transport and immune competence are affected by membrane fluidity.

Oleic acid is obtained by cells from endogenous biosynthesis or from serum triglycerides.

Biosynthesis of **oleic acid utilizes the same enzymes responsible for elongation of other fatty acids which are precursors for eicosanoids (prostaglandins). Thus, deficient oleic acid status may also indicate deficient eicosanoid production, signifying a need for essential fatty acids.**

Tocopherols and Tocotrienols

Vitamin E exists in eight different forms, four **tocopherols** and four **tocotrienols**. They are fat-soluble antioxidants that also seem to have many other functions in the body.

Tocotrienols, which are related compounds, also have vitamin E activity.

*Wagner KH, Kamal-Eldin A, Elmadfa I (2004). "Gamma-tocopherol--an underestimated vitamin?". *Annals of Nutrition & Metabolism*. 48 (3): 169–88.

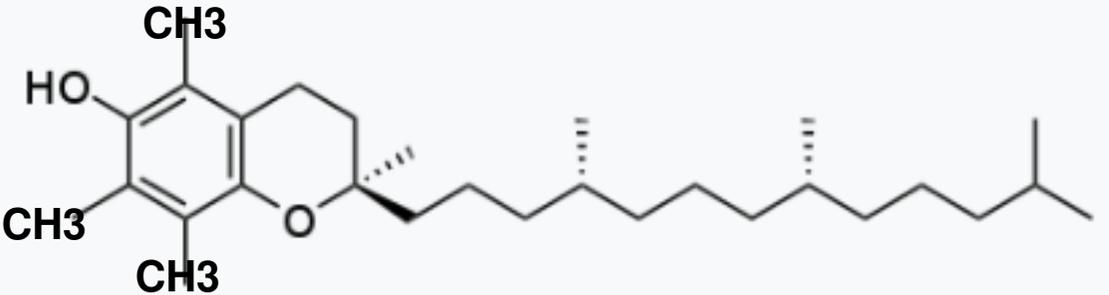
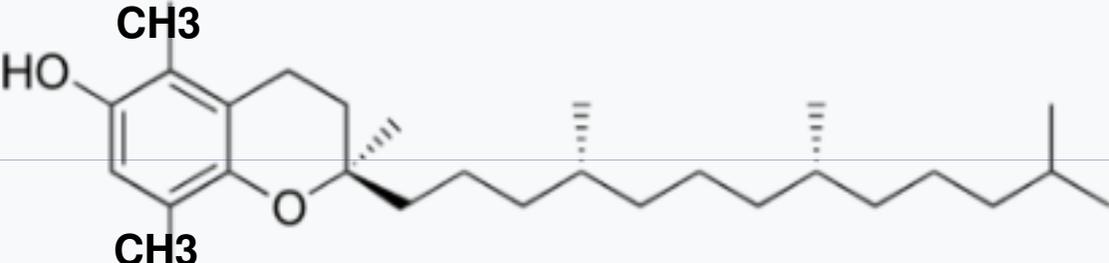
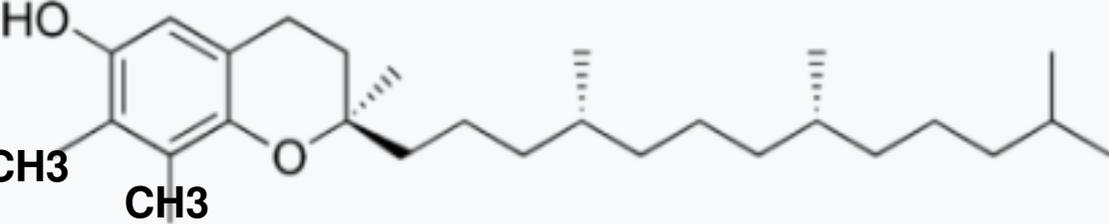
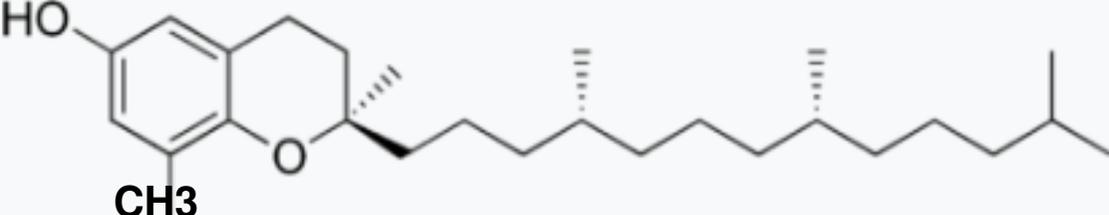
α -Tocopherol is the main source found in supplements and in the European diet where the main dietary sources are olive and sunflower oils.*

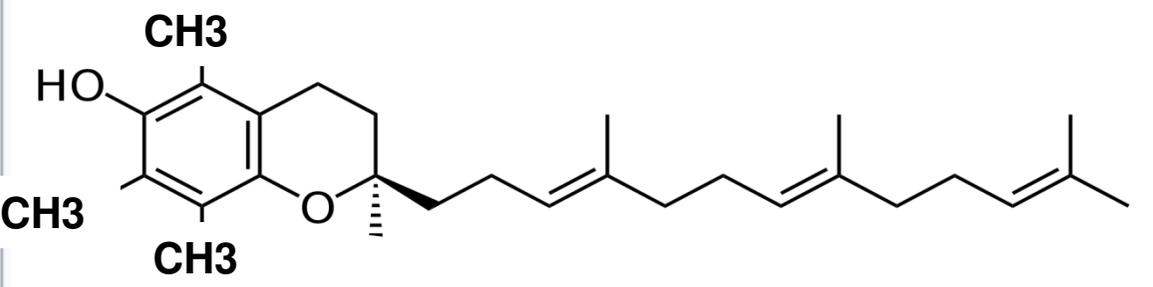
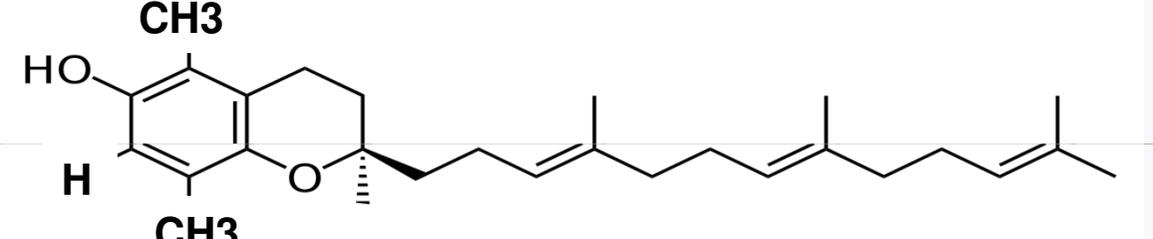
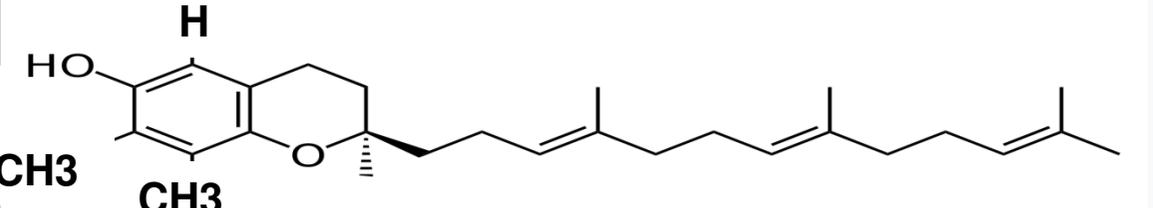
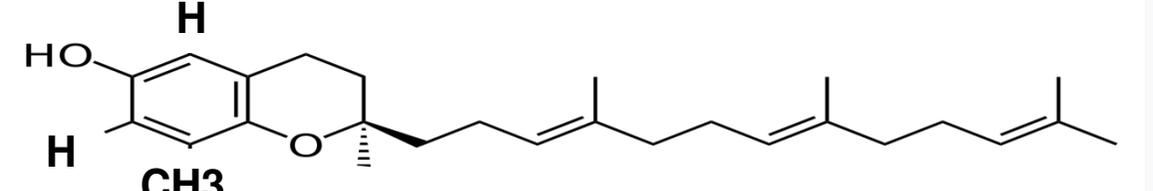
γ -Tocopherol is the most common form in the American diet due to a higher intake of soybean and corn oil.*

*Wagner KH, Kamal-Eldin A, Elmadfa I (2004). "Gamma-tocopherol--an underestimated vitamin?". *Annals of Nutrition & Metabolism*. 48 (3): 169–88.

All feature a **chromane ring**, with a hydroxyl group that can donate a hydrogen atom to reduce free radicals and a hydrophobic side chain which allows for penetration into biological membranes.

Both **the tocopherols** and **tocotrienols** occur in α (alpha), β (beta), γ (gamma) and δ (delta) forms, determined by the number and position of methyl groups on the chromanol ring.

Form	Structure
<i>alpha</i> -Tocopherol	 <p>The structure of <i>alpha</i>-Tocopherol consists of a chromanol ring system. The ring has a hydroxyl group (HO) at the 6-position and three methyl groups (CH₃) at the 2, 4, and 8 positions. A phytyl side chain is attached to the 2-position of the chromanol ring via a saturated ether linkage.</p>
<i>beta</i> -Tocopherol	 <p>The structure of <i>beta</i>-Tocopherol is similar to <i>alpha</i>-Tocopherol, but the hydroxyl group (HO) is located at the 5-position of the chromanol ring. The methyl groups (CH₃) are at the 2 and 8 positions. The phytyl side chain is attached to the 2-position.</p>
<i>gamma</i> -Tocopherol	 <p>The structure of <i>gamma</i>-Tocopherol has the hydroxyl group (HO) at the 7-position of the chromanol ring. The methyl groups (CH₃) are at the 2 and 8 positions. The phytyl side chain is attached to the 2-position.</p>
<i>delta</i> -Tocopherol	 <p>The structure of <i>delta</i>-Tocopherol has the hydroxyl group (HO) at the 8-position of the chromanol ring. The methyl groups (CH₃) are at the 2 and 4 positions. The phytyl side chain is attached to the 2-position.</p>

Form	Structure
<i>alpha</i> -Tocotrienol	 <p>The structure of α-Tocotrienol features a chromanol ring with a hydroxyl group (HO) at the 5-position and three methyl groups (CH₃) at the 2, 4, and 8 positions. The side chain at the 3-position is a branched triene chain with methyl groups at the 10, 14, and 18 positions. The side chain is attached to the chromanol ring via a dashed bond, indicating it is in the <i>trans</i> configuration.</p>
<i>beta</i> -Tocotrienol	 <p>The structure of β-Tocotrienol features a chromanol ring with a hydroxyl group (HO) at the 5-position and two methyl groups (CH₃) at the 2 and 8 positions. The side chain at the 3-position is a branched triene chain with methyl groups at the 10, 14, and 18 positions. The side chain is attached to the chromanol ring via a dashed bond, indicating it is in the <i>trans</i> configuration.</p>
<i>gamma</i> -Tocotrienol	 <p>The structure of γ-Tocotrienol features a chromanol ring with a hydroxyl group (HO) at the 5-position and two methyl groups (CH₃) at the 2 and 8 positions. The side chain at the 3-position is a branched triene chain with methyl groups at the 10, 14, and 18 positions. The side chain is attached to the chromanol ring via a dashed bond, indicating it is in the <i>trans</i> configuration.</p>
<i>delta</i> -Tocotrienol	 <p>The structure of δ-Tocotrienol features a chromanol ring with a hydroxyl group (HO) at the 5-position and one methyl group (CH₃) at the 8 position. The side chain at the 3-position is a branched triene chain with methyl groups at the 10, 14, and 18 positions. The side chain is attached to the chromanol ring via a dashed bond, indicating it is in the <i>trans</i> configuration.</p>

Each form has a different **biological activity**.*

1 IU is defined as 1 milligram of an equal mix of the eight stereoisomers of alpha tocopherol. This mix of stereoisomers is often called dl-alpha-tocopheryl acetate.

*Burton, G. W.; Ingold, K. U. (1981). "Autoxidation of biological molecules. 1. Antioxidant activity of vitamin E and related chain-breaking phenolic antioxidants in vitro". *J. Am. Chem. Soc.* 103 (21):

α -Tocopherol is also the predominant vitamin E homologue in human skin; only small amounts of the γ -tocopherol analogue are detectable, amounting to about 10% to total tocopherol in this tissue.

<https://www.sciencedirect.com/topics/chemistry/gamma-tocopherol>

α -Tocopherol levels in human dermis and epidermis are about 15 and 30 nmol/g tissue, respectively. This is in the same range of the α -tocopherol plasma levels, about 20–25 nmol/ml. Considerably higher amounts of this antioxidant are found in the heart (45nmol/g) ---

<https://www.sciencedirect.com/topics/chemistry/gamma-tocopherol>

testes (90 nmol/g), adrenals (300 nmol/g) or fat tissues (350 nmol/g). Levels comparable to human epidermis are measured in the stratum corneum. The vitamin E levels in this outer skin barrier are depleted by almost 50% when the skin is irradiated with low doses of UV-light.

<https://www.sciencedirect.com/topics/chemistry/gamma-tocopherol>

Alpha-tocopherol is the form that is preferentially absorbed and accumulated in humans.* The measurement of "vitamin E" activity in international units (IU) was based on fertility enhancement by the prevention of miscarriages in pregnant rats relative to alpha-tocopherol.

*Rigotti A (2007). "Absorption, transport, and tissue delivery of vitamin E". *Molecular Aspects of Medicine*. 28 (5–6): 423–36.

Beta tocopherol.

Found in low concentrations in many vegetable oils, only cottonseed oil contains significant amounts.

Tocopherols are radical scavengers, delivering an H atom to quench free radicals. This weak bond allows the vitamin to donate a hydrogen atom to the peroxy radical and other free radicals, minimizing their damaging effect.

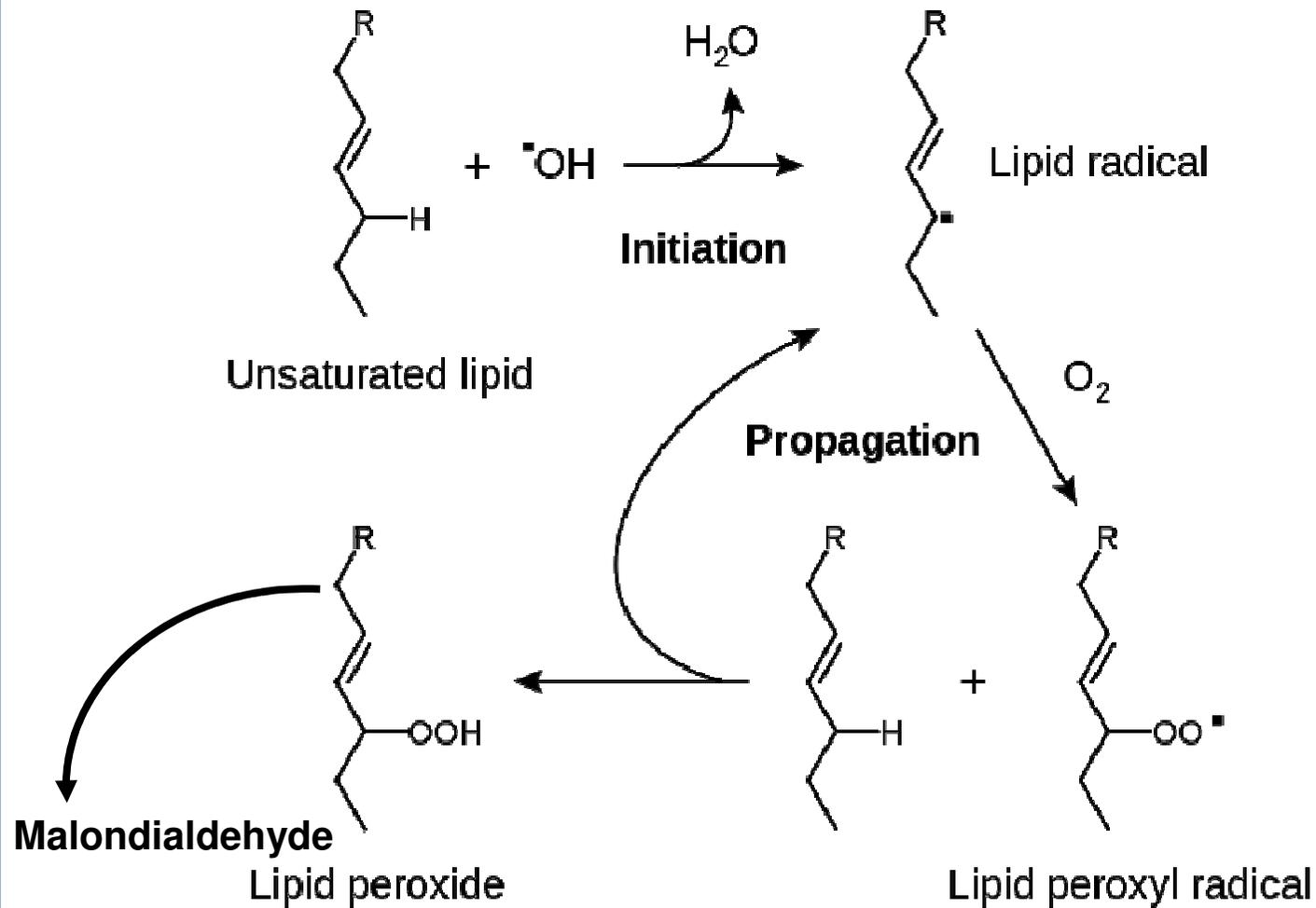
The thus generated **tocopheryl radical** is relatively unreactive but revert to tocopherol by a redox reaction with a hydrogen donor such as vitamin C.* As they are fat-soluble, tocopherols are incorporated into cell membranes, which are protected from oxidative damage.

*Traber MG, Stevens JF (September 2011). "Vitamins C and E: beneficial effects from a mechanistic perspective". *Free Radical Biology & Medicine*. 51 (5): 1000–13.

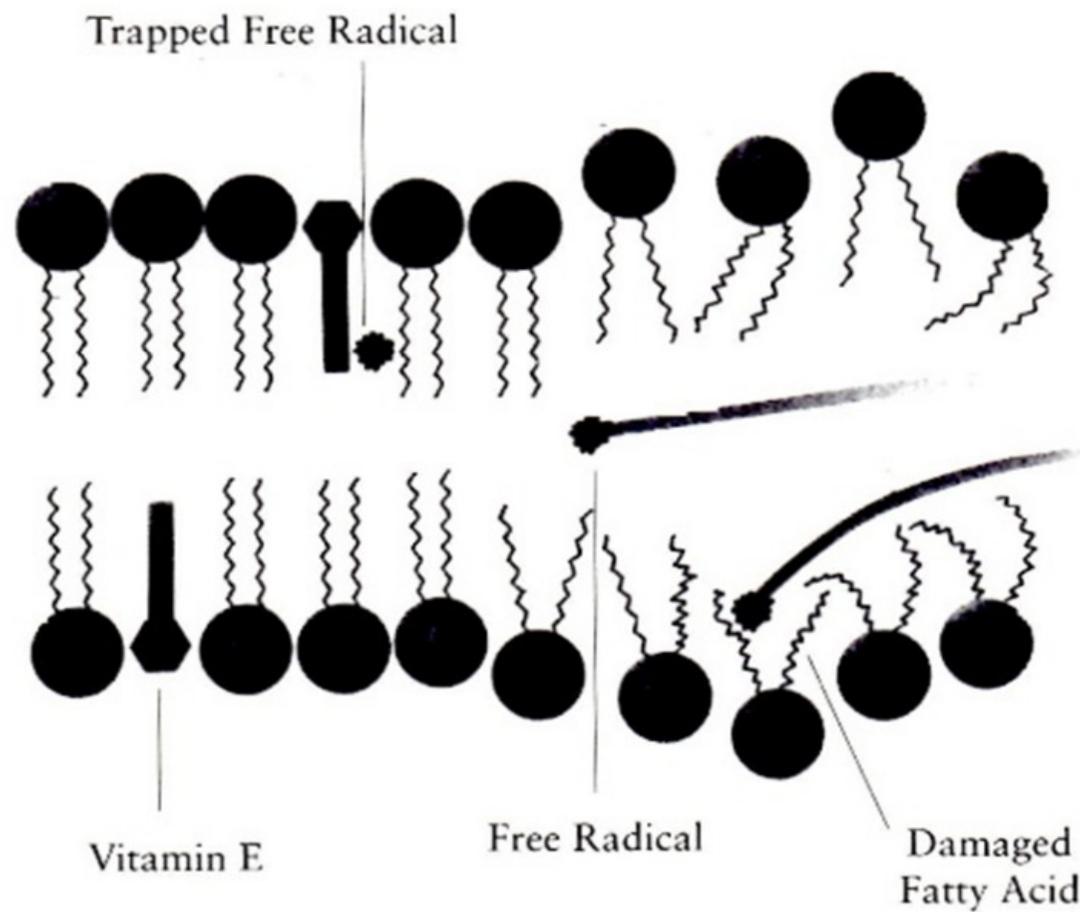
As a **fat-soluble antioxidant**, it interrupts the propagation of reactive oxygen species (ROS) that spread through biological membranes or through a fat when its lipid content undergoes oxidation by reacting with more-reactive lipid radicals to form more stable products.*

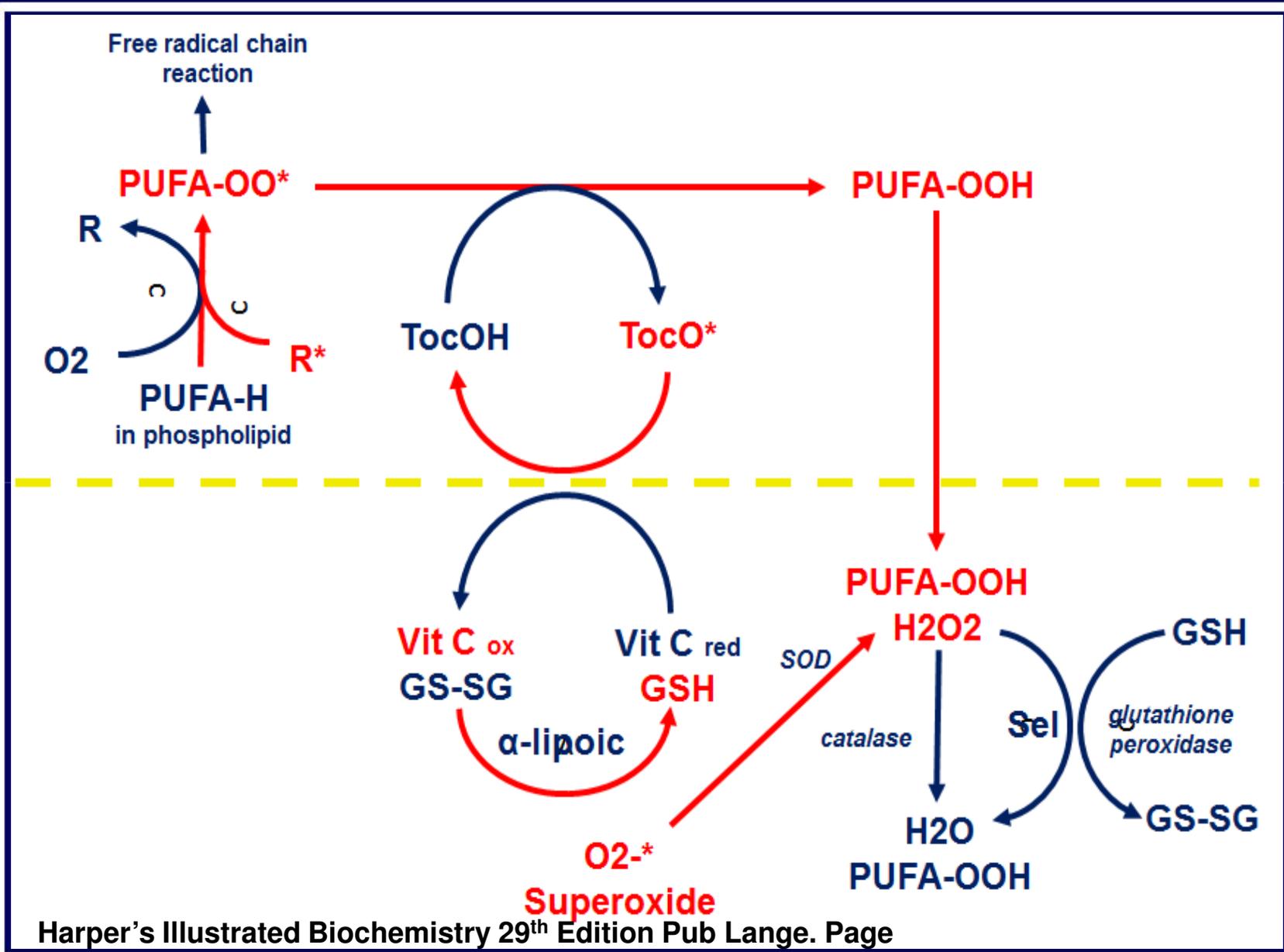
*Galli, F. Azzi, A. Birringer, M. Cook-Mills, J. M. Eggersdorfer, M. Frank, J. Cruciani, G. Lorkowski, S. Ozer, N. K. (2017). "Vitamin E: Emerging aspects and new directions". *Free Radic Biol Med.* 102: 16–36.

