

**Annual Update 2013**  
21-22 September 2013  
**Gatwick UK**

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**Seminars taught during the last 12 months**

**Genetics, Epigenetics and Biochemistry**  
**Epigenetics and Cancer**  
**Chemistry of Pain**  
**Anxiety or Depression**

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**Traditional diets *maximized* nutrients while modern diets *minimize* nutrients**

**TRADITIONAL DIETS**

Foods from fertile soil  
Choice of organ meats over muscle meats  
Animal fats  
**Animals on pasture**  
**Dairy products raw and/or fermented**  
Grains and legumes soaked/fermented  
Bone broths  
Unrefined sweeteners (honey, maple syrup)  
Lacto-fermented vegetables  
Lacto-fermented beverages  
Unrefined salt  
Natural vitamins in foods  
Traditional cooking  
Traditional seeds/open pollination

**MODERN DIETS**

Foods from depleted soil  
Muscle meats, few organ meats  
Vegetable oils  
**Animals in confinement**  
**Dairy products pasteurized**  
Grains refined and/or extruded  
MSG, artificial flavorings  
Refined sweeteners  
Canned vegetables  
Modern soft drinks  
Refined salt  
Synthetic vitamins added to foods  
Microwave, irradiation  
Hybrid seeds, GMO seeds

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**Dr George Goodheart**

August 18, 1918 – March 5, 2008

**who founded Applied Kinesiology and based most of his nutritional researches on the works of these pioneers.**



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**Body Types**

*A new look at evaluating different genetic constitutions*

We all are aware that people's structure and size is different. Some people are tall, some medium and some small. Many different cultures have called these differences by names such in Ayurvedic medicine they are known as kapha, pita and vata. In the west we know them as endomorphs, mesomorphs and ectomorphs. Biologically the human body's growth and metabolism is dependant upon three primary coordinating hormonal glands—the thyroid, the adrenal cortex and the gonads. These glands regulate our growth during childhood and repair of tissue as we age, our metabolic rate, how we cope with all forms of stress and how we function and behave sexually.

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Back in 1993 I was studying defects in visual pigmentation in the eye of a number of patients with macular degeneration. Using different coloured acetates over their eyes to determine both detrimental and beneficial light wavelengths. It is known that the human eye is a trichromate, that is it sees using three cones in the macular of the eye, each picking up wavelengths in the red, green and blue zones. Each cone colour is slightly offset at 619nm, 550nm and 440nm respectively giving the human over 5 million shades of colour perception. It was noted during clinical testing that one cone wavelength would be detrimental to a person whilst the other two were generally well tolerated.

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Occasionally a person would not weaken to any of the three colours but would weaken to a black acetate. This was found to indicate a low level of vital energy.

The cones in the macula at the back of the eye are responsible for our ability to see colour. It is known that the retina of the eye is rich in the pigment melanin. Cones are present throughout the retina but are most densely packed in the fovea.

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Because the rods and cones are at the back of the retina, the incoming light has to go through the other two layers in order to stimulate them. The reason for this is the location behind the receptors of a row of cells containing the pigment, melanin (also found in skin, brain and adrenal glands).

Melanin mops up the light that has passed through the retina, keeping it from being reflected back and scattering around inside the eye; it has the same function as the black paint inside a camera. The melanin-containing cells also help chemically restore the light-sensitive visual pigment in the receptors after it has been bleached by light. For both functions, the melanin pigment must be close to the receptors.

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There are three forms of melanin—black and brown eumelanin and the red pheomelanin all of which have been detected in the retina and are known as ocular melanin. Melanin variation has been connected for some time with various genetic abnormalities and disease states and is known to be inherited from generation to generation.

It is proposed that the weakening on manual muscle testing to one of the specific coloured acetates is due to an overstimulation of the red, green or blue cones due to genetic, inherited variation in the melanin content. An alternative mechanism may involve variations in the gene expressing the visual pigment melanopsin.