RANCID FATS



Vitamin E Activity in Cell membrane





Vitamin E

The phospholipids of the mitochondria, endoplasmic reticulum and the plasma membranes possess affinities for tocopherols and the vitamin appears to concentrate predominantly at these sites.

The crucial function played by Vitamin E may involve antioxidant functions in cell membranes. Other theories hold that vitamin E – specifically the RRR stereoisomer of alpha-tocopherol – act by controlling **gene expression and cell signal transduction.***

**Rimbach G, Moehring J, Huebbe P, Lodge JK (2010). "Gene-regulatory activity of alpha-tocopherol". *Molecules*. 15 (3): 1746–1761.*

Consumption of **vitamin E** has been in decline in recent years and it is now estimated that more than 90 per cent of the population in the US do not meet the dietary intake recommendations. The impact of low vitamin E intake globally is a serious public health concern and there is an urgent requirement for **additional research.***

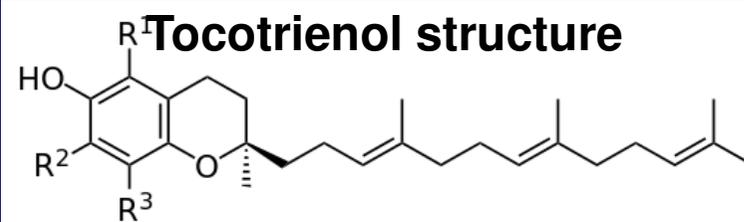
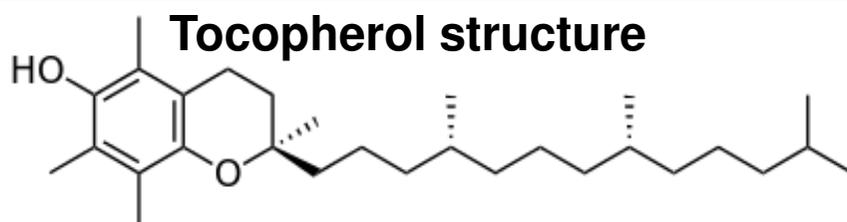
*Nutrient Intakes from Food and Beverages"(PDF). *What We Eat In America, NHANES 2012-2014 (2016)*. Retrieved 18 August 2018

Tocotrienols are members of the vitamin E family. The body contains four tocotrienols (alpha, beta, gamma, delta) and four tocopherols (alpha, beta, gamma, delta).*

However these have different antioxidant activities when measured in human plasma.

* Kamal-Eldin A, Appelqvist LA (July 1996). "The chemistry and antioxidant properties of tocopherols and tocotrienols". *Lipids*. 31(7): 671–701

The critical difference between **tocotrienols** and tocopherols is in that tocopherols have saturated side chains, whereas tocotrienols have unsaturated isoprenoid side chains (farnesyl isoprenoid tails) with three double bonds.*



* Kamal-Eldin A, Appelqvist LA (July 1996). "The chemistry and antioxidant properties of tocopherols and tocotrienols". *Lipids*. 31(7): 671–701

Tocotrienols are compounds naturally occurring at higher levels in select vegetable oils, including palm oil, rice bran oil, wheat germ, coconut oil, barley, saw palmetto, evening primrose, and certain other types of seeds, nuts, grains, and the oils derived from them.*

*Tocopherol and tocotrienol contents of raw and processed fruits and vegetables in the United States diet p.199

This **vitamin E analogue typically only occurs at very low levels in the human body but different isomers function well as a physical antioxidant.***

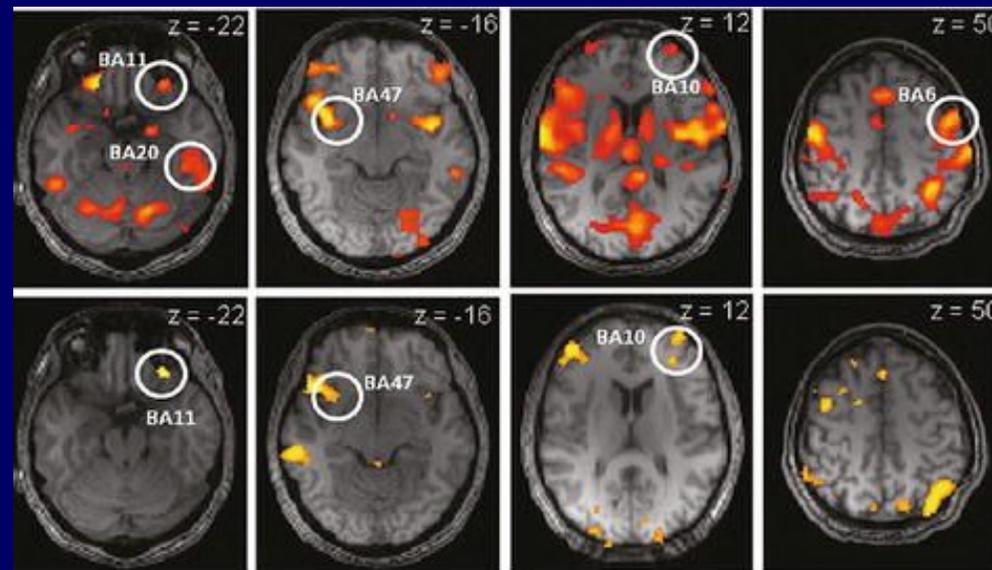
*Tocopherol and tocotrienol contents of raw and processed fruits and vegetables in the United States diet p.199

Tocotrienols may improve
Cognitive function
Improved heart disease outcomes
Lowers cholesterol
Potential benefit in diabetes
Anticancer*

Rich in Rice bran oil

*Watson & Preedy 2008, p. 6

Vitamin E is present in all seed oils. When the Vitamin E is used up the oil goes rancid just like our unsaturated phospholipids and brain.



Vitamin E deficiency is rare, and in almost all instances caused by an underlying disease rather than a diet low in vitamin E. *

Vitamin E deficiency causes neurological problems due to poor nerve conduction.

*Vitamin E Fact Sheet for Health Professionals Archived 2009-08-13 at the Wayback Machine National Institutes of Health, Office of Dietary Supplements

These include **neuromuscular problems** such as spinocerebellar ataxia and myopathies.*

Deficiency can also cause anemia, due to oxidative damage to red blood cells.

*Brigelius-Flohé R, Traber MG (July 1999). "Vitamin E: function and metabolism". *FASEB Journal*. 13 (10): 1145–55.

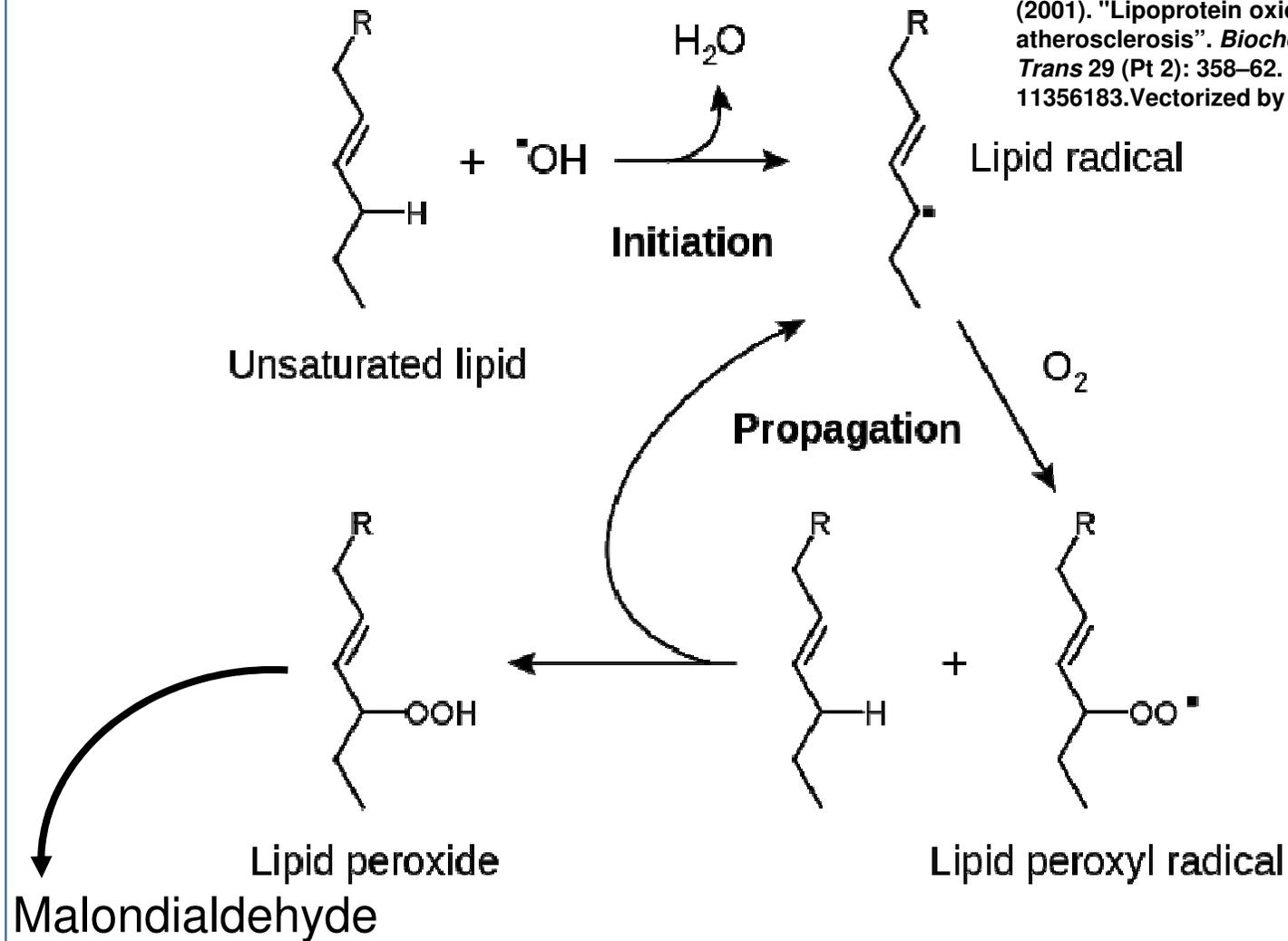
Rancid Fats

- **Primarily occurs with unsaturated fats**
- **More susceptible to rancidity because of structure with many double bonds**
- **Fats turn rancid in the presence of free radicals or reactive oxygen species**

Erich Lück and Gert-Wolfhard von Rymon Lipinski "Foods, 3. Food Additives"
in *Ullmann's Encyclopedia of Industrial Chemistry*, 2002, Wiley-VCH, Weinheim.

RANCID FATS

Tim Vickers, after Young IS, McEneny J (2001). "Lipoprotein oxidation and atherosclerosis". *Biochem Soc Trans* 29 (Pt 2): 358-62. PMID 11356183. Vectorized by Fvasconcellos



Rancid Fats

- **Reactive oxygen species degrade polyunsaturated lipids forming malondialdehyde**
- **Reactive aldehyde causes toxic stress in cells and forms advanced lipoxidation end products**
- **Lead to loss of membrane integrity**

Sergey,, Bylikin,. *Chemistry : course companion*. Horner, Gary,, Murphy, Brian,, Tarcy, David, (2014 ed.). Oxford.

Rancid Fats

- **Malondialdehyde** is used as a biomarker to assess the oxidative stress of a person
- It reacts with deoxyadenosine and deoxyguanosine in DNA to form DNA combinations which can be mutagenic.

•V. Nair, C. L. O'Neil, P. G. Wang "Malondialdehyde", *Encyclopedia of Reagents for Organic Synthesis*, 2008, John Wiley & Sons, New York. doi:10.1002/047084289X.rm013.pub2 Article Online Posting Date: March 14, 2008

•** Moore K, Roberts LJ (1998). "Measurement of lipid peroxidation". *Free Radic. Res.* 28 (6): 659–71.

Malondialdehyde, a colourless liquid, is a highly reactive compound that occurs as the enol*. It occurs naturally and is a marker for oxidative stress.**

•V. Nair, C. L. O'Neil, P. G. Wang "Malondialdehyde", *Encyclopedia of Reagents for Organic Synthesis*, 2008, John Wiley & Sons, New York. doi:10.1002/047084289X.rm013.pub2 Article Online Posting Date: March 14, 2008
•** Moore K, Roberts LJ (1998). "Measurement of lipid peroxidation". *Free Radic. Res.* 28 (6): 659–71.

Malondialdehyde is reactive and potentially mutagenic. It has been found in heated edible oils such as sunflower and palm oils. MDA also can be found in tissue sections of joints from patients with osteoarthritis.*

*Tiku ML, Narla H, Jain M, Yalamanchili P (2007). "Glucosamine prevents in vitro collagen degradation in chondrocytes by inhibiting advanced lipoxidation reactions and protein oxidation". *Arthritis Research & Therapy*. 9 (4): R76.

Oils should be
Organic.
Cold pressed.
In small dark glass
bottles.
Kept away from heat.
Sealed with nitrogen.
Tops kept on.



Rancid Fats

- **Measure the oxidative stability of an oil**
- **Rancimat method measures the progress of the oxidation reaction**
- **Measures the volatile oxidation products, largely formic acid**
- **Biomarker Formic acid to test rancid oils**

Allen, J.C. & Hamilton, R.J. (1994). *Rancidity in Foods*. Springer-Verlag GmbH. p. 47.

4-Hydroxynonenal (4-HNE) is an α,β -unsaturated hydroxyalkenal that is produced by lipid peroxidation in cells.

4-HNE has 3 reactive groups: an aldehyde, a double-bond at carbon 2, and a hydroxy group at carbon 4.

*Awasthi, Y. C.; Yang, Y.; Tiwari, N. K.; Patrick, B.; Sharma, A.; Li, J.; Awasthi, S. (2004). "Regulation of 4-hydroxynonenal-mediated signaling by glutathione S-transferases". *Free Radical Biology and Medicine*. 37 (5): 607–619.

It is found throughout all tissues,
and in higher quantities
during **oxidative stress** due to the
increase in the lipid
peroxidation chain reaction.*

*Awasthi, Y. C.; Yang, Y.; Tiwari, N. K.; Patrick, B.; Sharma, A.; Li, J.; Awasthi, S. (2004).
"Regulation of 4-hydroxynonenal-mediated signaling by glutathione S-
transferases". *Free Radical Biology and Medicine*. 37 (5): 607–619.

4-HNE has been hypothesized to play a key role in cell signal transduction, in a variety of pathways from cell cycle events to cellular adhesion.*

*Awasthi, Y. C.; Yang, Y.; Tiwari, N. K.; Patrick, B.; Sharma, A.; Li, J.; Awasthi, S. (2004). "Regulation of 4-hydroxynonenal-mediated signaling by glutathione S-transferases". *Free Radical Biology and Medicine*. 37 (5): 607–619

4-Hydroxynonenal is generated in the oxidation of lipids containing polyunsaturated omega-6 acyl groups, such as arachidonic or linoleic groups respectively. *

*Riahi, Y.; Cohen, G.; Shamni, O.; Sasson, S. (2010). "Signaling and cytotoxic functions of 4-hydroxyalkenals". *AJP: Endocrinology and Metabolism*. 299 (6):

These compounds can be produced in cells and tissues of living organisms or in foods during processing or storage, and from these latter can be absorbed through the diet.*

*Riahi, Y.; Cohen, G.; Shamni, O.; Sasson, S. (2010). "Signaling and cytotoxic functions of 4-hydroxyalkenals". *AJP: Endocrinology and Metabolism*. 299 (6)

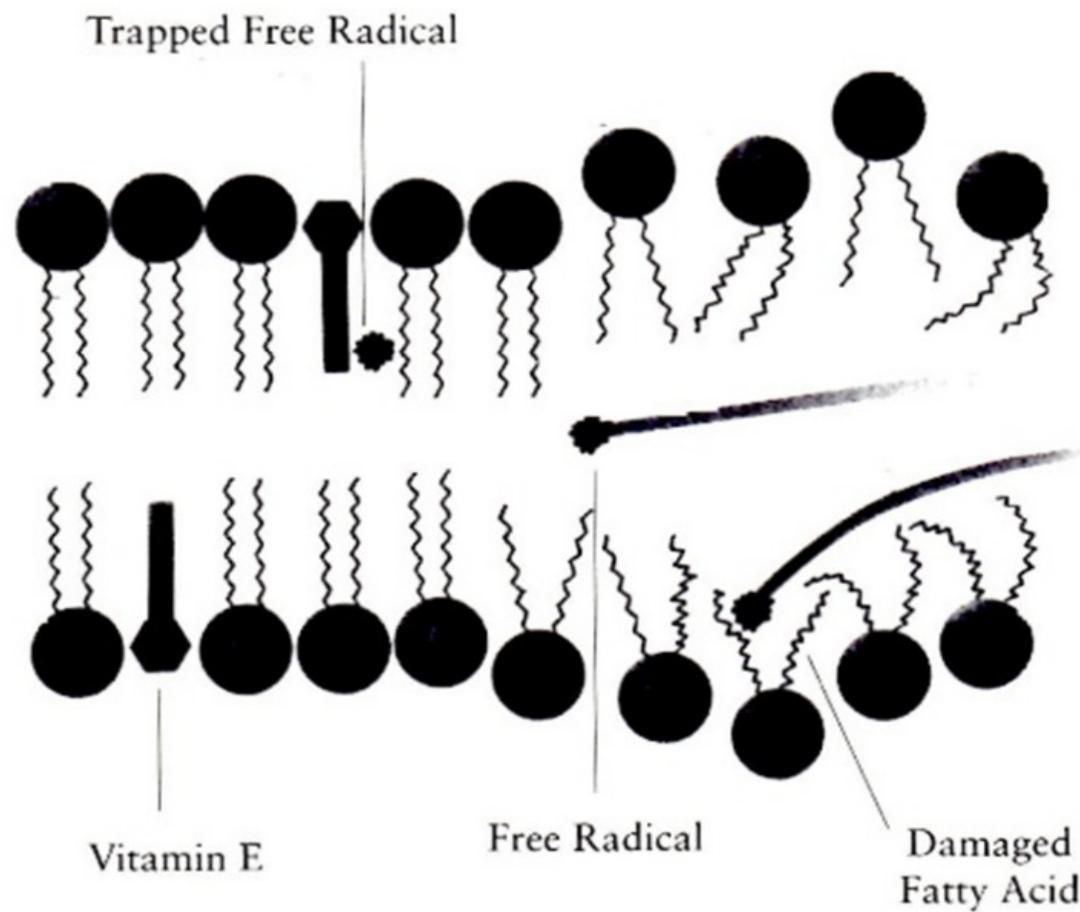
They are being considered as possible **causal agents** of numerous diseases, such as chronic inflammation, neurodegenerative diseases, adult respiratory distress syndrome, atherogenesis, diabetes and different types of cancer.*

*Zarkovic, N. (2003). "4-Hydroxynonenal as a bioactive marker of pathophysiological processes". *Molecular Aspects of Medicine*. 24(4–5): 281–291.

A small group of **enzymes are specifically suited to the detoxification and removal of 4-HNE from cells.**

**Within this group are
Glutathione-S-
transferases (GSTs),
Aldose reductase,
Aldehyde dehydrogenase.**

Vitamin E Activity in Cell membrane



Organic Wheatgerm Oil

- **One of highest sources of Vitamin E - 150mg per 100g**
- **Tocopherols and tocotrienols**
- **Combination of enzymes, catalysts, plant compounds, minerals**
- **Synergy of natural components**
- **Optimal Vitamin E complex**

Edible flowers can contribute to daily dose of vitamin E, study suggests

By [Adi Menayang](#)

15-Aug-2019 - Last updated on 14-Aug-2019 at 21:09 GMT



For the petals of borage and centaurea, the researchers argued that *“daily consumption of edible flowers may contribute to supplying some macronutrients, vitamins, and organic acids to the human diet.”*



RELATED TAGS: [edible flowers](#), [Fatty acid](#), [Carotenoid](#)

A flower a day keeps the doctor away? Study highlights two flowers as source of healthy fatty-acids, carotenoids, and more.

Borage



Knapweed

**How much of a supplement do
we absorb?**

Liposomes

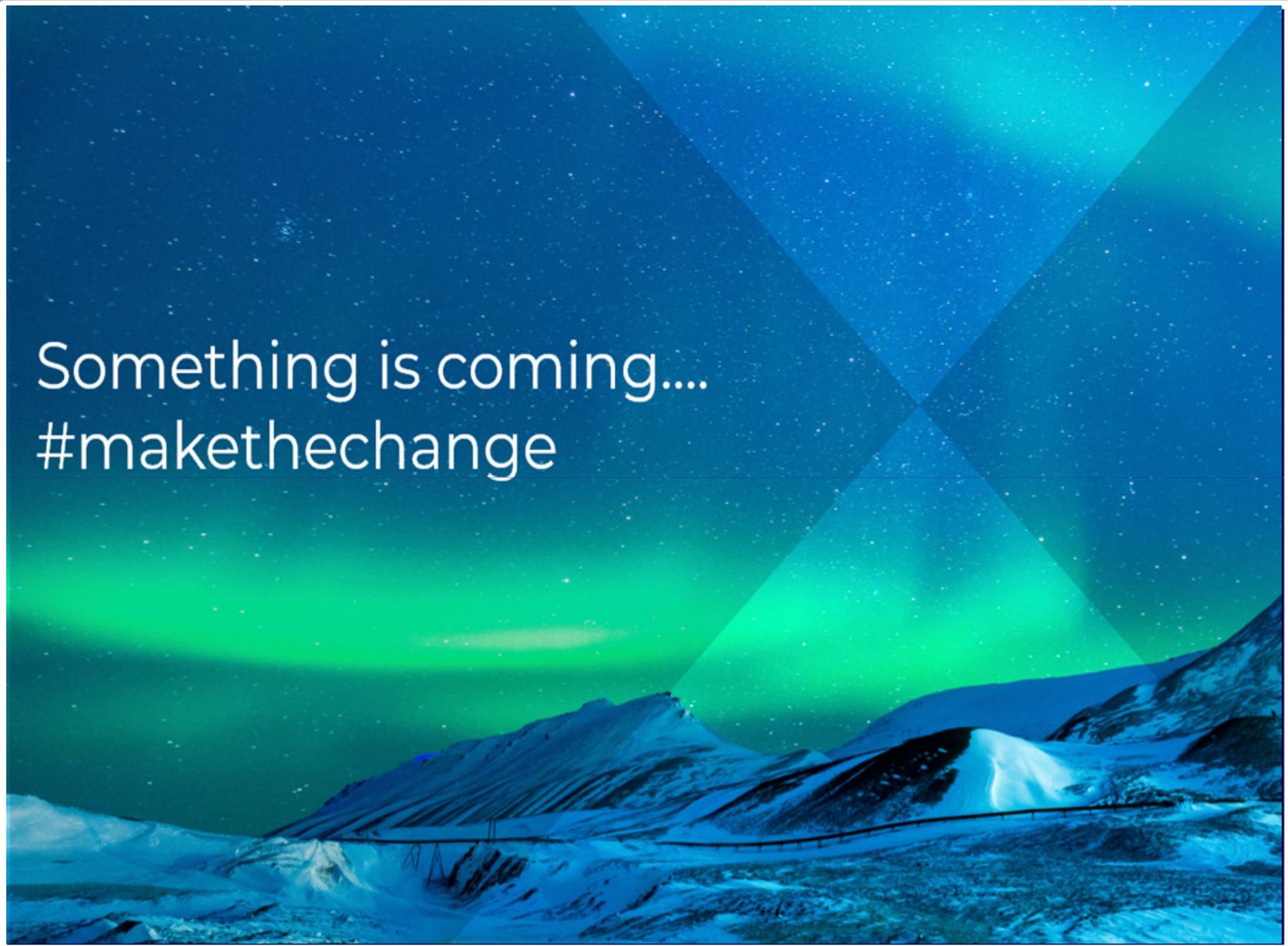
v

Capsules

v

Aqueous solutions

Something is coming...
#makethechange



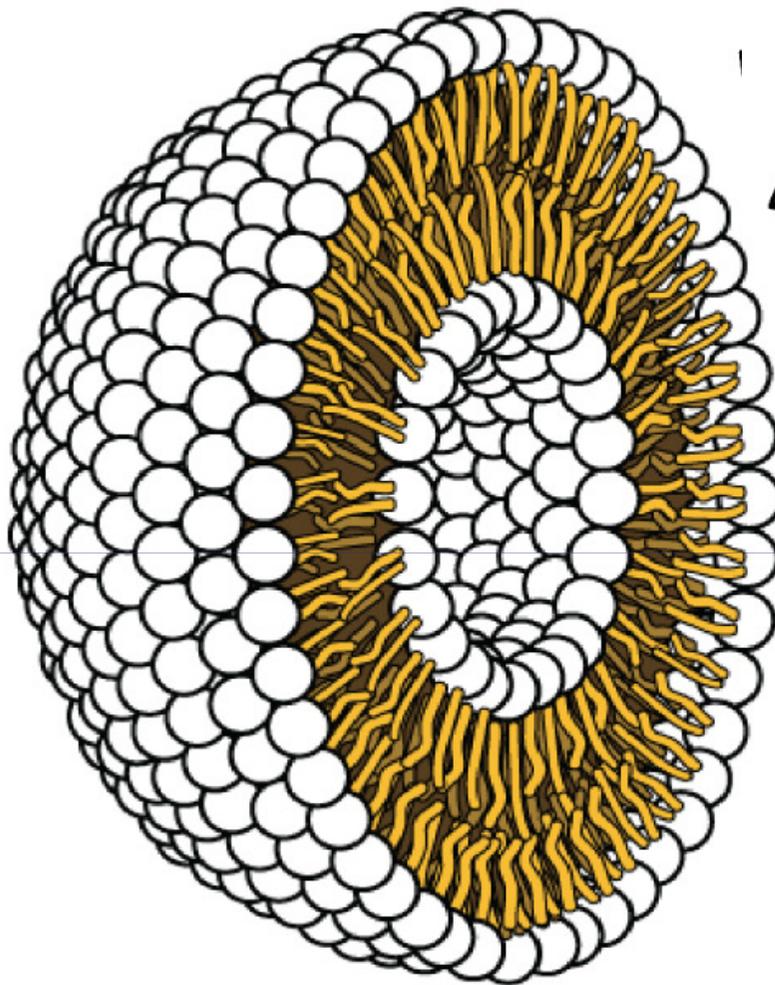


**Innovative Formulations for
Bioavailability Enhancement**

Botanicals

Antioxidants

Vitamins



Liposome



**Micelle
(emulsion)**

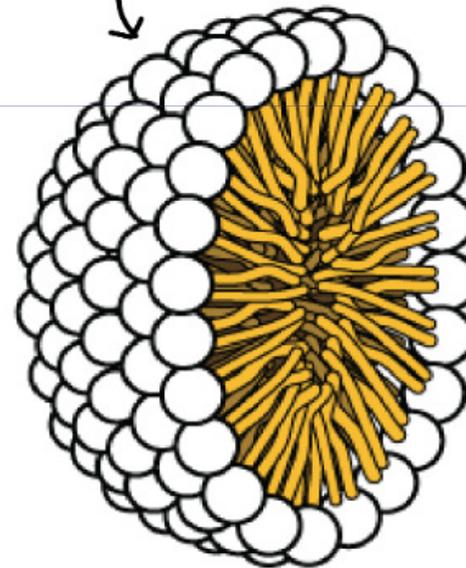


Image credit: modification of work by OpenStax Biology, originally by Mariana Ruiz Villareal.

If the **phospholipids** have small tails, they may form a micelle (a small, single-layered sphere), while if they have bulkier tails, they may form a liposome (a hollow droplet of bilayer membrane).

Formulations with Phospholipids – Diverse Possibilities, Numerous Advantages



Enhancement of Bioavailability

**Formulations with phospholipids
improve the bioavailability
of nutrients**

Gastrointestinal Protection

**Formulations with phospholipids
protect nutrients from
degradation and support the
mucosal barrier function**

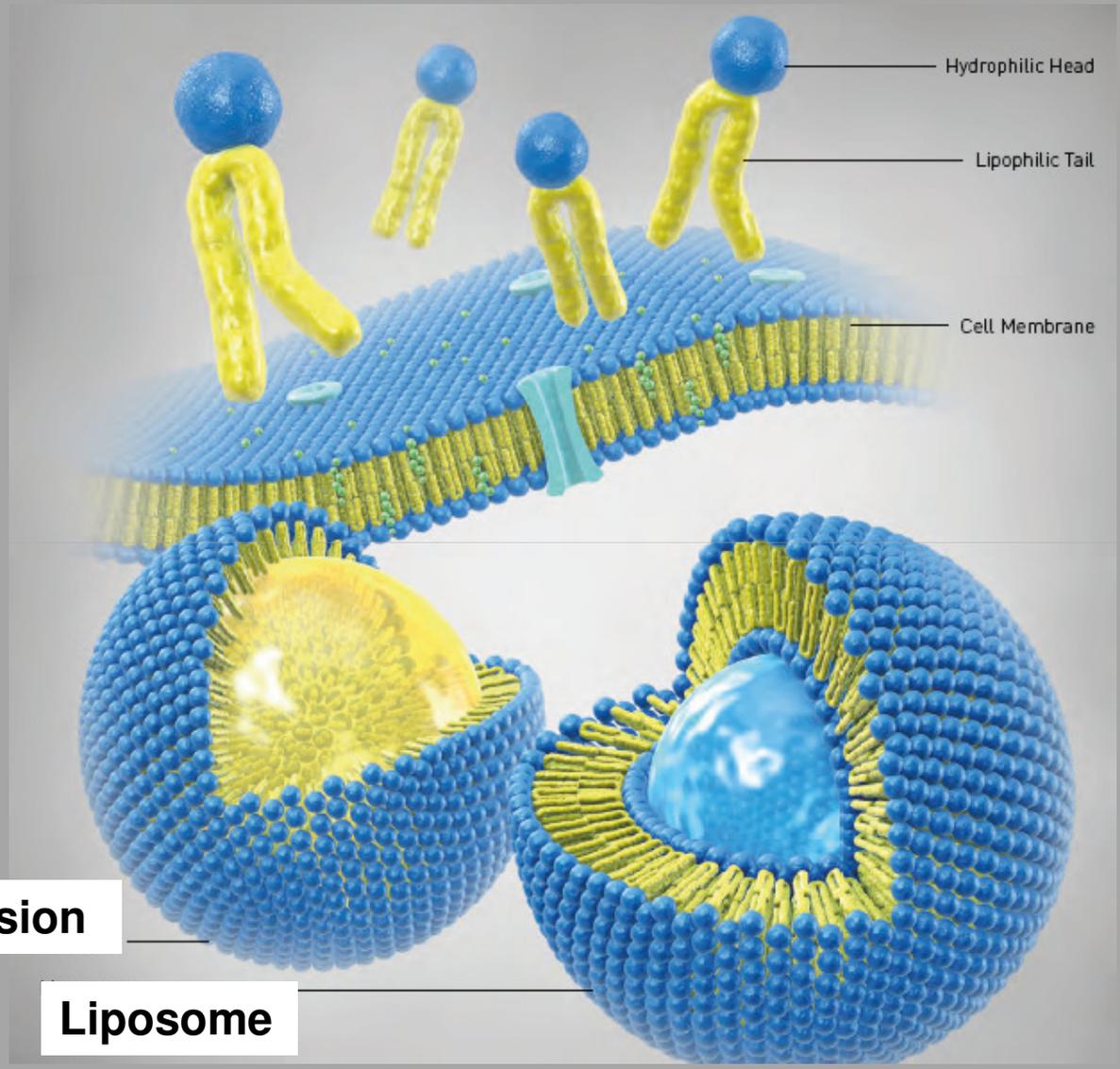
Natural Choline Source

Formulations with phospholipids are natural sources of the vitamin-like nutrient choline

Phospholipids are amphiphilic molecules and consist of a hydrophilic and a lipophilic moiety.

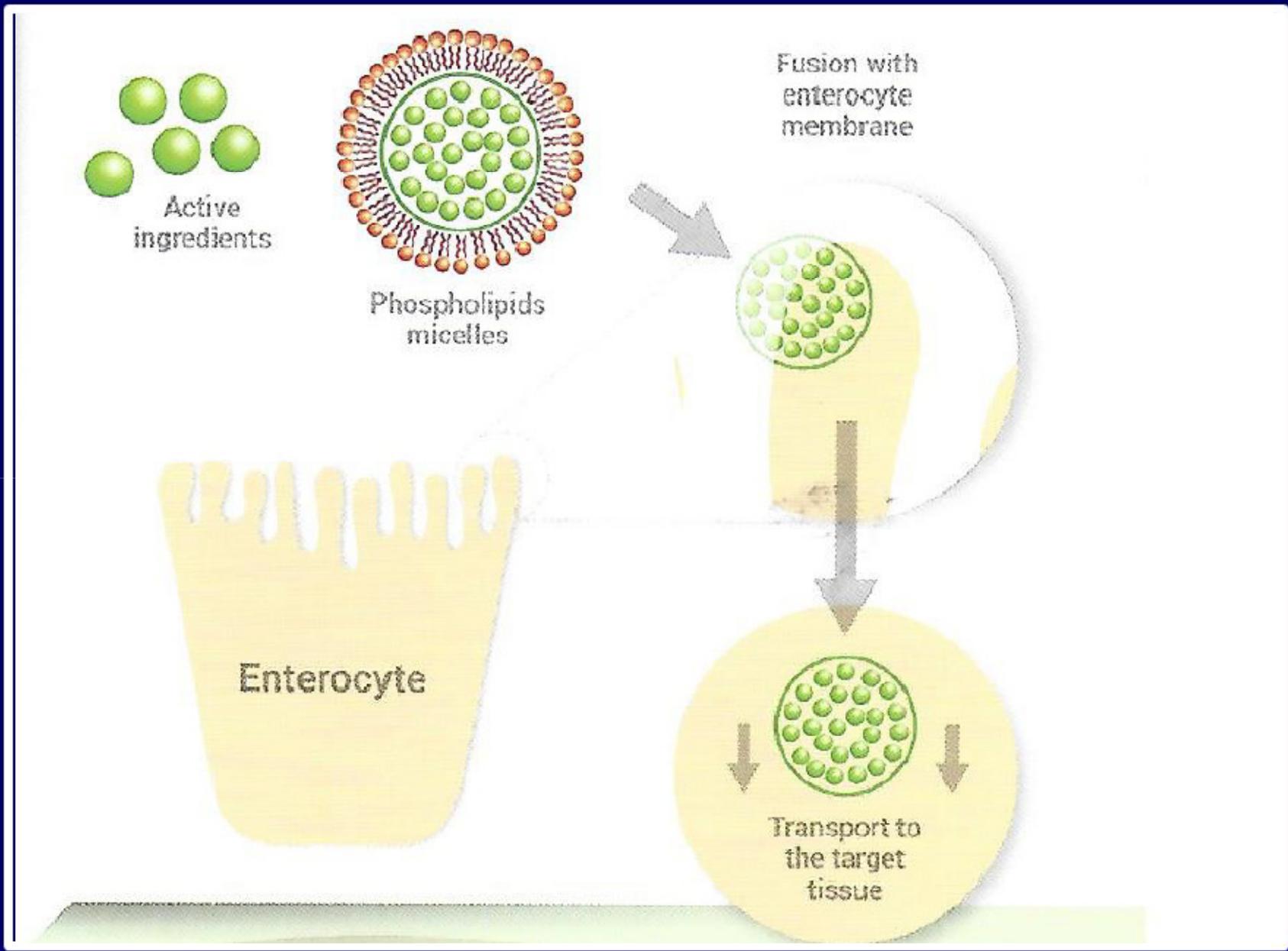
In water they can form a “shell” which encloses a fat droplet (lipophilic ingredient) to form a micelle which allows phospholipids – the dispersion in aqueous media.

This is called an **emulsion**. In absence of non-polar lipids and the presence of water, phospholipids organize as bilayer structures which are called **liposomes**. The aqueous core of a liposome can be loaded with hydrophilic nutrients like minerals and vitamins.



Emulsion

Liposome



For the preparation of **liposomes**, phospholipids are mixed with water and the desired active ingredients.

Ethanol or glycerol may be added to improve the stability of the product or to enhance the solubility of the ingredients.

High-shear mixing is usually applied for the preparation of liposomes.

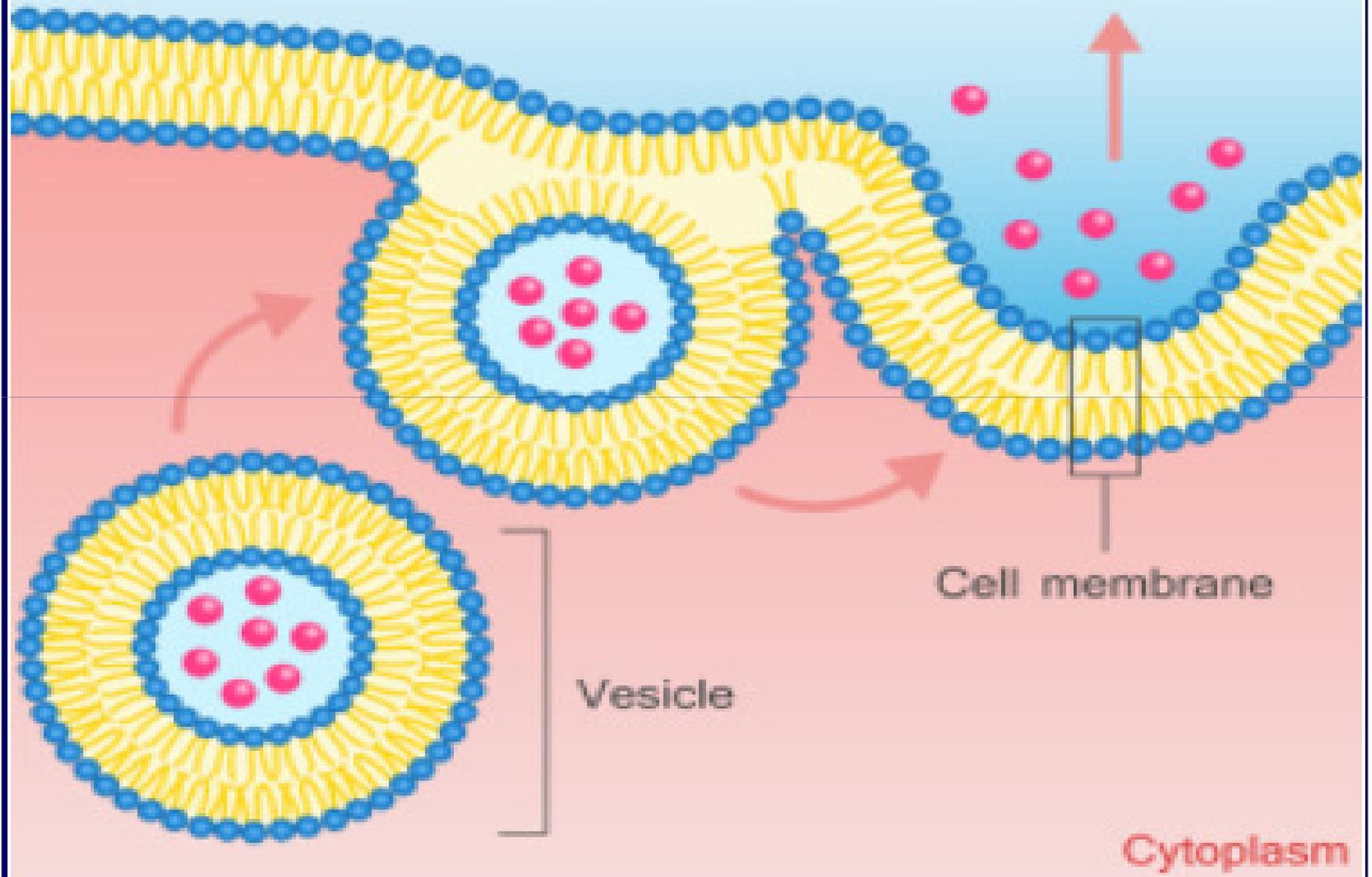
In a second step, high-pressure homogenization is used to obtain smaller and homogeneously distributed liposomes.

**With the help of phospholipids
fat-soluble nutrients
such as coenzyme Q10 can be
solubilized into liposomes.**

**With this technology the uptake
into the enterocytes of the small
intestine is significantly
improved.**

The **enterocytes** require phospholipids to pack dietary fats and lipophilic nutrients into chylomicrons, that are then released into the lymph.

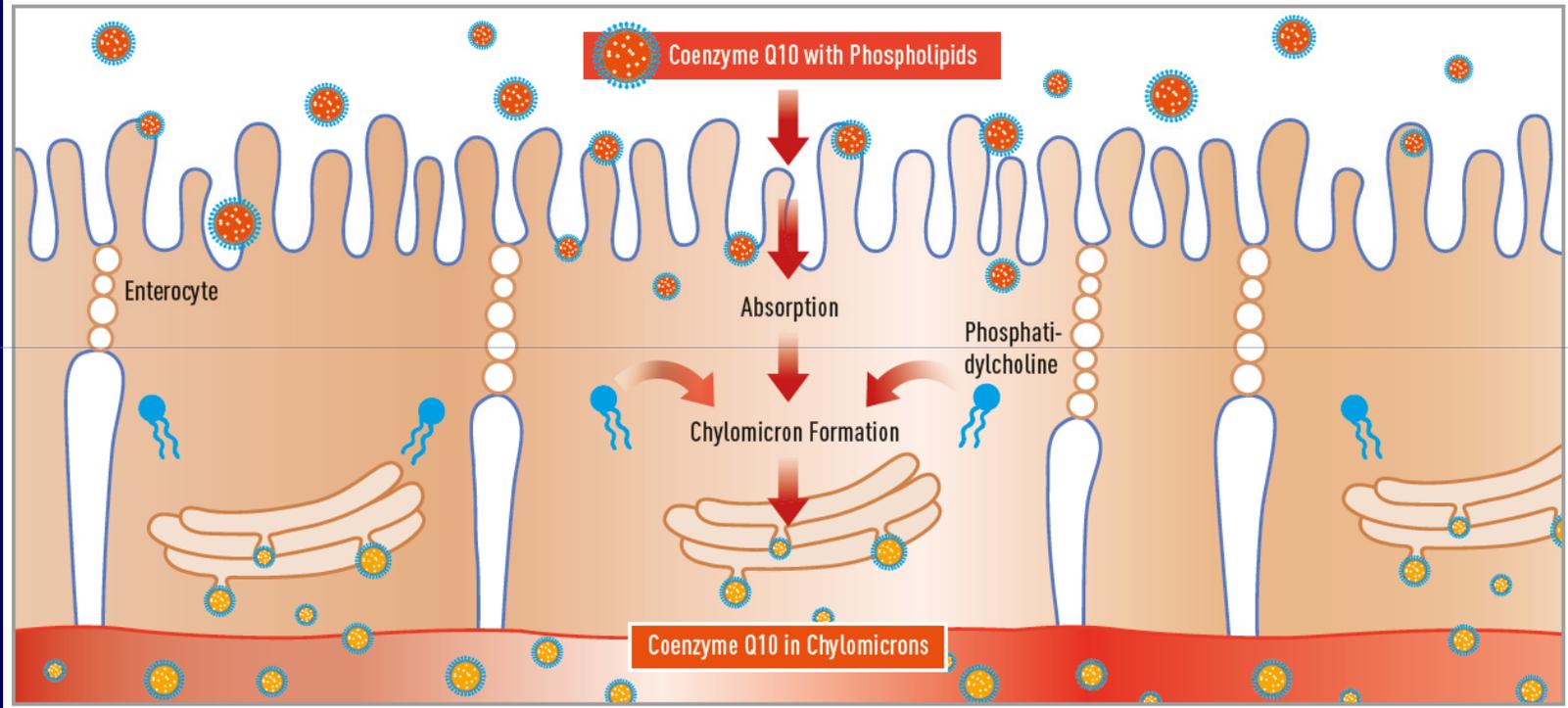
Outside the cell



Cell membrane

Vesicle

Cytoplasm



**Common diseases associated
with chronic intracellular
deficiencies.**

Alzheimer's – Zinc

Multiple sclerosis - Sulphur

Parkinson's – Magnesium

Type 1 Diabetes - Manganese

Cancer – Selenium or Selenium methionine

Gout – Taurine

Osteoarthritis – Vitamin B5

MND - Molybdenum

Rheumatoid arthritis – Iron

Diabetes type 2 – Carnitine

Angina / Atherosclerosis-

Vitamin B6, Vitamin C

Myocardial infact – Vitamin C

Co-Enzyme Q10
Ubiquinone - Ubiquinol

Co-enzyme Q10

Acetyl CoA

NADPH
Mg

ATP

Hydroxy Methylglutaryl (HMG) CoA reductase

ADP

Farnesyl
phosphate

Cholesterol

Tyrosine

SAM

B6

Vitamin C

O₂

Co-enzyme Q10
Ubiquinone (oxi)

Co-enzyme Q10
Ubiquinol (red)

Co-enzyme Q10 is a fat-soluble substance, is present in most eukaryotic cells, primarily in the mitochondria. It is a component of the electron transport chain and participates in aerobic cellular respiration, which generates energy in the form of ATP.*

* Ernster, L.; Dallner, G. (1995). "Biochemical, physiological and medical aspects of ubiquinone function". *Biochimica et Biophysica Acta*. 1271 (1): 195–204

Ninety-five percent of the human body's energy is generated this way.* Therefore, those organs with the highest energy requirements—such as the heart, liver, and kidney—have the highest CoQ₁₀ concentrations.