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Melanopsin is a photopigment found in specialized photosensitive ganglion cells of the retina that are involved in the regulation of circadian rhythms, pupillary light reflex, and other non-visual responses to light. When light activates the melanopsin signaling system, the melanopsin-containing ganglion cells discharge nerve impulses, which are conducted through their axons to specific brain targets.

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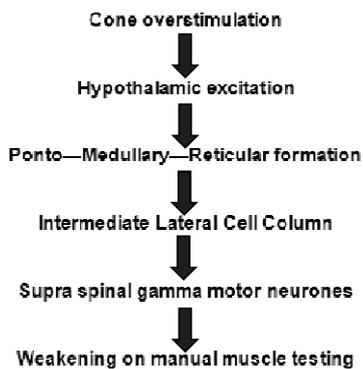
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These targets include the olivary pretectal nucleus (OPN) (a centre responsible for controlling the pupil of the eye) and, through the retinohypothalamic tract, the suprachiasmatic nucleus of the hypothalamus (the master pacemaker of circadian rhythms). Melanopsin-containing ganglion cells are thought to influence these targets by releasing from their axon terminals the neurotransmitters glutamate and pituitary adenylate cyclase activating polypeptide. Melanopsin-containing ganglion cells also receive input from rods and cones that modifies or adds to the input to these pathways.

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**The BLACK acetate.**  
When a person's vital energy is low they may not weaken to any of the three constitutional coloured acetates but weaken to the BLACK acetate. Black is not a colour but rather a total absence of any light wavelength. Placing the black acetate over the eyes thus inhibits any light from entering the brain via the eyes thus decreasing neurological activity and creating an inhibitory effect on any muscles tested.

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**Vital energy is otherwise known as vitality or life energy (in Ayurvedic medicine it is called prana and in Chinese medicine chi) and is different from biochemical energy generated in cellular mitochondria (ATP).**  
**A low vital energy maybe caused by prolonged emotional stress, lack of daylight, nutritional deficiency or cranial faults.**  
**Low vital energy decreases resistance to infectious diseases and promotes toxic build up. People may require medicinal intervention either herbal or pharmaceutical.**

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**A variety of techniques maybe employed to increase low vitality when someone weakens to the BLACK acetate.**  
**Light therapy using a light box for 15 minutes**  
**Miron torch for 1 minute through the umbilicus.**  
**Cranial therapy**  
**Manipulation to the spine especially the upper cervicals**  
**Vital Energy Protector (VEP) spray**  
**Aromatherapy**

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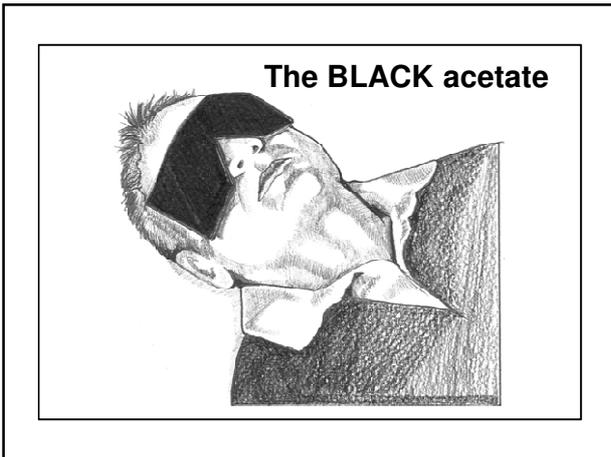
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**RED BODY TYPE**  
**Morphology.** RED body types have the thyroid gland as their primary coordinating hormonal gland. The thyroid hormones regulate metabolic rate so this body type has leanness as it's key feature. They are of average height, males 5ft6in—5ft8in (167cm – 172cm) in height, females around 5ft5in to 5ft7in (165cm—170cm). They have long thin bone structure which is evident especially in the hands with the fingers being long and straight but often with knuckles present in the finger joints. The nails are hard and half moons pronounced.