* Okamoto, T.; Matsuya, T.; Fukunaga, Y.; Kishi, T.; Yamagami, T. (1989). "Human serum ubiquinol-10 levels and relationship to serum lipids". *International Journal for Vitamin and Nutrition Research*. 59(3): 288–292.

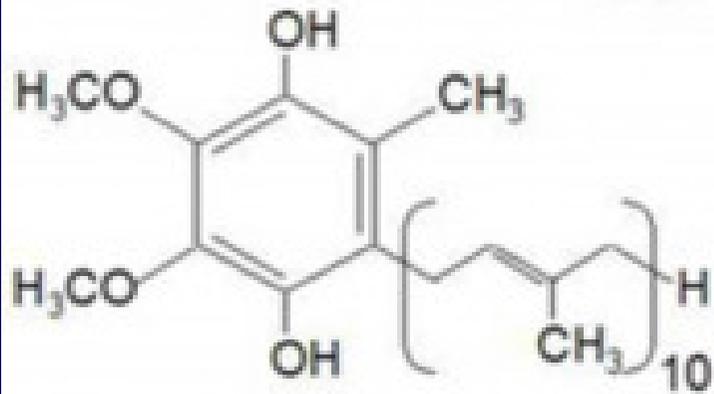
There are **three redox states** of CoQ₁₀: fully oxidized (ubiquinone), semiquinone (ubisemiquinone), and fully reduced (ubiquinol).

The capacity of this molecule to act as a two-electron carrier (moving between the quinone and quinol form) and-

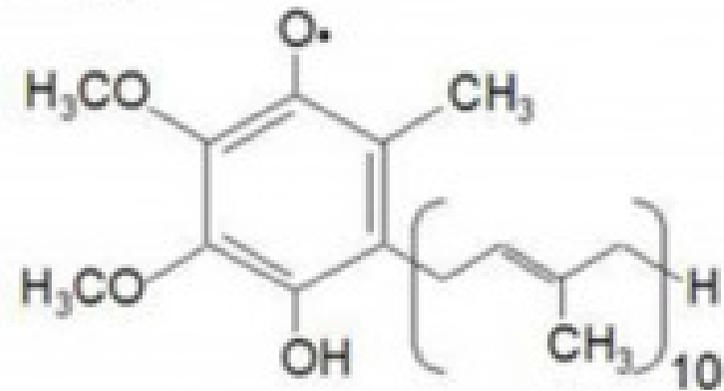
a one-electron carrier (moving between the semiquinone and one of these other forms) is central to its role in the electron transport chain due to the iron–sulfur clusters that can only accept one electron at a time, and as a free radical-scavenging antioxidant.*

** Aberg, F.; Appelkvist, E. L.; Dallner, G.; Ernster, L. (1992). "Distribution and redox state of ubiquinones in rat and human tissues". Archives of Biochemistry and Biophysics. 295 (2): 230–234.*

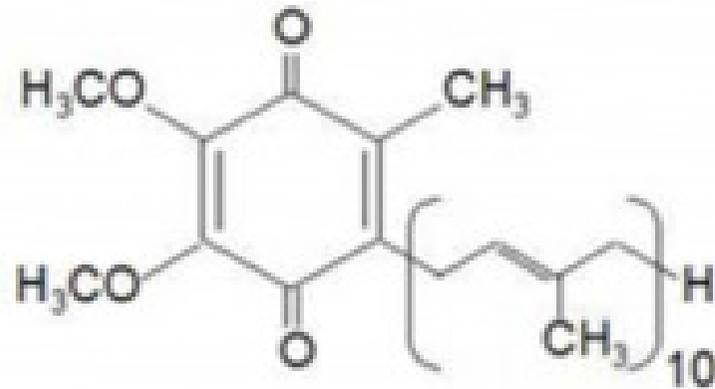
Coenzyme Q₁₀



Ubiquinol (CoQH₂)



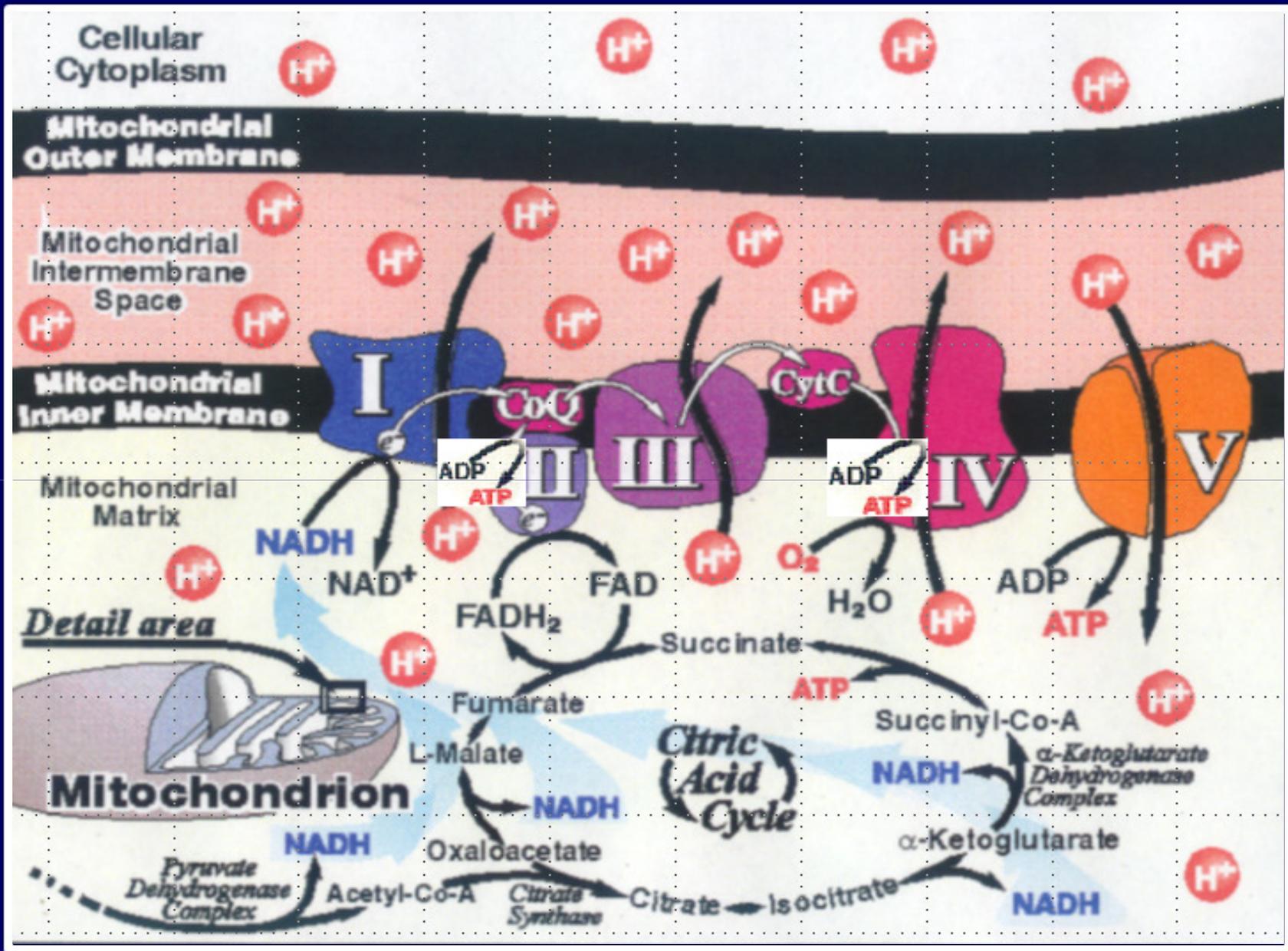
Semiquinone radical (CoQH•)



Ubiquinone (CoQ)

Functions of CoQ10

- **Mitochondrial energy coupling**
- **Antioxidant**
- **Generation of intracellular signals**
- **Control of membrane structure and phospholipid composition**



CoQ deficiency in humans

Basis	Tissue	% decrease
Age	Myocardium	72
Age	Heart	58
Age	Pancreas	83
Age	Adrenal	50
Age	Kidney	45
Age	Epidermis	75
Age	Liver	17
Statins	Serum	20-30
Diabetes	Serum	65

Food Sources of CoQ10

There are foods with CoQ10 that you can eat if you want to increase your body's levels. It's said that if you consume a balanced diet, you're likely to get enough CoQ10. Notable examples include:^{6,7}

- Fish like [wild-caught Alaskan salmon](#) and herring
- [Grass fed beef](#) and organ meats
- [Organic pastured meats](#)
- Sesame seeds
- [Broccoli](#)



Call Toll Free: 877-985-2695

CoQ10's Potential Capabilities for Your Health

Lately, research has highlighted the impact of eating chlorophyll-rich vegetables and sun exposure in improving the body's conversion of CoQ10 to ubiquinol. Chlorophyll that's consumed is transported to the blood, and once the skin is exposed to significant amounts of sunlight, chlorophyll absorbs solar radiation and promotes CoQ10 conversion into ubiquinol. You can increase your chlorophyll intake by eating these vegetables:⁸

Spinach	Asparagus	Beet greens
Green bell peppers	Bok choy	Brussels sprouts
Green cabbage	Celery	Collard greens
Cucumber	Green beans	Green peas
Kale	Leeks	Mustard greens
Green sea vegetables	Swiss chard	Turnip greens

Fruits like green grapes or kiwis (provided that these are eaten in moderation), as well as [parsley](#) and pistachio nuts, are other chlorophyll-rich foods to consider.

Coenzyme Q₁₀ has potential to inhibit the effects of warfarin* (Coumadin), a potent anticoagulant, by reducing the INR, a measure of blood clotting.

* Wyman, M.; Leonard, M.; Morledge, T. (Jul 2010). "Coenzyme Q₁₀: a therapy for hypertension and statin-induced myalgia?". *Cleveland Clinic Journal of Medicine*. 77 (7): 435–442.

The structure of coenzyme Q₁₀ is very much similar to the structure of **Vitamin K**, which competes with and counteracts warfarin's anticoagulation effects. Coenzyme Q₁₀ should be avoided in patients currently taking warfarin due to the increased risk of clotting.*

* Wyman, M.; Leonard, M.; Morledge, T. (Jul 2010). "Coenzyme Q₁₀: a therapy for hypertension and statin-induced myalgia?". *Cleveland Clinic Journal of Medicine*. 77 (7): 435–442.

Sperm use CoQ10 as their source of energy via the mitochondria in their tails. When their tails drop off they can no longer swim. Important in sub-fertile couples.

Do men need sperm health supplements?



Supplements for sperm health

Folic acid

Vitamin C

Vitamin E and Selenium

Acetyl Carnitine

CoQ10

Zinc

Lycopene

Garlic

Sources*

**Beef heart, liver and muscle,
Pork heart liver and muscle,
sardines, Red fish, Soy bean,
Olive, Grape seed and
Rapeseed oils**

*Pravst, Igor; Žmitek, Katja; Žmitek, Janko (2010). "Coenzyme Q₁₀ Contents in Foods and Fortification Strategies". *Critical Reviews in Food Science and Nutrition*. 50 (4): 269–280. doi:10.1080/10408390902773037. PMID 20301015

Table 1. Coenzyme Q₁₀ Content of Selected Foods (98-100)

Food	Serving	Coenzyme Q ₁₀ (mg)
Beef, fried	3 ounces*	2.6
Herring, marinated	3 ounces	2.3
Chicken, fried	3 ounces	1.4
Soybean oil	1 tablespoon	1.3
Canola oil	1 tablespoon	1.0
Rainbow trout, steamed	3 ounces	0.9
Peanuts, roasted	1 ounce	0.8
Sesame seeds, roasted	1 ounce	0.7
Pistachio nuts, roasted	1 ounce	0.6
Broccoli, boiled	½ cup, chopped	0.5
Cauliflower, boiled	½ cup, chopped	0.4
Orange	1 medium	0.3
Strawberries	½ cup	0.1
Egg, boiled	1 medium	0.1

*A three-ounce serving of meat or fish is about the size of a deck of cards.

<https://lpi.oregonstate.edu/mic/dietary-factors/coenzyme-Q10>

FDA Daily Value (RDA)

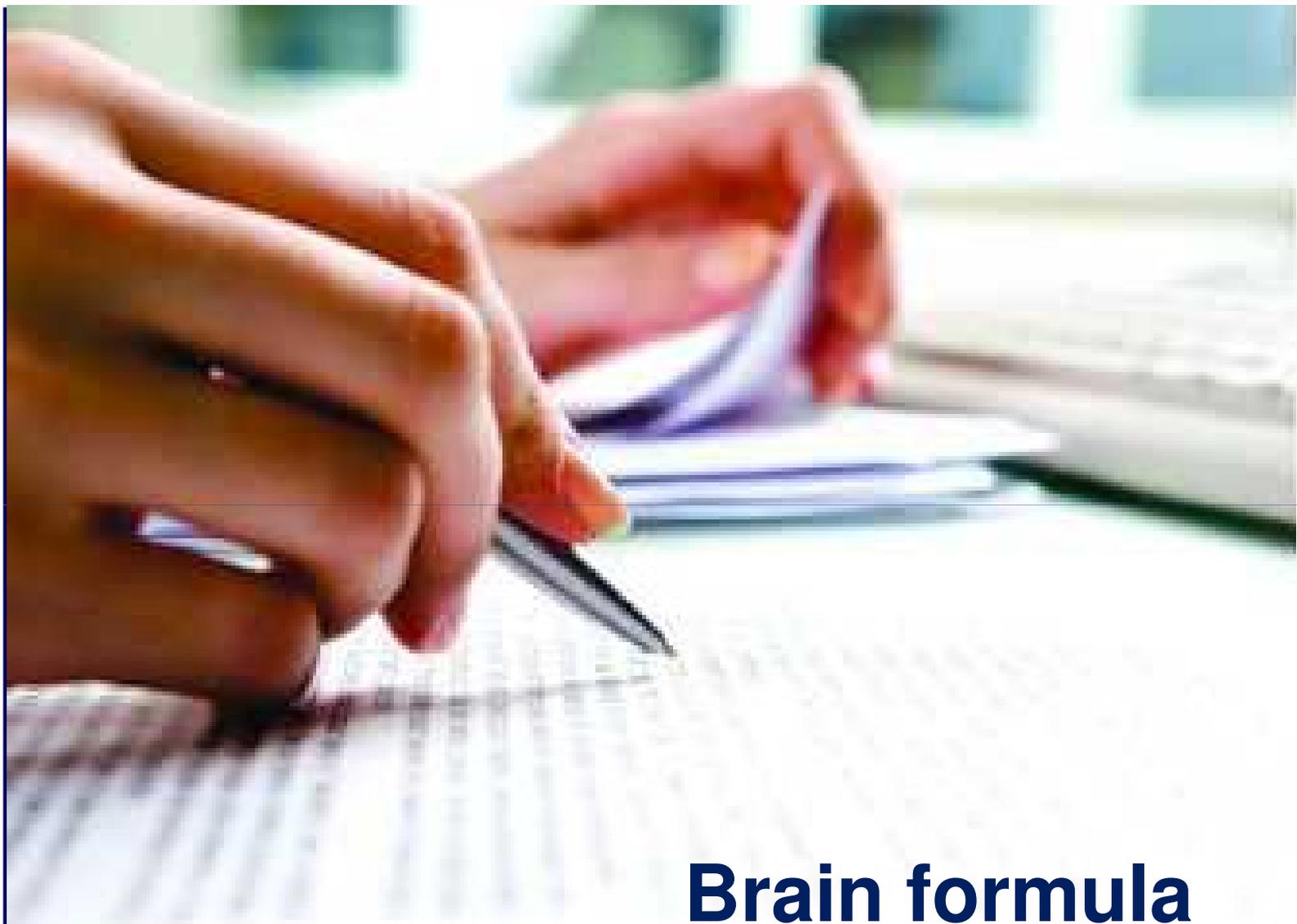
None known*

Up to 3500mg considered to be safe. **

Clinically best taken last thing at night as acid inhibits absorption.

***Hyson, H. C.; Kieburtz, K.; Shoulson, I.; et al. (Sep 2010). "Safety and tolerability of high-dosage coenzyme Q₁₀ in Huntington's disease and healthy subjects". *Movement Disorders*. 25 (12): 1924–1928.*

***https://www.accessdata.fda.gov/scripts/InteractiveNutritionFactsLabel/factsheets/Vitamin_and_Mineral_Chart.pdf**



Brain formula

Memory recall

Restricted cerebral blood flow.

Stress - high cortisol.

Toxins.

Low ACh neurotransmitter. (Low ACh people don't dream).

Nutritional deficiency

Low Magnesium,

Phosphatidyl- serine,

Choline,

Dimethylethanolamine (DMAE)

A lesser-known compound in fish, **dimethylaminoethanol (DMAE)**, is increasingly favoured for its role in boosting brain power. DMAE has shown positive results in the treatment of a variety of cognitive and disruptive disorders, including attention-deficit hyperactivity disorder (ADHD) and memory lapses. DMAE is even being used in skin care products designed to treat sagging skin and age spots.

Liposomal Brain Formula

**Liposomal mix of
Phosphatidylcholine and
Phosphatidylserine, DMAE 25mg.
5ml to delivers**

Acetylcarnitine 100mg

Pantothenic acid 50mg

NADH 1mg

Riboflavin-5-phosphate 5mg

Thiamine 5mg

ATP 5mg

Additional memory supplements

Vitamin E

Polyphenolics - Sulfurophane

Astraxanthin

Selenium

Omega 3

Glutathione

Hupezine A, Vinpocetin,

Rosemary, Radiola,

Bacopa monniera, Ginkgo biloba

**Catecholamine intermediates
and their relationship to mental
illnesses**

**Abram Hoffer
and Linus
Pauling at the
symposium,
“Adjuvant
Nutrition in
Cancer
Treatment,”
Tulsa, Oklahoma.
November 1992.**



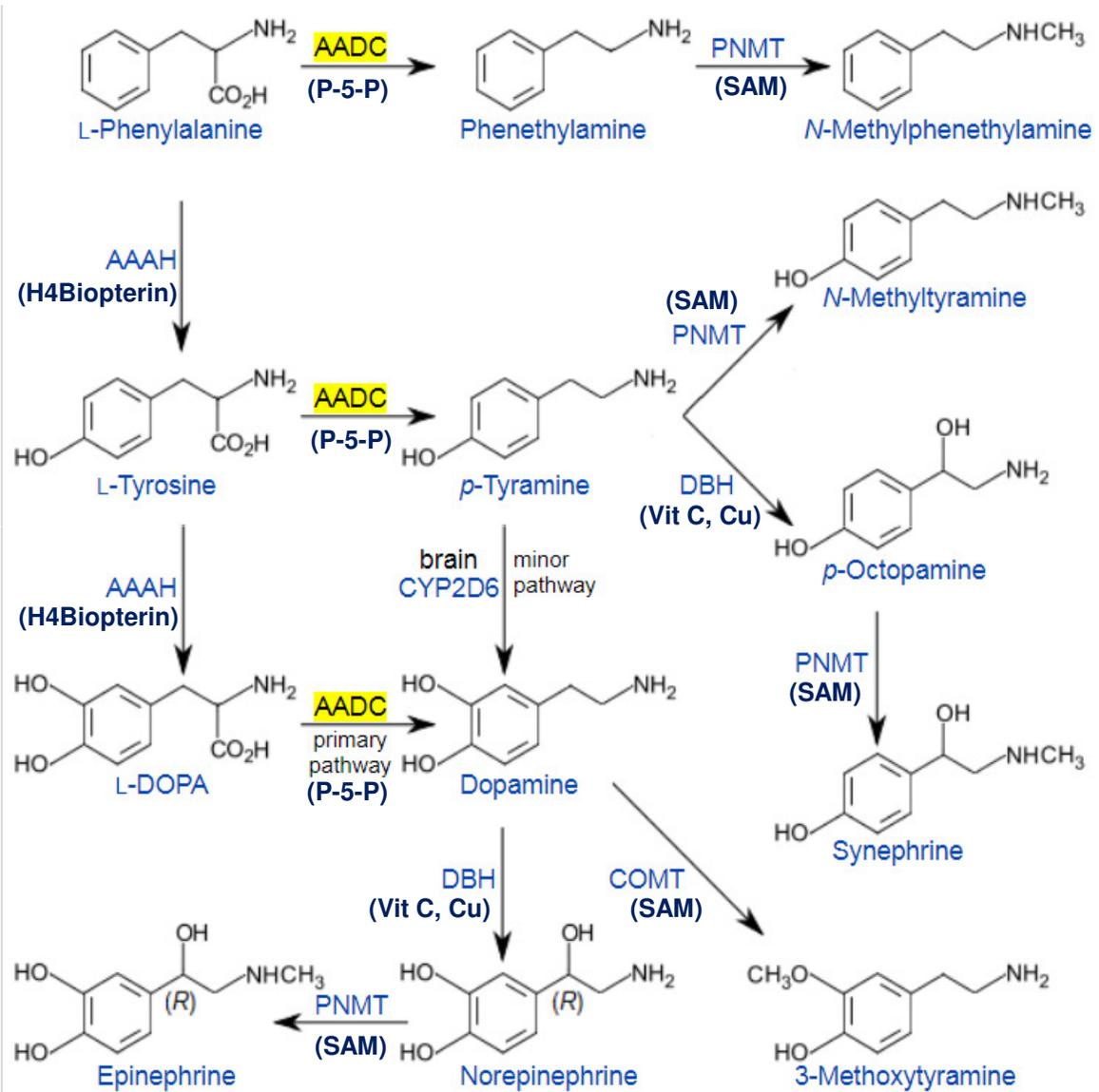
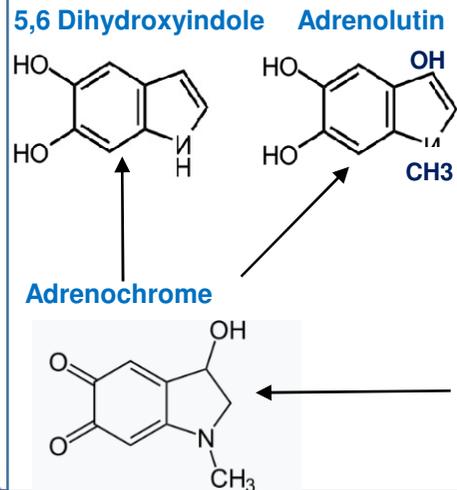
AAAH = Aromatic amino acid hydroxylase (H4Bioterin)

PNMT = Phenylethanolamine N-Methyltransferase (SAM)

AADC = Aromatic L-amino acid decarboxylase (P-5-P)

DBH = Dopamine beta-hydroxylase (Vit C, Cu)

COMT = Catechol -O-methyl transferase (SAM)



**Noradrenalin and Adrenalin
(Norepinephrine and
Epinephrine)**

TYROSINE

O₂
Inhibited by Co, DDT,
Mn, Ni, Zn)

H4 Biopterin
tyrosine hydroxylase
(stimulated by Vit D,
Cu, Fe, S)

D4 Biopterin

11p 384nm
NADH
Vit C

L.DOPA

CO₂
(inhibited by high
levels of CO₂, Mg,
Ca)

dopamine decarboxylase 7p 380nm
P-5-P
Zn, Glutathione, Light

DOPAMINE

O₂

Vit C, Cu
dopamine hydroxylase 9q 382nm

NORADRENALIN **ADRENALIN**

PNMT SAM 17q 392nm

NORADRENALIN

monoamine oxidase 14 387nm
23x 400nm

Cu+ FAD

Inhibited by benzoic acid,
caffeine, anthrocyandins,
eugenol, naringen, raison

O₂ + H₂O

H₂O₂

Dihydroxymandelic
acid + NH₂

catechol-O-methyltransferase

Mg⁺⁺, Fe, Mn, Cysteine 22 399nm

Inhibited by epicatechin, 2OH and
CH₃ Estrogens, Vit C, Ca, quercetin
SAH, SAM,

Vanillylmandelic acid

Fe⁺⁺

Fe⁺⁺⁺

·OH + OH⁺

SAM

Vanillylmandelic acid



*Glutathione (Cysteine,
Glycine, Glutamic acid)*

NAC, Zn⁺⁺, P5P, Sel

a-Lipoic or

Sulfation (PAPs) S, MSM

Taurine or

Glucuronidation (UDP

Gucuronic acid) Glucuronate,

Vit C, or

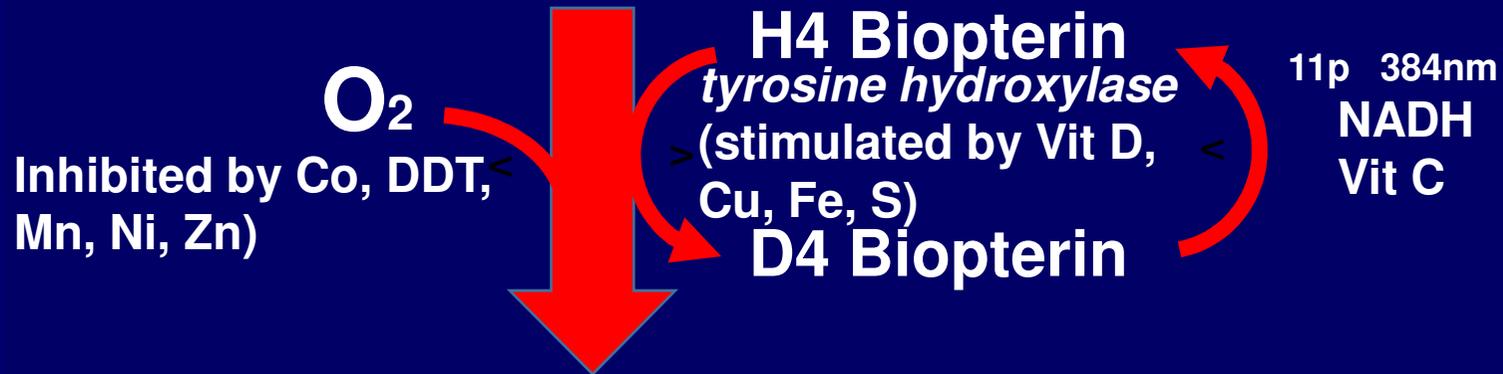
Acetylation (Acetyl CoA) B5,

Acetyl CoA

Conjugates excreted through
the bile or urine

Dopamine

TYROSINE



L.DOPA



DOPAMINE

DOPAMINE

monoamine oxidase 14 387nm
23x 400nm

Cu+ FAD

Inhibited by benzoic acid,
caffeine, anthrocyandins,
eugenol, naringen, raison

O₂ + H₂O

H₂O₂

Dihydroxyphenyl
acetic acid + NH₂

catechol-O-methyltransferase

22 399nm

Mg⁺⁺, Fe, Mn, Cysteine

Inhibited by epicatechin, 2OH and
CH₃ Estrogens, Vit C, Ca, quercetin
SAH, SAM,

SAM

Fe⁺⁺

Fe⁺⁺⁺

·OH + OH⁺

Homovanillic acid

Homovanillic acid

*Glutathione (Cysteine,
Glycine, Glutamic acid)*

NAC, Zn⁺⁺, P5P, Sel

a-Lipoic or

Sulfation (PAPs) S, MSM

Taurine or

Glucuronidation (UDP

Gucuronic acid) Glucuronate,

Vit C, or

Acetylation (Acetyl CoA) B5,

Acetyl CoA

**Conjugates excreted through
the bile or urine**

**Adrenalin
(Epinephrine)**

TYROSINE

O₂
Inhibited by Co, DDT,
Mn, Ni, Zn)

H4 Biopterin
tyrosine hydroxylase
(stimulated by Vit D,
Cu, Fe, S)

D4 Biopterin

11p 384nm
NADH
Vit C

L.DOPA

CO₂
(inhibited by high
levels of CO₂, Mg,
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dopamine decarboxylase 7p 380nm
P-5-P
Zn, Glutathione, Light

DOPAMINE

O₂

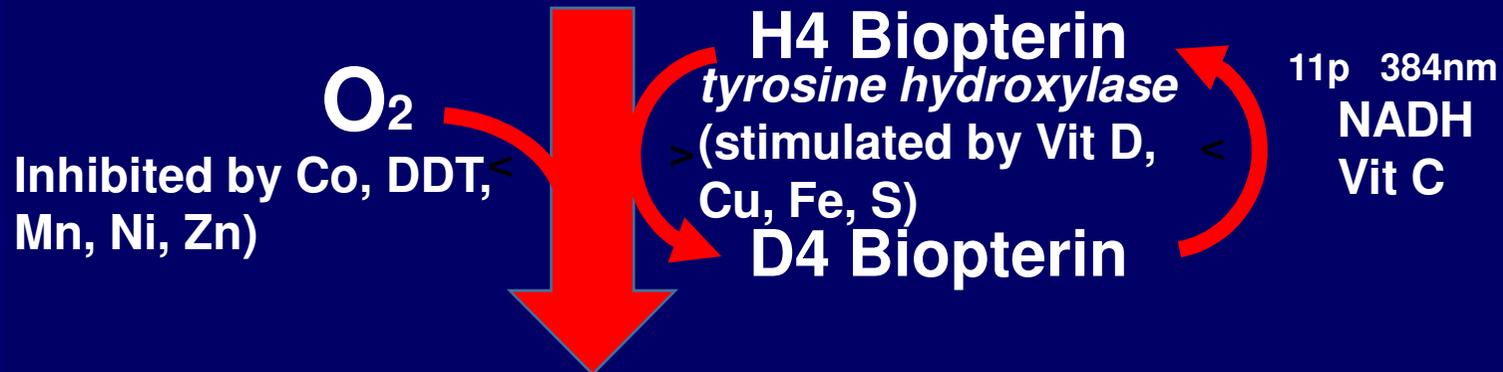
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NORADRENALIN **ADRENALIN**

PNMT SAM 17q 392nm

Serotonin

TRYPTOPHAN



5-Hydroxytryptophan



SEROTONIN

SEROTONIN

monoamine oxidase 14 387nm
23x 400nm

Cu+ FAD

Inhibited by benzoic acid,
caffeine, anthrocyandins,
eugenol, naringen, raison

O₂ + H₂O

H₂O₂

Hydroxyindole
acetate + NH₄



catechol-O-methyltransferase

22 399nm

Mg⁺⁺, Fe, Mn, Cysteine

Inhibited by epicatechin, 2OH and
CH₃ Estrogens, Vit C, Ca, quercetin
SAH, SAM,

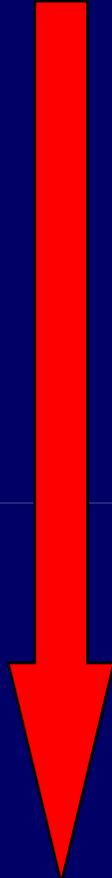
SAM

Fe⁺⁺⁺

·OH + OH⁺

Methoxyindole acetate

Methoxyindole acetate



*Glutathione (Cysteine,
Glycine, Glutamic acid)*

NAC, Zn⁺⁺, P5P, Sel

a-Lipoic or

Sulfation (PAPs) S, MSM

Taurine or

Glucuronidation (UDP

Gucuronic acid) Glucuronate,

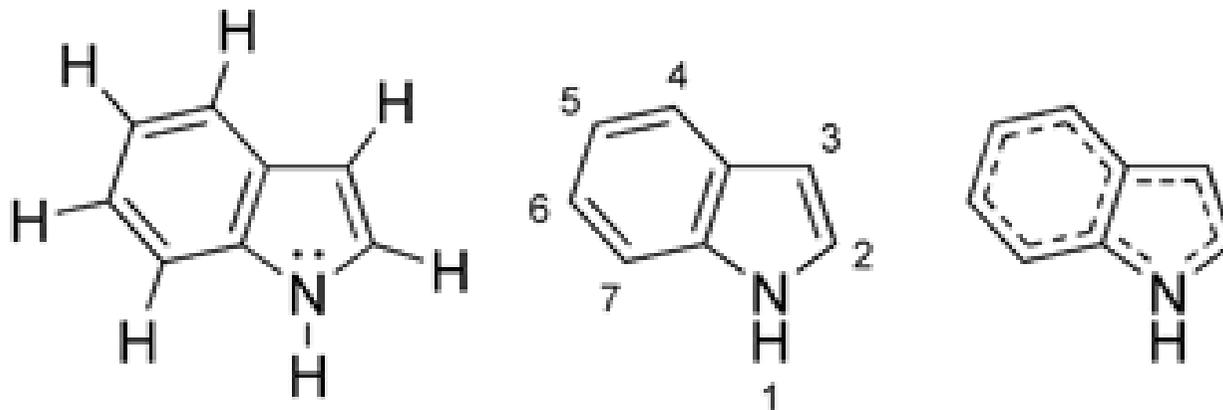
Vit C, or

Acetylation (Acetyl CoA) B5,

Acetyl CoA

Conjugates excreted through
the bile or urine

Indole is a by-product of the digestion of tryptophan and is one of the compounds that gives the faeces its characteristic odour (together with the scatol and other substances).



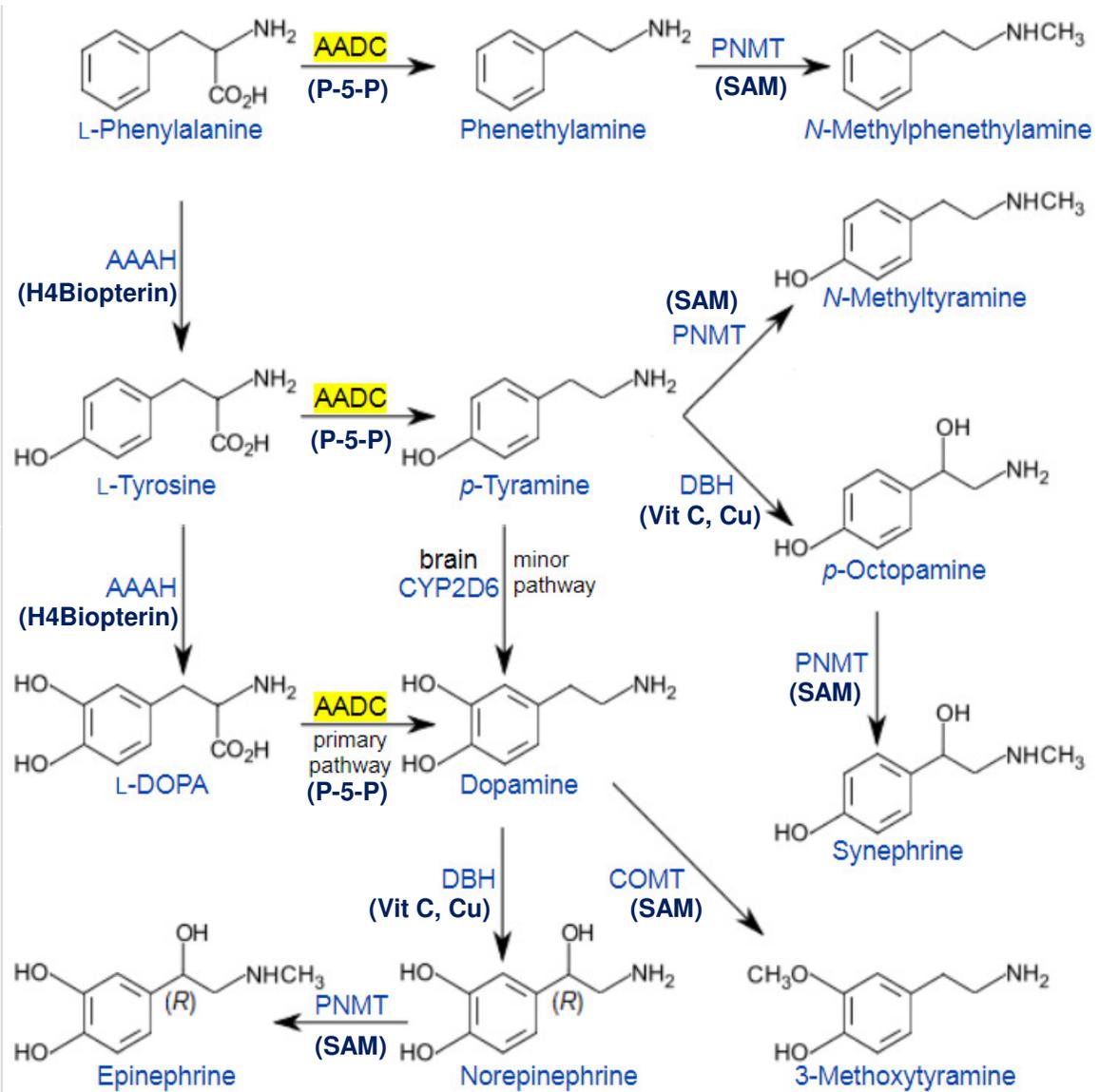
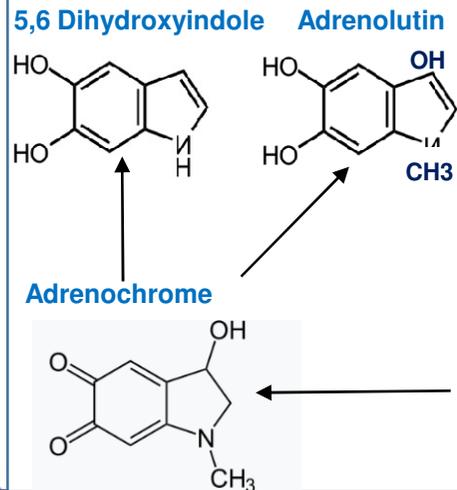
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ELSEVIER

International Review of Neurobiology

Volume 4, 1962, Pages 307-371

This chapter describes the activity of adrenochrome and some of its derived compounds. The effect of adrenochrome is considered first upon simple systems, then more complex systems, then simple animals, and finally, upon the most complex animal, the man. animals that are given adrenochrome range from spiders, fish, and pigeons to the mammals including rats, cats, dogs, monkeys, and man. The chapter gives much original data on cats and man. Chemically, adrenochrome and adrenolutin are very reactive substances. Some of the changes produced by adrenochrome may persist several days, and in some cases, the effects lead to nearly disastrous results. Two cases of prolonged reactions are discussed in the chapter. There is also a discussion regarding the reaction that lasted more than one day after a single administration of adrenolutin as well as reactions up to one week. The changes in thinking induced by adrenochrome are similar to those observed in schizophrenia. Adrenochrome causes an elective inhibition of the process, which determines the content of associative thinking. This occurs in doses that do not heighten the lability of basic processes, do not reduce excitation, and do not loose temporary connections as is the case with LSD.

Conversion of Adrenaline to Adrenolutin in Human Blood Serum

A. HOFFER, M.D.; M. KENYON

» [Author Affiliations](#)

AMA Arch NeurPsych. 1957;77(4):437-438. doi:10.1001/archneurpsyc.1957.02330340113017

Abstract

Adrenochrome (3-hydroxy-N-methyl-5,6-dioxindole) and adrenolutin (3,5,6-trihydroxy-1-methylindole) may be involved in the production of schizophrenia. These compounds have not been detected in blood, nor have enzyme systems been clearly demonstrated which can produce them from adrenaline. It is therefore of interest to show that the conversion can occur in blood serum.

Following Osmond and Smythies'⁸ suggestion that schizophrenic patients may have within them an M substance related in structure to both mescaline and epinephrine, Hoffer, Osmond, and Smythies⁵ discovered that adrenochrome, an oxidized derivative of epinephrine, induced psychological changes in humans. Hoffer and Osmond² postulated that the basic physiological abnormality in schizophrenia was an abnormality in the autonomic nervous system expressed chemically in the increased production of both acetylcholine and some oxidized derivative of adrenaline similar in structure to either adrenochrome or adrenolutin. Both these substances have similar properties in producing psychological changes (Hoffer³).

Adrenochrome is a pigment obtained by the oxidation of adrenaline. Studies in the mid-twentieth century have indicated that adrenochrome is metabolized as one of two other substances, dihydroxyindole or **adrenolutin**.

Dihydroxyindole may balance the anxiety and depression effects of adrenaline to reduce tension and irritability.

Defective processing of **adrenochrome, however, primarily produces the toxic **adrenolutin** instead, which combines with adrenochrome.**

The **adrenochrome-adrenolutin** combination is hypothesized by Dr. Abram Hoffer and Humphrey Osmond to result in disruption of the brain's normal chemical processes. This disruption, according to their hypothesis, would be responsible for the symptomatology of schizophrenia.

This hypothesis has long been opposed by proponents of the establishment medical industry.

Treatment

Mega doses Niacin and Vitamin C

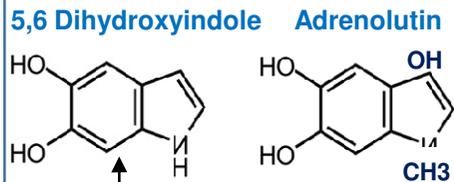
AAAH = Aromatic amino acid hydroxylase (H4Bioterin)

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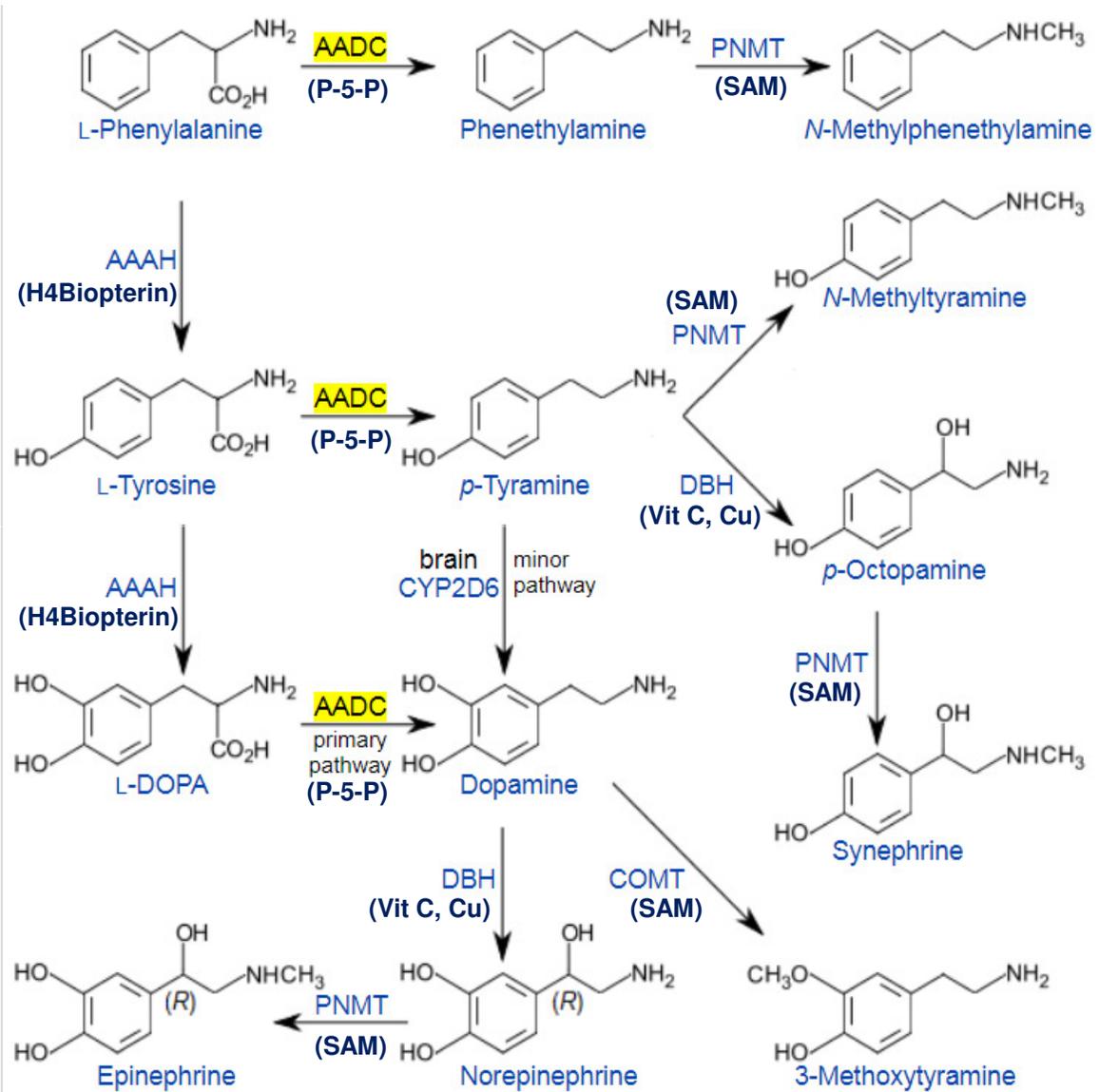
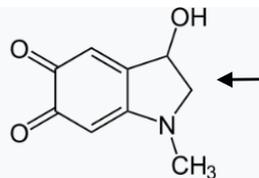
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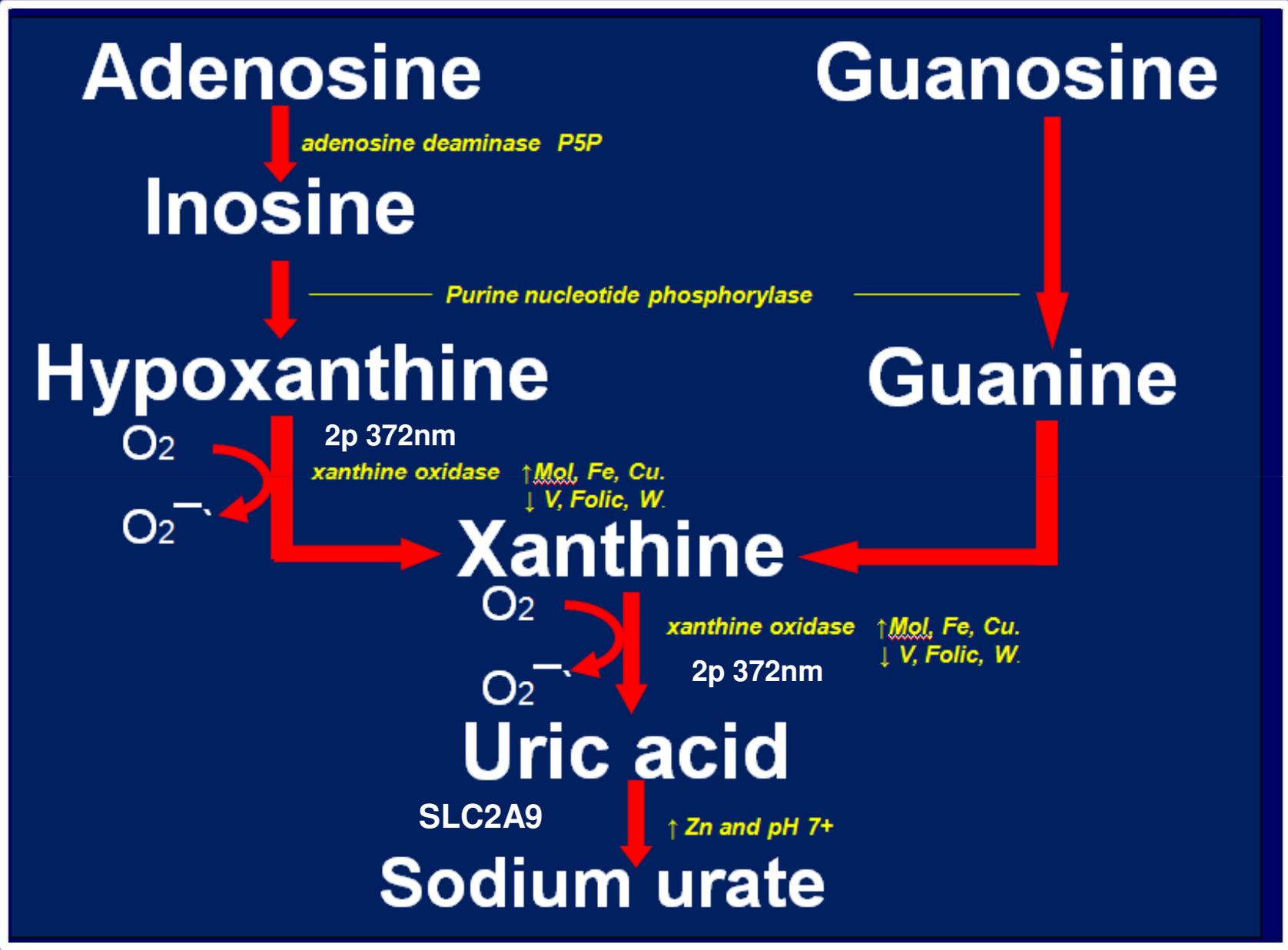
Adrenochrome