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They have lots of eye brows often meeting above the nose. Fine hair and small white teeth. They have a tendency to arthritis and skin problems. The thyroid is stimulated by anything that raises blood glucose and thus they crave sweets, coffee, chocolate, juices and alcohol. They do best on an early to bed and early to rise regime with breakfast being the most important meal of the day. Generally do best on a high protein, moderate fat and low carbohydrate diet making them natural carnivores. Should avoid broccoli as it contains elements that inhibit thyroid function.

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**Health risks.** Main one is cardiovascular due to their genetic enzyme defects. They have a tendency to high levels of homocysteine (a known cardiovascular risk factor), have the APOE4 lipoprotein allele which gives them poor removal of cholesterol fragments and elimination of toxic metals specifically aluminium, and a propensity to convert glucose into triglycerides and cholesterol as their thyroids become hypoactive. Spinning of the Kreb's Cycle depends upon thyroid hormones and the slower the energy cycle the more substrate is shunted into synthesising triglycerides and cholesterol. Ample intake of iodine is required not only for their thyroid glands but also their immune system and to balance their estradiol / estrone / estriol ratios.

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**Food intolerances.** RED body types are generally intolerant to wheat products and in particular whole wheat flour products. This is probably due to being both reactive to the lectin in wheat bran and also to the rancid fatty acids present in non freshly milled wheat.  
**Emotions.** Tend to have an unconscious emotion of not feeling lovable.

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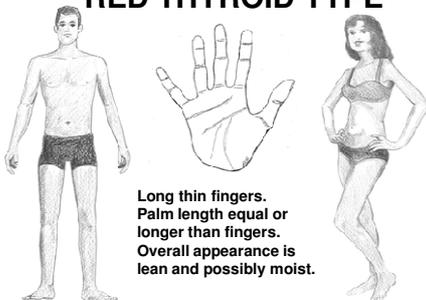
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### RED THYROID TYPE



Women 5115-5117  
Men 5116-5118

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**Diet.** Breakfast most important meal of the day.  
High protein – red meat and fish  
Moderate fats  
Low carbohydrates  
Avoid whole wheat unless freshly milled. Better on white flour products and pasta.  
Avoid broccoli but cabbage ok.

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**Supplements**

<b>Vitamins</b>	<b>Minerals</b>
Vitamin B2 (Riboflavin)	Iodine or Iodides
Vitamin B6 (Pyridoxine)	Manganese
Folic acid	Molybdenum
Vitamin B12 (Hydroxycobalamin)	Selenium
Inositol	Silica
Vitamin C	Zinc

Should be taken in water 1-3 times a day with meals

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**Oils**  
(blend of Omega 3, 6 and 9 plant based oils)  
Flax seed oil  
Hemp seed oil  
Olive oil  
Pumpkin seed oil  
All oils must be organic, cold pressed and taken with the evening meal. Never cook with any of these oils.

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**Herbs and Spices**

Coriander  
Oregano  
Rosemary  
Black walnut

Cumin  
Fenugreek  
Ginger  
Mace

Herbs and spices must be organic and to be taken as a beverage in hot water 1-3 times a day between meals.

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**Weight gain**

Due to decreased thyroid hormone production. Generalised fatty deposition all over but not forearms and lower legs. Tendency to thickening of the neck, course hair and loss of the lateral third of the eyebrows.

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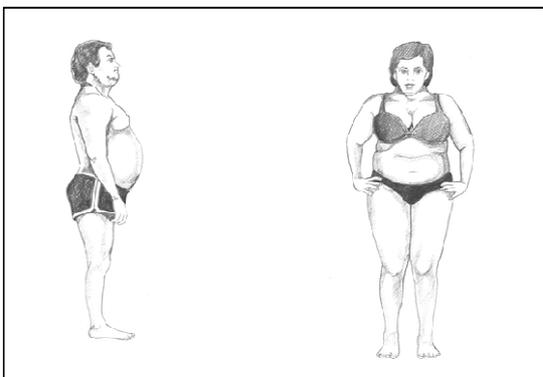
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**GREEN BODY TYPE**