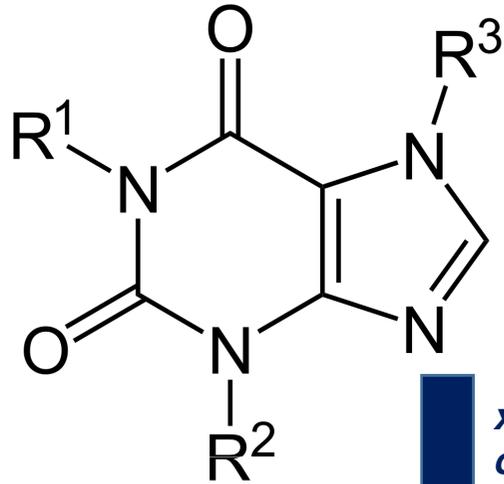
Xanthine v Alloxan



Dr Royal Lee 1895- 1967

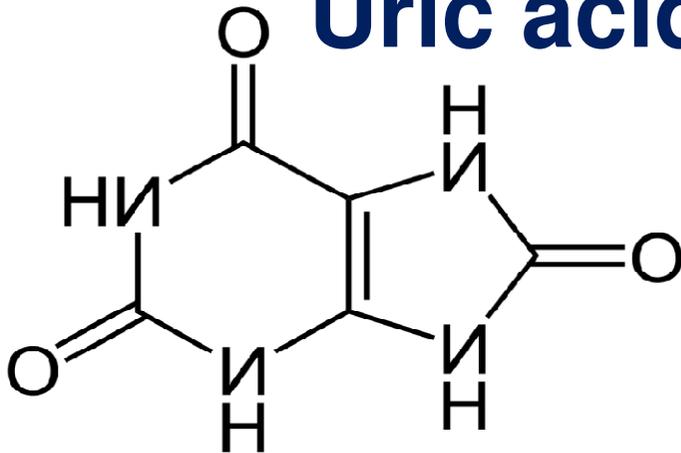


Xanthine



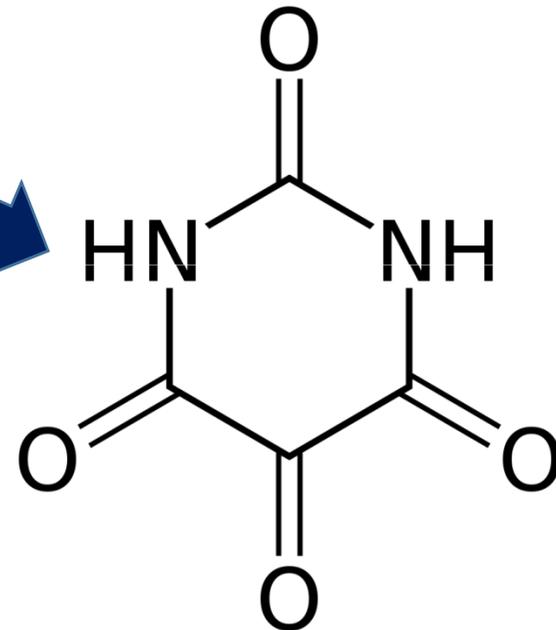
xanthine oxidase

Uric acid



Alloxan

bleaching agents



Xanthine is a purine base found in most human body tissues and fluids and in other organisms.

A number of stimulants are derived from xanthine, including caffeine and theobromine.*

*Spiller, Gene A. (1998). *Caffeine*. Boca Raton: CRC Press. ISBN 0-8493-2647-8

Alloxan is classified as a derivative of pyrimidine.

The alloxan model of diabetes was first described in rabbits by Dunn, Sheehan and McLetchie in 1943.*

It was originally obtained by oxidation of uric acid by nitric acid.

*Dunn, J. S.; Sheehan, H. L.; McLetchie, N. G. B. (1943). "Necrosis of Islets of Langerhans Produced Experimentally". *Lancet*. 241 (6242): 484–487.

Alloxan is a toxic glucose analogue, which selectively destroys insulin-producing cells in the pancreas when administered to rodents and many other animal species.

This causes an insulin-dependent **diabetes mellitus** in these animals, with characteristics similar to type 1 diabetes in humans.

The beta cell toxic action of **alloxan** is initiated by free radicals formed in this redox reaction. Studies suggests that alloxan does not cause diabetes in humans.* Others found a significant difference in alloxan plasma levels in children with and without diabetes Type 1.

*Lenzen, S. (2008). "The Mechanisms of Alloxan- and Streptozotocin-induced Diabetes". *Diabetologia*. 51 (2): 216–226

Because it selectively kills the insulin-producing beta-cells found in the pancreas, **alloxan is used to induce diabetes in laboratory animals.***

*Loreto D, Elina V. 2009. Experimental surgical models in the laboratory rat. Boca Raton: CRC Press.

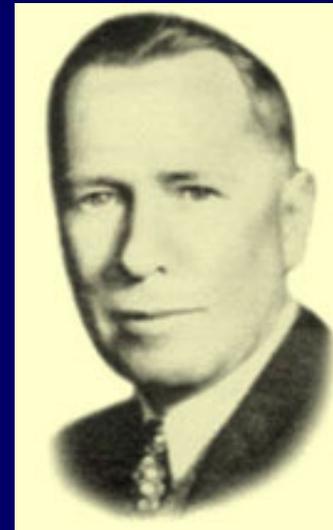
In addition, **alloxan** has a high affinity to SH-containing cellular compounds and, as a result, reduces glutathione content. Furthermore, alloxan inhibits glucokinase, a SH-containing protein essential for insulin secretion induced by glucose.*

*Szkudelski T. 2001. The mechanism of alloxan and streptozotocin action in B cells of the rat pancreas. *Physiol Res* 50:536–546

Royal Lee says

**Bleaching flour turns
Vitamin E into Alloxan.**

**All flour bleaches covert
xanthine of flour (xanthine is one
of the germ components that
have vitamin value) it cooperates
with Vitamin E) into the highly
poisonous alloxan.**



Flour bleaching agent is a food additive added to flour in order to make it appear whiter (freshly milled flour has a yellowish tint) and to oxidize the surfaces of the flour grains and help with developing of gluten.

Usual flour bleaching agents are:

Organic peroxides (benzoyl peroxide)

Calcium peroxide

Chlorine

Chlorine dioxide

Azodicarbonamide

Nitrogen dioxide

Atmospheric oxygen, used during natural aging of flour

Use of chlorine, bromates, and peroxides is not allowed in the European Union.*

*The Bread and Flour Regulations 1998 (as amended) (PDF), Food Standards Agency, UK, p. 6, retrieved December 28, 2012



INDEPENDENT

THE SHOCKING TRUTH ABOUT BREAD

Flour, yeast, water and salt - a traditional loaf needs only four ingredients. So why are calcium propionate, amylase, chlorine dioxide and L-cysteine hydrochloride now crammed into our daily bread? Andrew Whitely, Britain's leading organic baker, reveals how our staple foodstuff was transformed into an industrial triumph, but a nutritional and culinary disaster. And, overleaf, he shares essential recipes for making your own slice of homemade heaven

BLEACH

Chlorine dioxide gas is used by millers and makes white flour whiter. It has some "improving" effect on the flour - bleaches have been used as a substitute for the natural ageing of flour.

**Naturally occurring
endogenous chemicals
as intermediates in
metabolism _f**

Common naturally endogenously occurring reactive intermediates

Acetaldehyde

Acetic acid

Acetone

Ammonia*

Butyric acid

Cyanide

Ethane

Formaldehyde

Formic acid*

Glutamate

Hydrogen sulfite*

H₂O₂*

4-Hydroxynonenol*

Indole

L. Lactic acid

D. Lactic acid

D/L Lactic acid

Malondialdehyde*

Methane

Methanol, Oxalate*

Phenol*

Propionic acid*

Pyruvate

Toluene

Tyramine*

Uric acid*

* **Most common**

**Naturally occurring
ingested chemicals in
foods and drinks** f

Many changes in gene expression are due to faulty signals caused by toxins or are inherited.

The most common toxins are naturally occurring chemicals within the foods we eat or drink or natural endogenously produced reactive intermediates which fail to be metabolised completely.

Common naturally endogenously occurring reactive intermediates

Acetaldehyde

Acetic acid

Acetone

Ammonia*

Butyric acid

Cyanide

Ethane

Formaldehyde

Formic acid*

Glutamate

Hydrogen sulfite

H₂O₂

4-Hydroxynonenol*

Indole

Lactic acid D

Lactic acid D/L

Lactic acid L

Malondialdehyde*

Methane

Methanol

Oxalate

Phenol*

Propionic acid*

Pyruvate

Toluene

Tyramine*

Uric acid

* **Most common**

Persistent Organic Pollutants (POPs)

Hormone disruptors

Xeno-estrogens –

PCBs (electric and coolant fluids)

Bisphenol A (solvent)

Bisphenol S (adhesives)

Nonylphenols (lubricants)

DDT (insecticide)

**Polybrominated diphenyl ethers
(flame retardant)**

Perfluorooctanoic acid (flame retardant)

Endosulfan (insecticide)

Kepone (insecticide)

Vinclozolin (fungicide)

17-alpha ethinylestradiol (birth pill)

Genistein (isoflavone)

Zearalenone (fungal toxin)

Oxybenzone (sunscreen)

Tributyltin (biocide)

Electromagnetic Stress and Devices

Torsion radiation

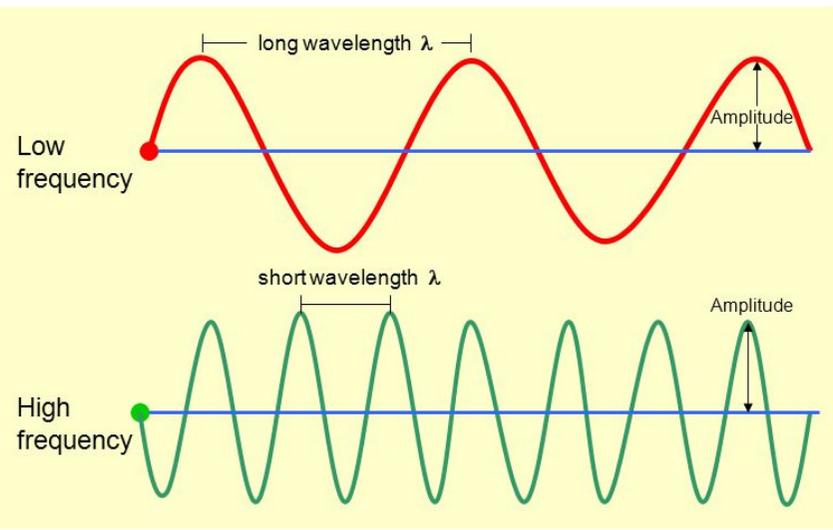
Anatoli Pavlenko - Professor of
Healthcare Management in Kiev



Wi-Fi networks use radio signals in either the 2.4 GHz or 5 GHz frequency bands.

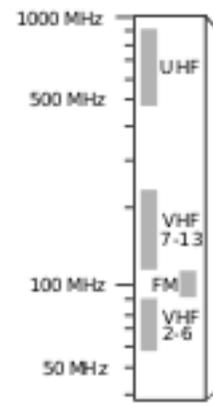
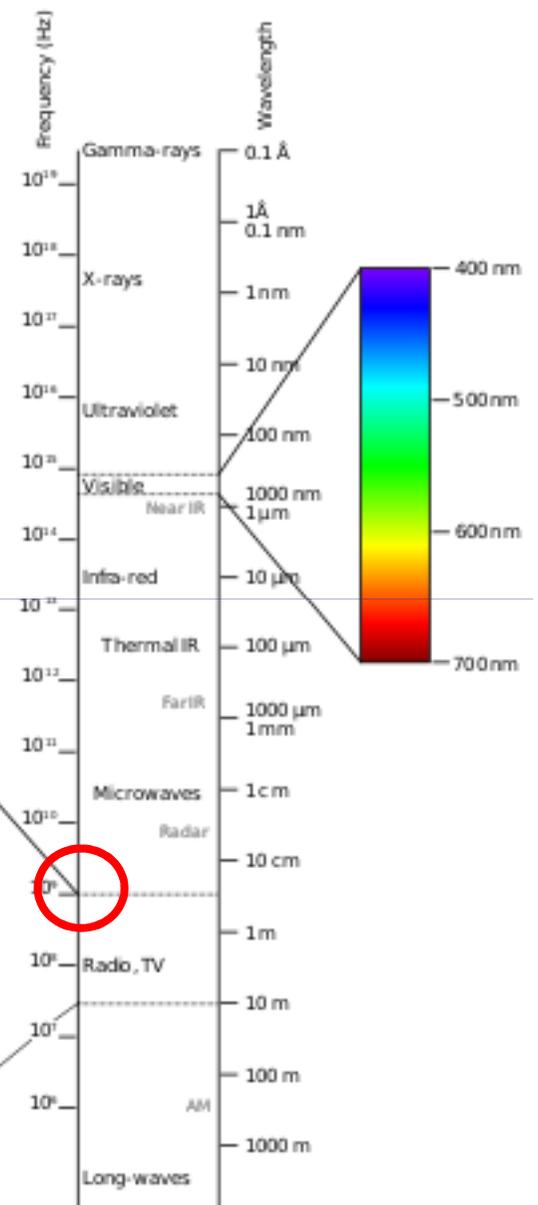
The introduction of 5G pioneers a new level of mobile performance with ultra-high speeds and low latencies.

What makes this possible is millimetre wave spectrum. In this range, 26 GHz and 28 GHz have emerged as two of the most important bands.



Prefixes in the SI System

Prefix	Symbol	Value	Power	Use
Giga	G	1,000,000,000	10^9	Gigabyte
Mega	M	1,000,000	10^6	Megamillion
Kilo	k	1,000	10^3	kilometer
deci	d	0.1	10^{-1}	decimeter
centi	c	0.01	10^{-2}	centimeter
milli	m	0.001	10^{-3}	millimeter
micro	μ	0.000001	10^{-6}	micrometer
nano	n	0.000000001	10^{-9}	nanometer



Cellular telephones work because they transmit and receive in a clearly defined range of frequencies. The 800- to 2400-megahertz transmission waves from a cellphone have a wavelength of approximately one foot and fall on the RF part of the electromagnetic spectrum.

Most apartments, family houses, offices, commercial and industrial premises are penetrated by negative **electromagnetic interference fields and torsion fields. These negatively affect people, animals and plants.**

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

Non classical electromagnetic fields have been known earlier under various definitions. The most appropriate notion of these fields should reflect their physical nature and called “torsion fields”.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

It is proved that the main factor affecting the living are **torsion (information) fields** generated by electronic equipment.

The earth's geo-pathogenic zones also have the torsion nature.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

The **blood brain barrier** which prevents invasion by toxins could be compromised by cell phone radiation. The developing skulls of children are penetrated deeply by the energy from a cell phone.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

The electromagnetic radiation and torsion component of this electromagnetic radiation creates micronuclei in human blood cells, a type of genetic damage known to be a diagnostic marker for cancer.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

Studies conducted within the industry of mobile communication are based on measurements of SAR (Specific Absorption Rate). It is used as the official standard to measure effects of electromagnetic radiation (EMR) from mobile phones on the human brain.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

This method is based on physics
and not biology.
In this model the human brain is
simulated by a solution of salts.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

So recommendations adopted in the industry of **mobile phones are as follows: any technology used to ensure safety of mobile phones shall decrease SAR values, determined on the basis of this rather disputable human brain model.**

Methods and Protection – Devices against Torsion Radiation by Anatolii Pavlenko PhD

Biologists do not consider SAR measurements as an accurate representation of mobile phone EMR effects on the human brain in real life.*

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

*Glen Rein – Quantum Biology Research March 2014

Torsion fields are often called longitudinal electromagnetic, Tesla scalar waves, tachyon field. The non classical electromagnetic fields are torsion fields generated by virtual particles – virtual electrons and positrons and some other virtual particles.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

It should be noted that **EMR level** from a mobile phone being in active mode and radiation from a iPhone being in a standby mode inhibit DNA activity identically.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

Torsion fields of any object contain information about elementary and quantitative composition of the matter and its structure including component that provides information about the spin state of this matter (rotation, parameters and nutation).

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

Analysis of the published data has shown a correlation between the development of pathological conditions and effects of EMR on user's body in the frequency range of 450-1800MHz.

Mobile phones can affect blood resulting in mononucleosis.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

Negative impacts of **mobile phone radiation** includes reduction of quantity of active man's spermatozoon by 30% after one and a half years of use.

Studies of the electromagnetic effects of UMTS (3G) have revealed that breaches of only $1/40^{\text{th}}$ times of the permitted levels.

Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD

This indicates that **genotoxicity of UMTS (3G) exceeds genotoxicity of GSM by a factor of 10 and this results in higher risk of cancer.**

**Methods and Protection – Devices against Torsion Radiation by
Anatolii Pavlenko PhD**

Professor Franz Adlkafer

**identifies mobile phone
technology of and its political
justification as a giant experiment
on human beings without any
plan and control of its
implementation and unpredictable
future consequences -**

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And warns about huge health problems in the society that continues to use mobile communications on more intensive and larger scale (5G???)

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Mobile phones have created conditions when a radio wave transmitter is in closest contact with a human being. Such emissions radiated and their torsion component account for a number of serious diseases in particular brain, and salivary gland tumours.

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They are a real lethal danger for a human only at the stage of his or her **embryonic development.**

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When a mobile phone is located in the area of the **lower pelvis of a pregnant woman**, the intensity of the electromagnetic radiation is approximately 500x higher than the maximum permissible levels by the Russian norms.

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These figure should persuade women to use **mobile phones** with more caution during pregnancy.



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Wi-Fi operates on the same frequency as microwave ovens.

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Dr Alexander Zarichanski at SpinorLab discovered ways to block the Earth's geopathic zones in residential and industrial buildings by using energy free blocking **colour combinations.**

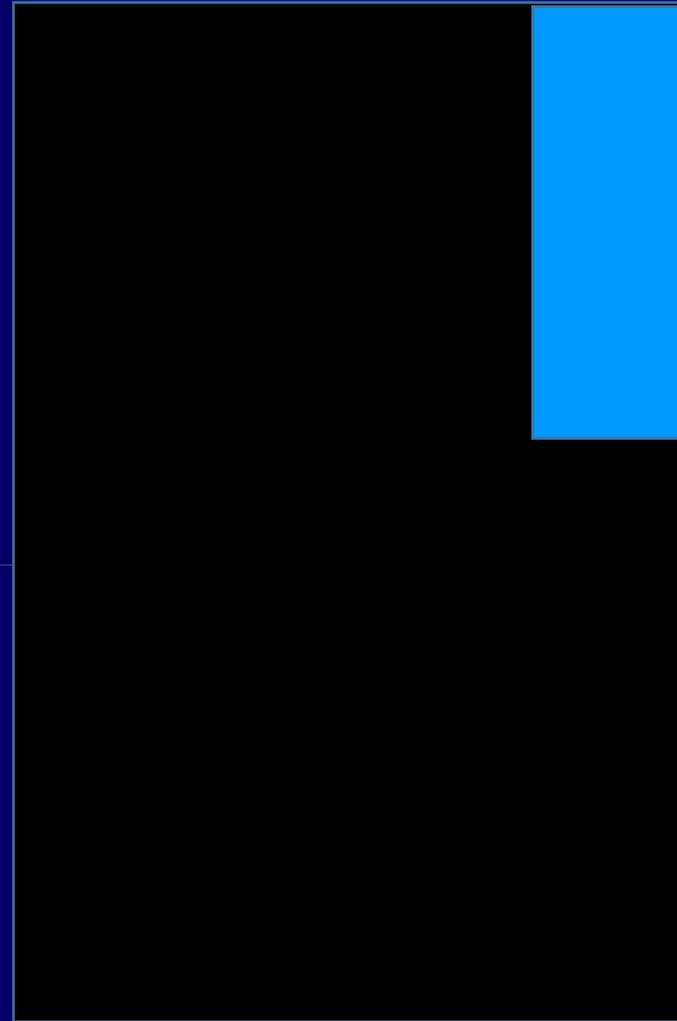
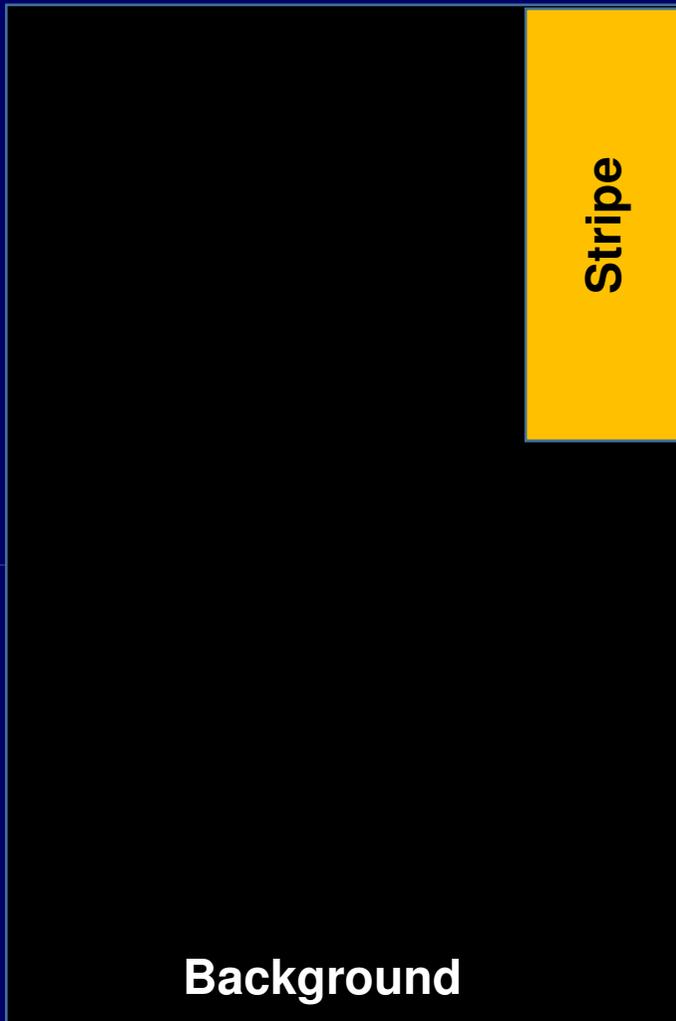
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It was found that all combinations of colours which block negative effects of geopathic zones on humans reliably protect them from adverse effects of mobile phones.