**Morphology.** Green body types have the adrenal cortex gland as their primary coordinating hormonal gland. The adrenal cortex regulates water retention, hypoglycemia, the immune system and the sex hormones via aldosterone, cortisol, DHEA , testosterone and the estrogens. They are generally strongly built and in the taller percentile of the population possibly emanating from the Scandinavian regions. Heights for males is 5ft 8in (173cm) and above and females 5ft7in (170cm) and above. The key feature is muscular development and intramuscular water retention. The hands are square with tubular fingers about as long as the palm. The face tends to be triangular or square.

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Good resistance to disease and get well quickly. They work and play hard. Along with the adrenal glands the thymus tends to be their weakest gland and may suffer asthma and allergies. The adrenals are stimulated by sodium and cholesterol and so crave salt and salty foods and greasy foods like crisps and chips. They get stronger and stronger as the day progresses and those who stimulate their adrenals tend to drink alcohol in the evenings to relax. They are hard working, intelligent and positive but very chemically sensitive. Temperament can be explosive. Late to bed and late to rise is the norm.

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**Health risks.** Green people are workaholics and so tend to work, work and work until they drop. Once the adrenal glands have become exhausted recovery takes time, requiring much rest and suitable nutritional intervention, sometimes needing glandular tissue nutritional support. They tend towards high blood pressure and some types of heart disease. Always sensitive to nickel so must avoid jewelry, piercings, watch straps and buckles containing this metal.

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**Food intolerances** — Main intolerance is to casein, the protein in cheese. Cooked cheese is especially detrimental to their health. Genetically they have difficulty metabolizing alpha solanine, a toxin found in the deadly nightshade foods such as potatoes, tomatoes, green bell peppers, green chillis and aubergines.  
**Emotions.** Tend to have an unconscious emotion of not feeling loving.

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### GREEN ADRENAL BODY TYPE



Fingers are strong and muscular with squared tips. Palm is square and muscular. Fingers and palm lengths tend to be equal.

Women 5ft8 and above  
Men 5ft8 and above

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**Diet** - Pritikin-Plenty of fruits, vegetables, legumes (such as black beans and pinto beans), whole grains such as brown rice, starchy vegetables like yams, lean meat, and seafood. Avoid as much as possible potatoes, tomatoes, green peppers, chilli. Avoid cheese especially cooked.

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**Supplements**

<u>Vitamins</u>	<u>Minerals</u>
Vitamin B1 (Thiamine)	Boron
Vitamin B6 (Pyridoxine)	Copper
Folic acid	Selenium
Vitamin B12 (Hydroxycobalamin)	Silica
Choline	Zinc

Should be taken in water 1-3 times a day with meals

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**Oils**  
(predominantly Omega 6 plant based oils)

Grape seed oil  
Hazelnut oil  
Peanut oil  
Sesame seed oil

All oils must be organic, cold pressed and taken with the evening meal. Never cook with any of these oils.

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**Herbs and Spices**

Rosemary	Cumin
Lemon balm	Ginger
	Star anise

Herbs and spices must be organic and to be taken as a beverage in hot water 1-3 times a day between meals.

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**Weight gain**

Generalised watery fatty deposition all over when under stress and the adrenals are hyperactive due to increased levels of aldosterone retaining water in the tissues. Rapid weight loss in hypoadrenic state due to loss of water.