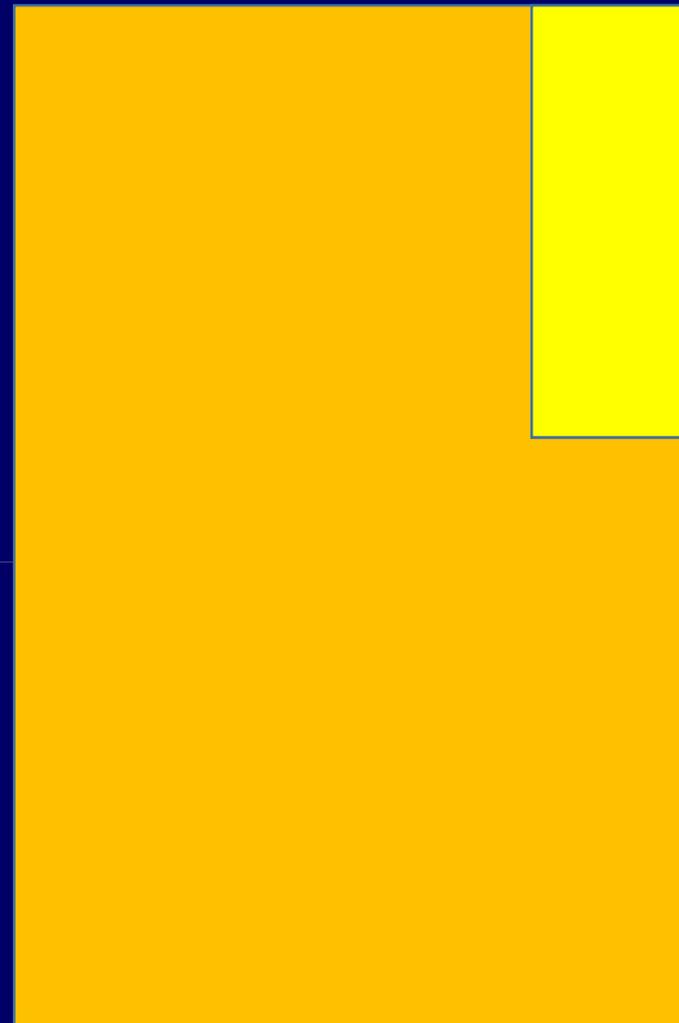
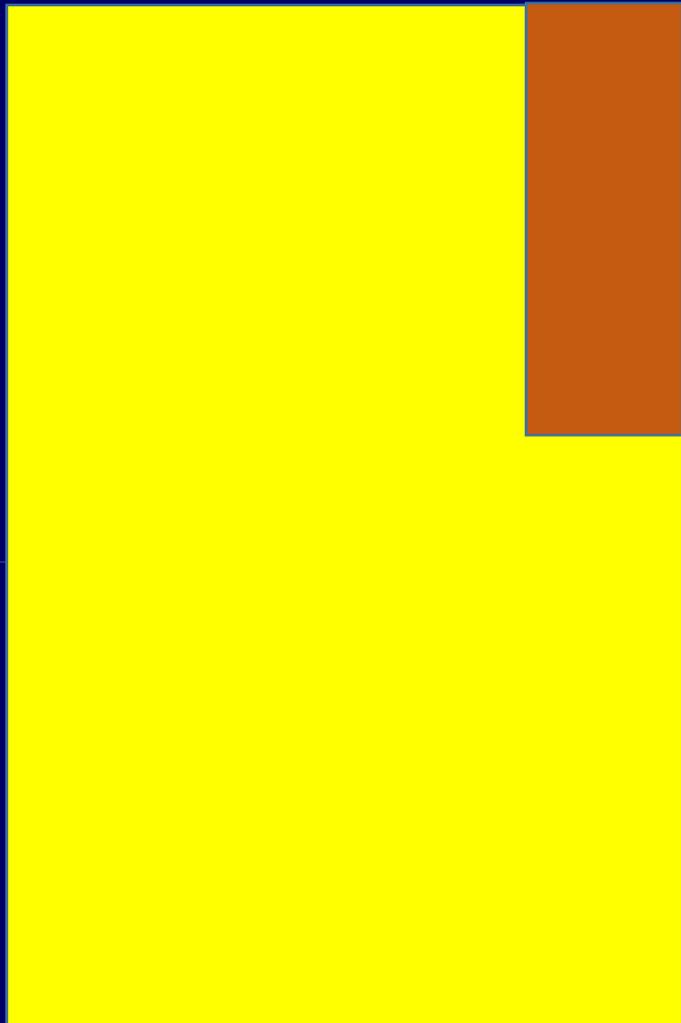
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Small size of coloured sheets in combination maybe placed on a mobile phone, laptop and other electronic devices. By placing a coloured stripe (edge) on the base colour (background) we get a torsion-active system. **Torsion-active range blocks geopathic zones**

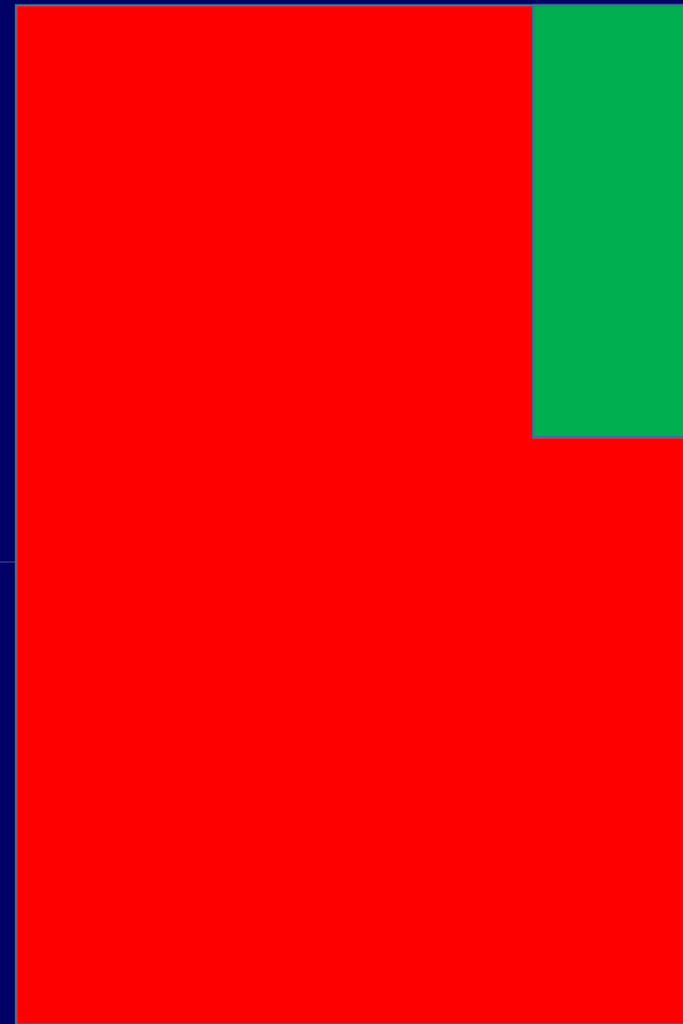
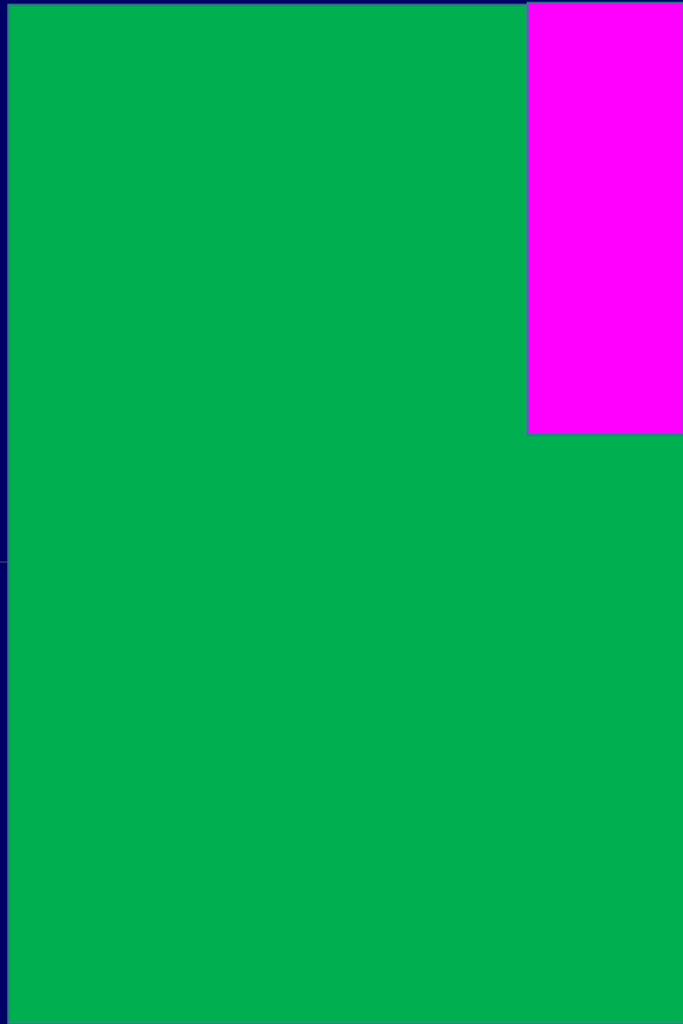
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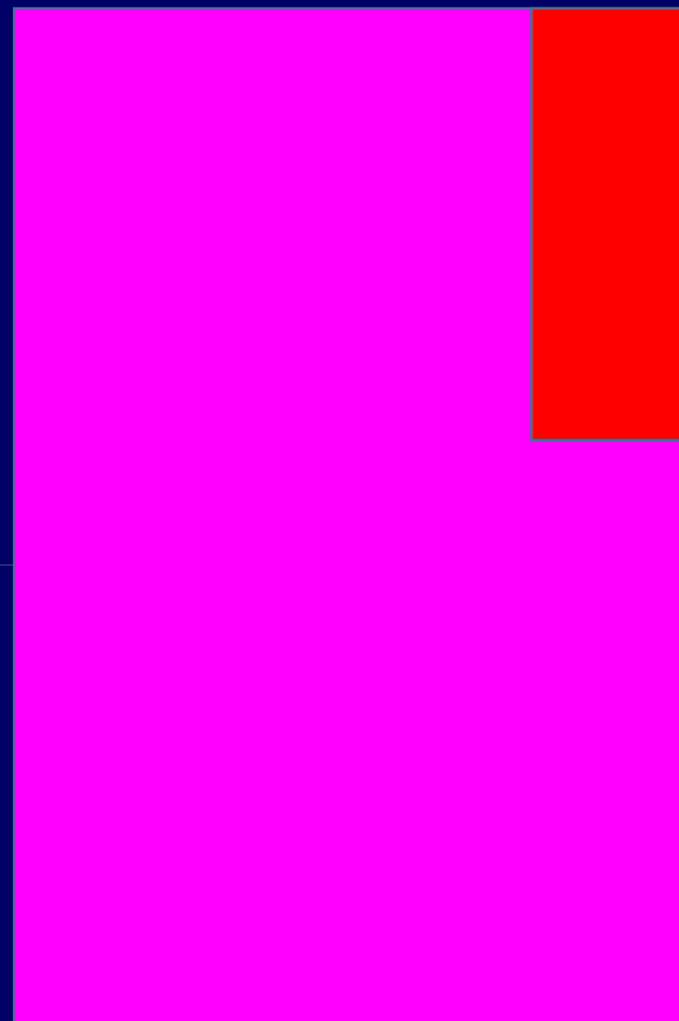
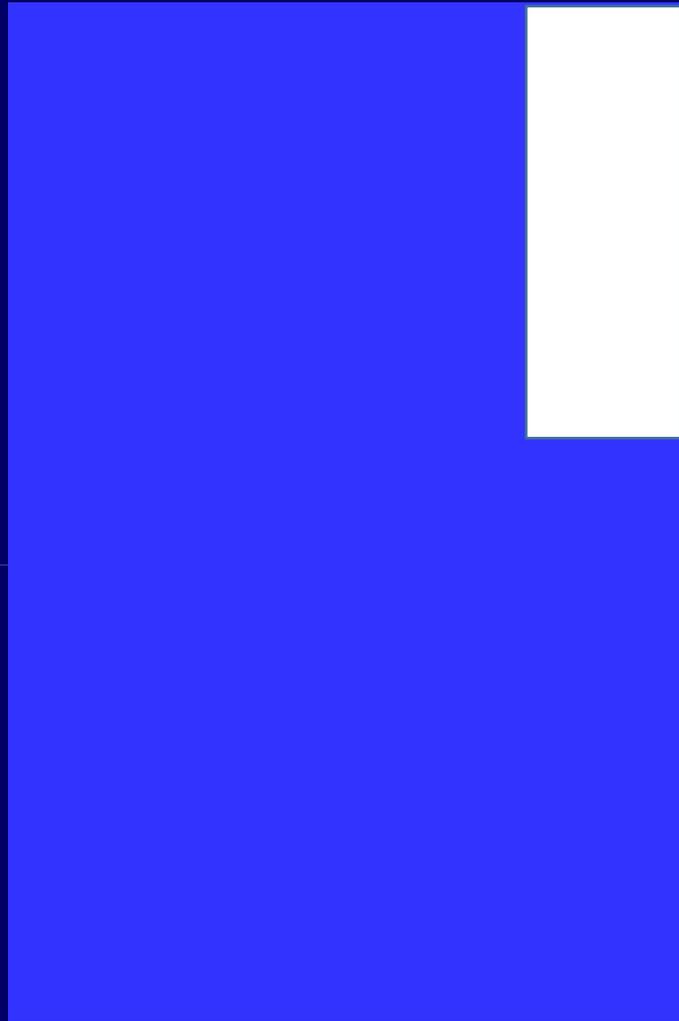
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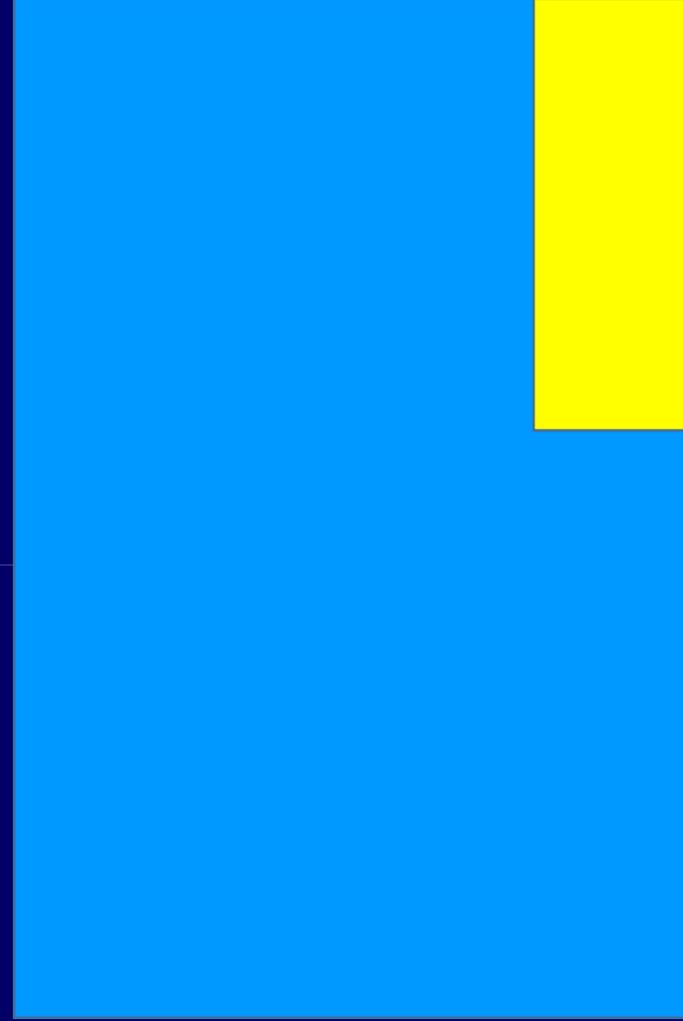
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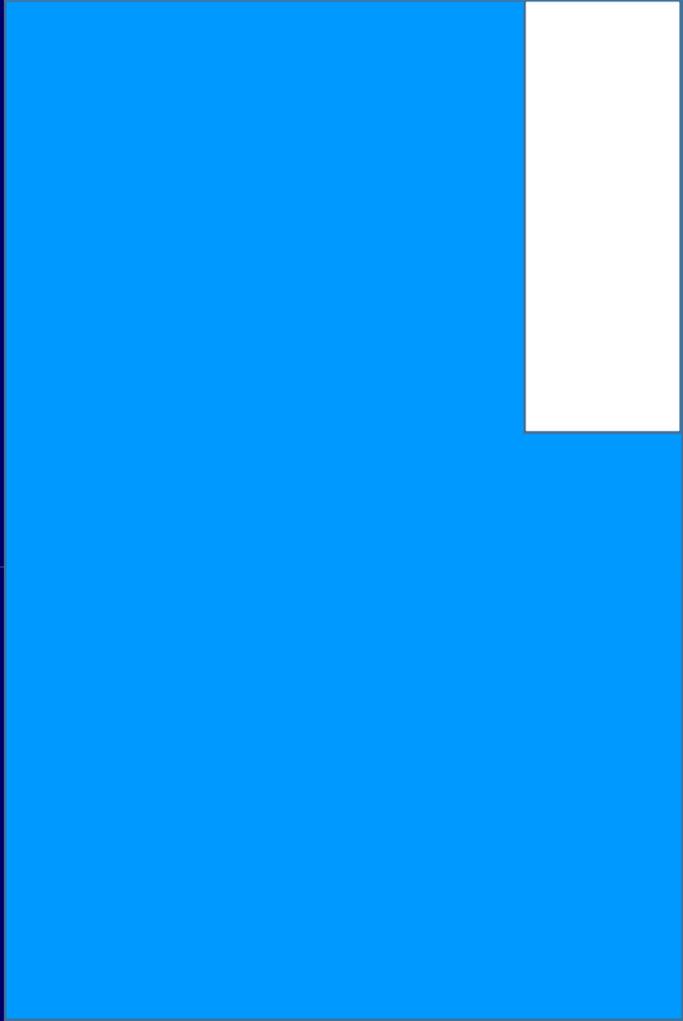
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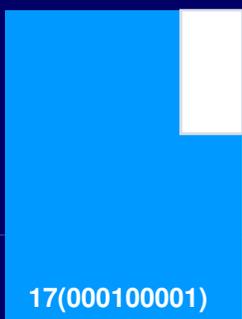
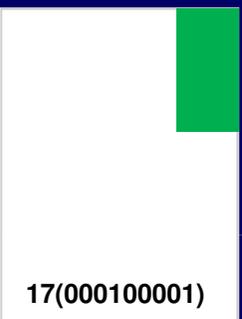
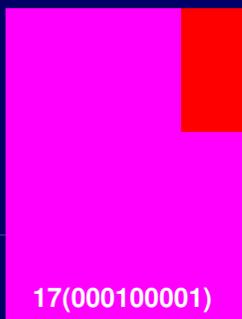
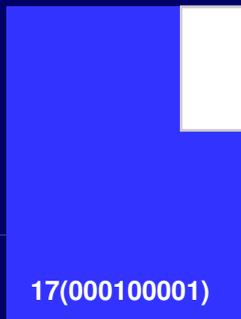
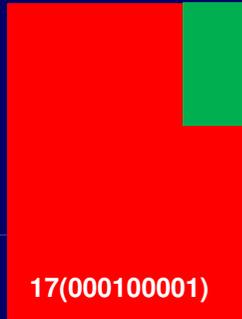
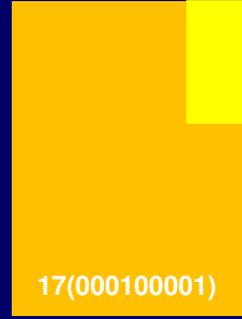
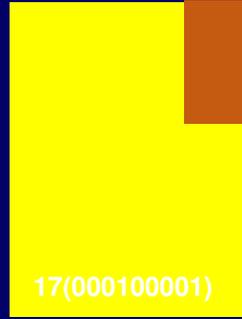
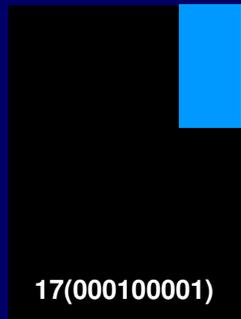
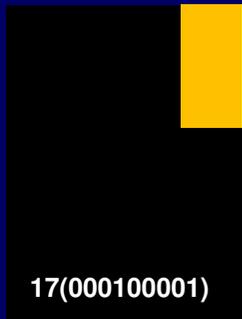
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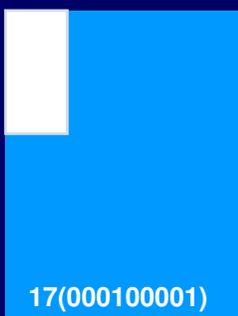
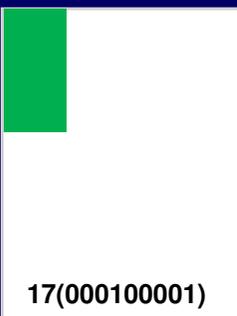
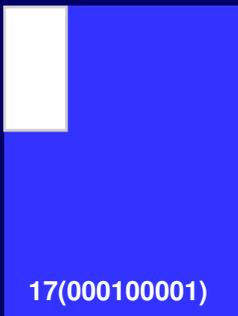
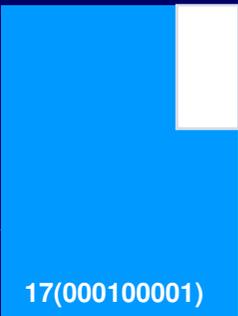
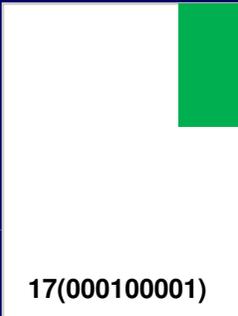


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Healthy home tips

Don't wear shoes in your home as they track in chemicals from outside.

Open windows everyday. If you don't have fresh air ventilation for at least 15 minutes daily.

This will dilute the chemicals in the air, rebalances the ions with nature and it rebalances the humidity.

Use cross ventilation.

Use a fan in stagnant windowless rooms.

Use a MERVE (minimum efficiency rated value) 11 filter and change them regularly

**Most protectors are ineffective.
Remove or shielding is best.
Active magnetic cancellation
does work.**

Summary

1. **Electricity off to bedrooms or distance yourself from the sources.**
2. **No electrical appliances near the bed**
3. **Check for static magnetics**
4. **No metal in the bed that has static magnetism – use a compass**
5. **Natural materials**
6. **No sources for a magnetic field – use a gauss meter. Possible shielding against radio waves such as foil**
7. **Timer switch for WiFi**
8. **Install a device against torsion radiation**

The **oxidative damage** by the SMART phones is yet unknown and only beginning to show - its only been 10 years on the market.

The word S.M.A.R.T stands for

S - Secret

M - Military

A- Armament in

R - Residential

T - Technology

These innocent looking cool smart phones are military devises.

The blue screen is thalium, a radioactive substance.

Why have you got military devises in your home?