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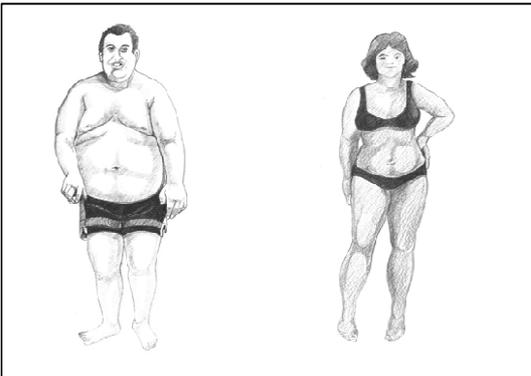
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**BLUE BODY TYPE**

**Morphology.** Blue body types have the gonads (ovaries in women and testes in men) as their primary coordinating hormonal glands. The gonads produce a range of sex hormones in both males and females but in different proportions between the two sexes. Progesterone is important in the synthesis of elastin, testosterone in the synthesis of muscle and the estrogens in the deposition of body fat.

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The key feature is short and sexual development. Heights for males is below 5ft 6in (168cm) and females below 5ft 5in (165cm). Classically far eastern body shape. Men tend to be short and stouter with softer musculature than the green person but with ample body hair often on the back. Small hands with tapered fingers which are shorter than the palm. Hair is usually thick and course. Skin tends to be smooth and elastic.

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Health risks. Blue people have a consistent physical fight with weight gain due to high levels of the estrogens which regulate fat deposition. They are sensitive to many estrogen mimicking chemicals which are in toiletries, cosmetics and pesticides. This puts them at risk of developing hormones dependent tumors. They are lactose intolerant thus sensitive to all dairy products. Cow's milk also contains bovine IGF which is identical to human IGF making dairy products doubly detrimental to their health . They have difficulty in detoxifying mercury and so must beware of leaking mercury fillings and never take fish oil supplements.

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They have poor detoxification enzyme expression for the breakdown of alcohol and so must drink it in moderation or not at all. They are sensitive to tyramine foods such as fermented soy, mature cheeses, chocolate, aging bananas and avocados which can give rise to migraine headaches. Also intolerant to aspartame the artificial sweetener and MSG the artificial flavouring. Food intolerances. All dairy products but may tolerate goat and sheep products. Soy products are ideal. Alcohol and tyramine containing foods. Emotions. Tend to have an unconscious emotion of not feeling loved.

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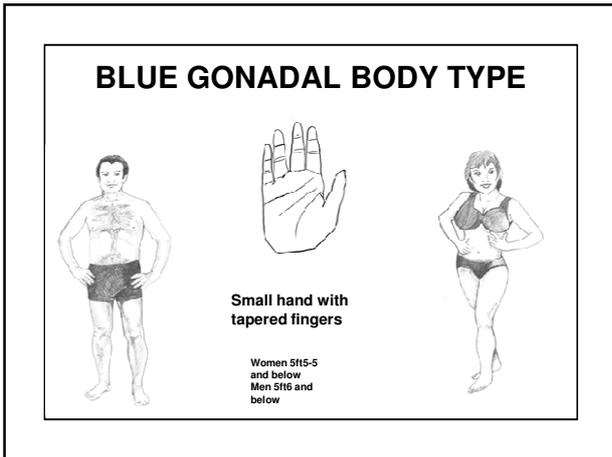
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**Diet.** They tend to have low stomach acid and so are more suitable to a vegetarian dairy free diet. Natural grazers. Small portions of protein spread throughout the day. Organic foods wherever possible.

**Supplements**

<b><u>Vitamins</u></b>	<b><u>Minerals</u></b>
Vitamin B1 (Thiamine)	Boron
Folic acid	Magnesium
Vitamin B12 (Hydroxycobalamin)	Selenium
Choline	Sulphur
	Zinc

Should be taken in water 1-3 times a day with meals

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**Oils**  
(predominantly Omega 3 plant based oils)  
Flaxseed oil  
Pumpkin seed oil  
Walnut oil

All oils must be organic, cold pressed and taken with the evening meal. Never cook with any of these oils.  
Avoid fish oils due to mercury and PCB toxicity

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**Herbs and Spices**

Basil

Coriander

Dill

Chilli

Cinnamon

Paprika

Herbs and spices must be organic and to be taken as a beverage in hot water 1-3 times a day between meals.