The Issues with 5G

Humans can't survive in, nor can trees, plants or animals

Causes miscarraiges and infertility

Suicides and heart attacks

Fatigue

Goodbye thyroid, hello cancer



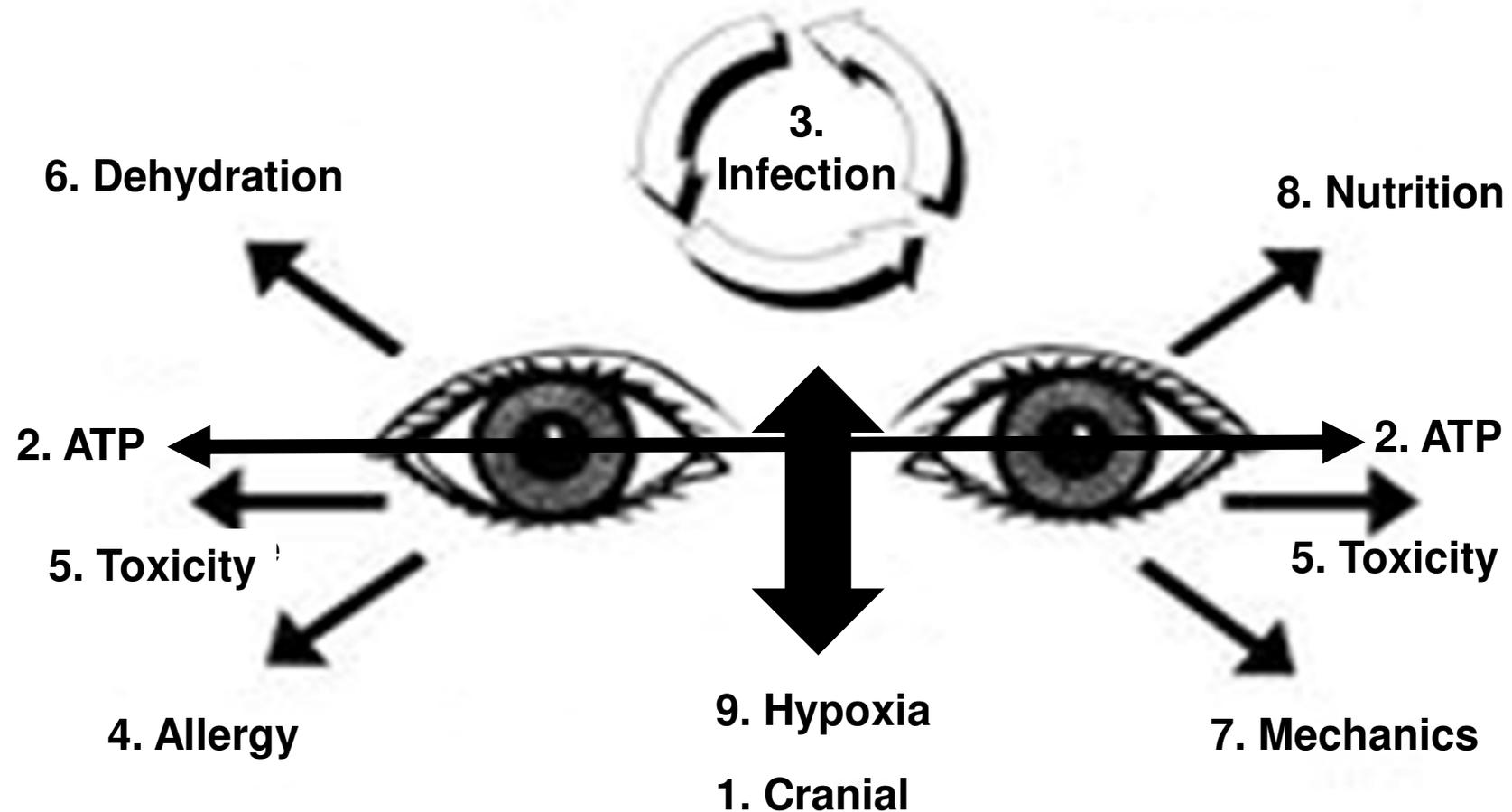
EMF protection

Shark liver oil

Hawthorne (Crateagus)

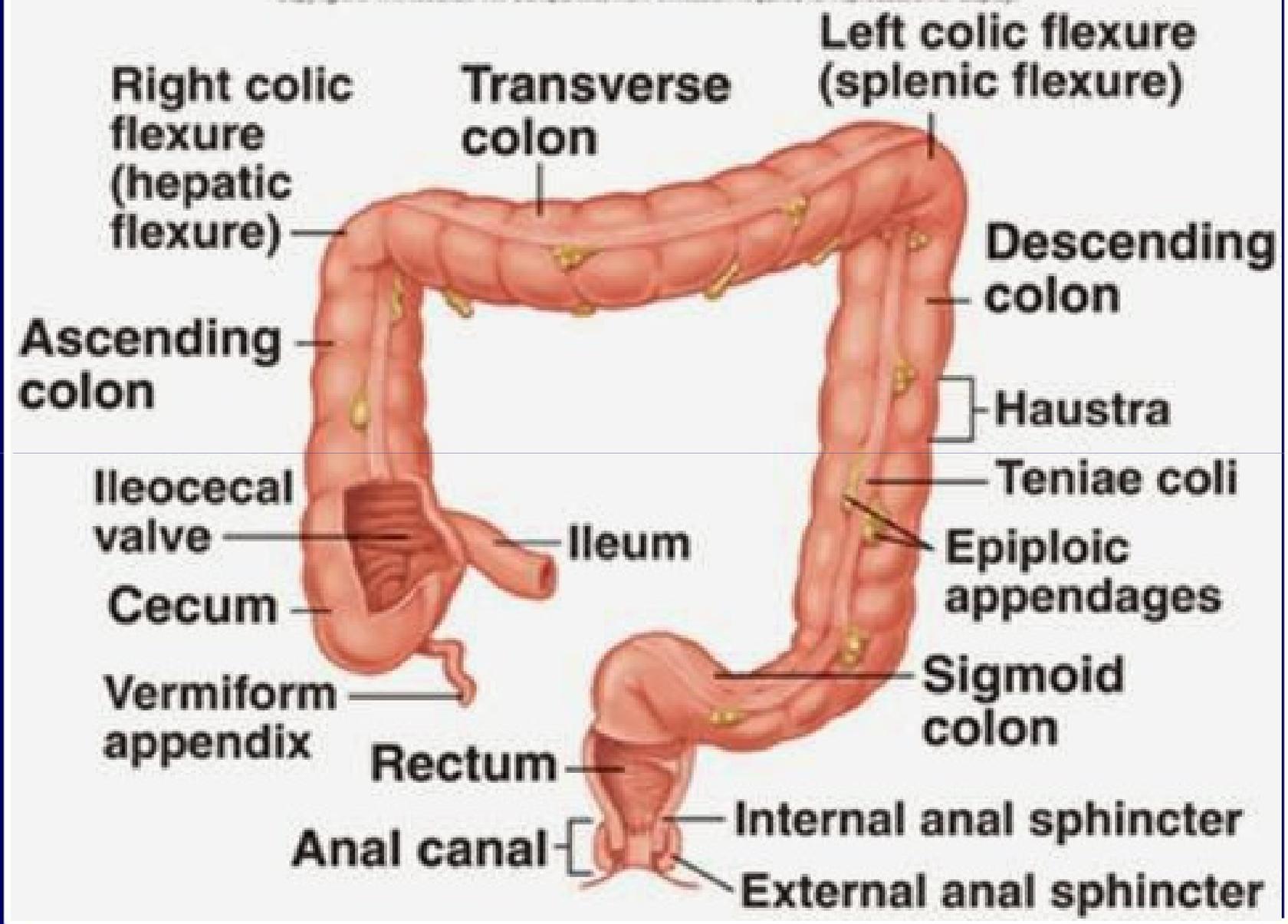


Eyes into Distortion (EID)



Ileocecal valve syndrome

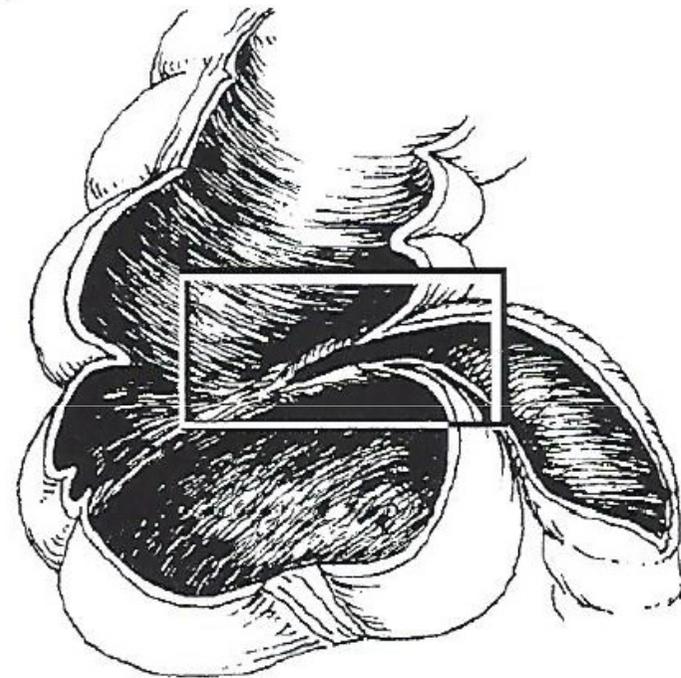
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Ileocecal Valve Syndrome

Located half way between the umbilicus and the ASIS.

Can challenge as open or closed.



Applied Kinesiology Synopsis 2nd Edition
by David Walther DC

Either open or closed may cause palpitations, heart fluttering, chest pain, pseudo Menieres's syndrome, migraine headaches, dependant oedema, right shoulder pain, neck stiffness, mid afternoon dizziness, tinnitus, nausea, , faintness, pseudo sinus infection, sudden thirst, dark circles under the eyes and general achiness.

Ileocecal Valve Syndrome

Differential Diagnosis and Treatment Summary

	Open	Closed
Challenge:	Pulling up on valve strengthens muscle. Pulling down on valve weakens strong muscle.	Pulling up on valve causes no change in weak muscle. Pulling down on valve causes weak muscle to strengthen.
Therapy localization:	Over cecum in lower right quadrant of the abdomen.	Same
Muscular involvement:	Test general indicator muscle with therapy localization.	Weak right rectus abdominis and quadriceps femoris. Hypertonic psoas.
NLR:	Below right ASIS, right bicipital groove (3"), and adjacent to right C3 lamina.	NL for rectus abdominis and quadriceps femoris.
NVR:	Halfway between lateral border of rectus abdominis and ASIS.	Same
Stress receptor:	1/2" lateral to posterior occipital protuberance.	Same
Vertebral involvement:	Usually L1 or possibly T12 or L2.	Anterior L3 and Lovett reactor (C3); L5 (associated point for small intestine).
Meridian:	BL 58 and/or KI 4, luo points for kidney and bladder meridians to balance meridians.	BL 58 or KI 4, luo point and sedation point for kidney meridian to drain kidney meridian. (Test to see if method is appropriate.)
Cranial:	Evaluate total cranium. Zygomatic and lambdoidal faults are often present.	Evaluate total cranium. Universal fault is often present, and sometimes zygomatic and lambdoidal faults are present.
Nutrition:	Chlorophyll, and sometimes digestive aids.	Calcium, vitamin D; sometimes hydrochloric acid when calcium cannot be absorbed.
Diet:	Off roughage, raw fruits and vegetables and spicy foods, caffeine, cocoa, and alcohol.	Same

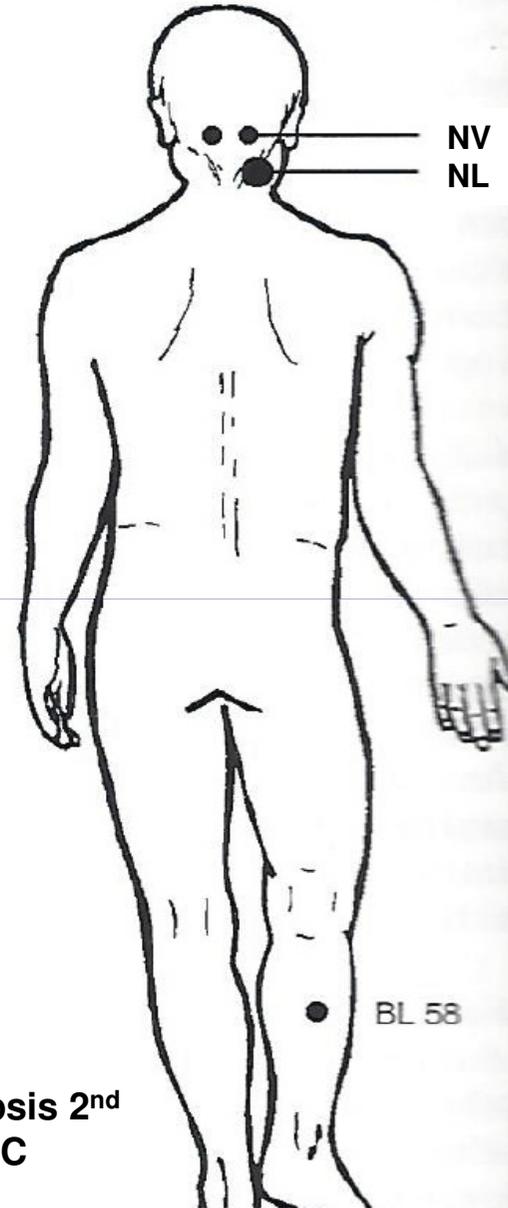
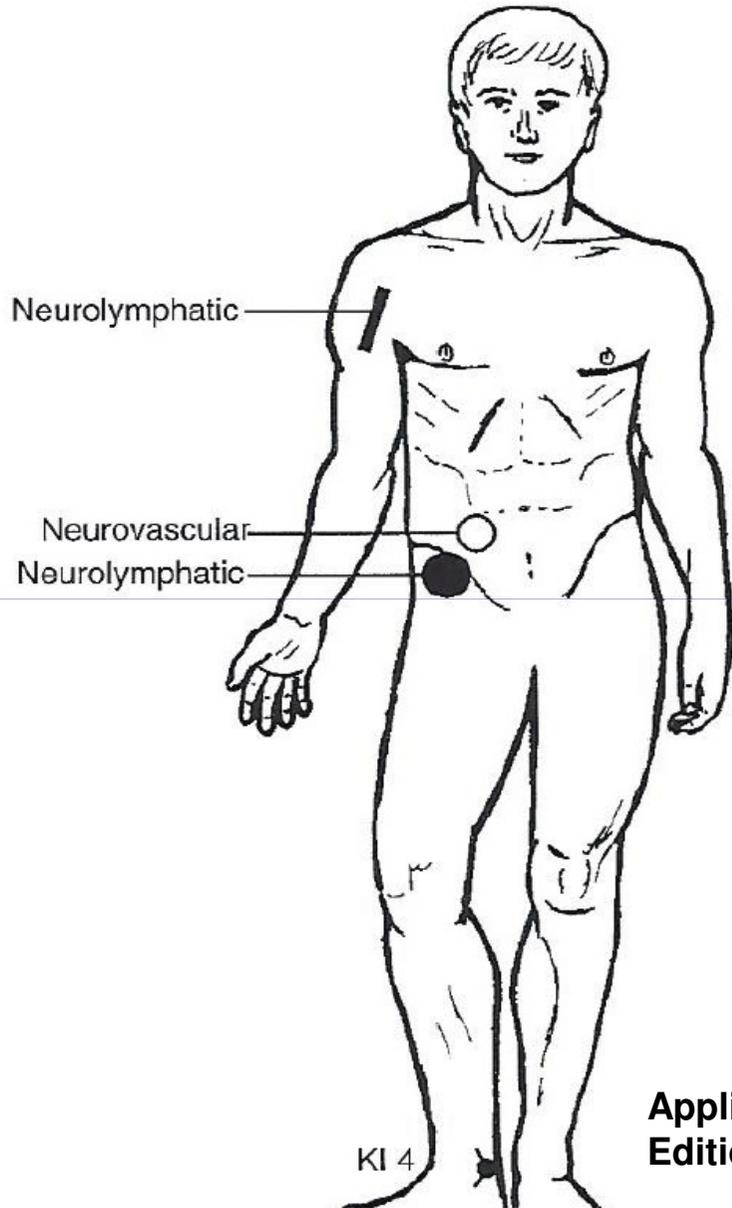
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Therapy localise halfway between the umbilicus and the ASIS.

Use sustained challenge in different directions to find vector that negates the positive therapy localisation.

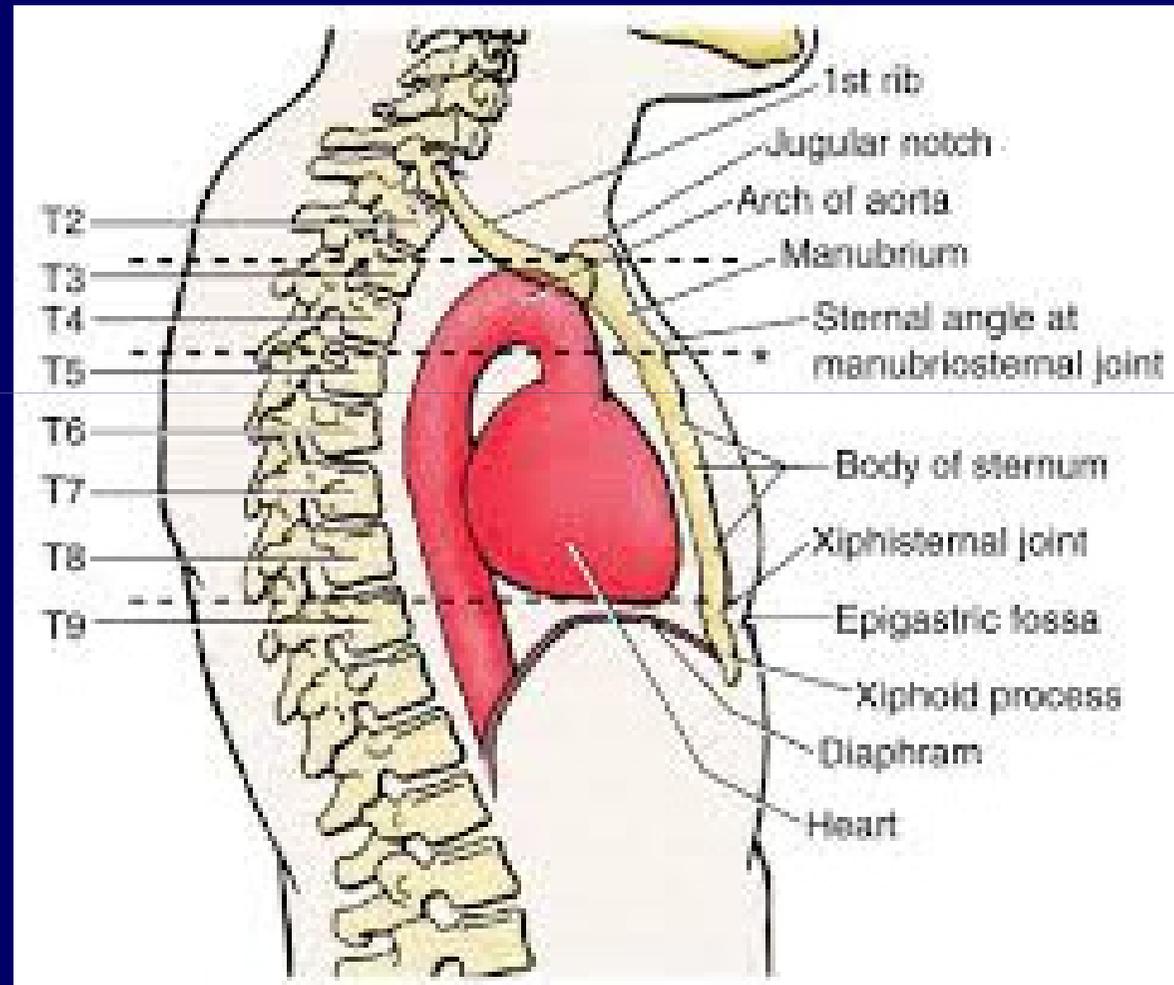
Hold in this direction until release felt.

Treat NLs, NVs, Kidney 4 point.

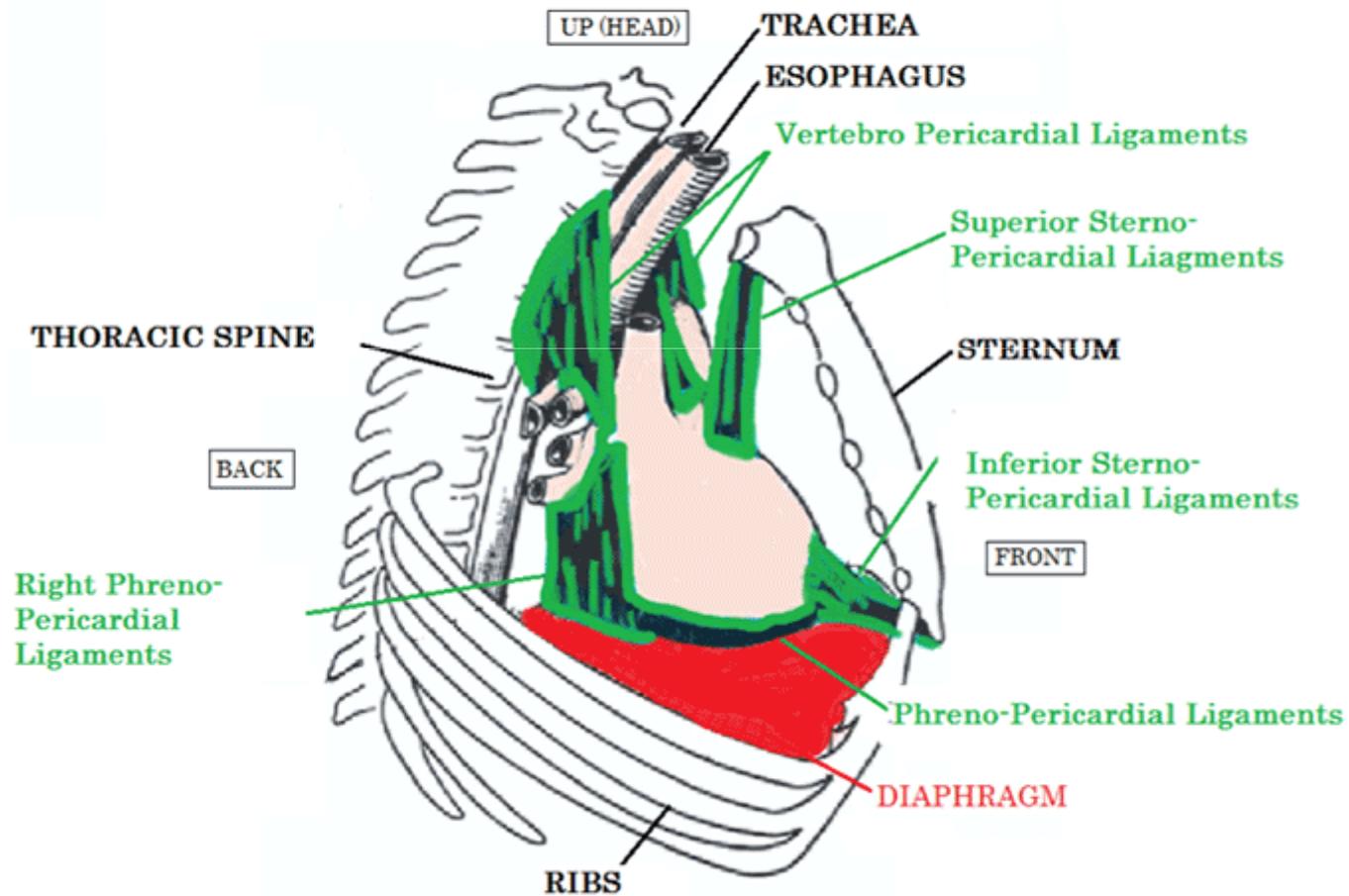


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Manubrio sternal joint Fixations



LIGAMENTS OF THE PERICARDIUM:
(Envelope of the heart) in the middle of your chest



RESIST Technique

**(Reflex Extremity and Spinal
Inhibitory and Stimulatory
Technique)**

**Identify primary biomechanical
Dysfunction by therapy
localisation.**

Two handed resistance to affected articulation.

In Manubrio sternal lesions patient actively moves upper extremity articulations in opposite directions for one minute.