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**Weight gain**

Due to excess estrogens production or insufficient breakdown. Three types of fat deposition depends upon the type of estrogen excess. Estrone (E1) fat deposits on the hips, buttocks and thighs—pear shape, Estradiol (E2) excess gives rise to a generalised increased body fat all over, and Estriol (E3) fat deposits on the abdomen—apple shape.

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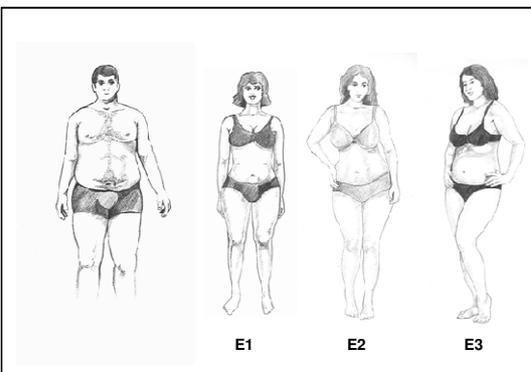
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**The ROD acetate**

The ROD acetate is a dark grey acetate placed over the eyes making sure no other light enters through peripheral vision. Turn off any overhead lights. If a strong muscle then weakens indicates a problem with dim vision. The rods in the retina pick up shades of grey light between black and white and the outline of objects. They are located all around the back of the retina and so pick up peripheral vision also. It is this peripheral vision that sends input to the vestibular centres in the brain to aid in maintaining balance. Vertigo episodes where the world spins around are due to peripheral vision defects. When the person spins round the world it is due to labyrinthine disorders.

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The two classic photoreceptor cells are rods and cones each contributing information used by the visual system to form a representation of the visual world, sight. The rods are narrower than the cones and distributed differently across the retina, but the chemical process in each that supports phototransduction is similar. A third class of photoreceptor cells was discovered during the 1990s: the photosensitive ganglion cells.

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These cells do not contribute to sight directly, but are thought to support circadian rhythms and pupillary reflex and employ the newly discovered visual pigment melanopsin. Interestingly melanopsin has recently been discovered to be present in the skin, making this tissue also sensitive to a wide range of light wavelengths.

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There are major functional differences between the rods and cones. Rods are extremely sensitive, and can be triggered by as few as 6 photons. At very low light levels, visual experience is based solely on the rod signal.

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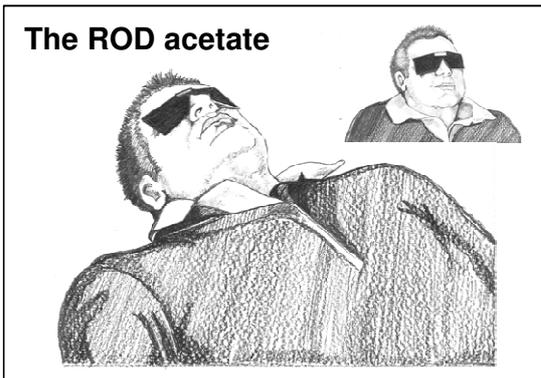
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**The ROD acetate**



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Dim vision maybe due to a deficiency in the rod visual pigment rhodopsin

- Vitamin A
- Mixed carotenoids
- Lutein / Zeaxanthine
- Zinc
- Niacin or NAD(H)
- Magnesium
- Lysine
- Bilberry
- DHA
- Omega 3 plant oils—Flax, Pumpkin and Walnut
- Vitamin C complex
- Urea (Carbamide)

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**Lipids are classified as**

1. Simple lipids – oils and fats
2. Complex lipids
  - a) Phospholipids
  - b) Glycosphingolipids containing a fatty acid, sphingosine and a CHO
  - c) Lipoproteins

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**Simple lipids are**

- a) Saturated (no double bonds)  
 $CH_3 \text{ ----- } COOH$
- b) Unsaturated (mono or poly double bonds)  
 $CH_3 \text{ ----=----- } COOH$   
 (Methyl (w) end    Carboxyl end)

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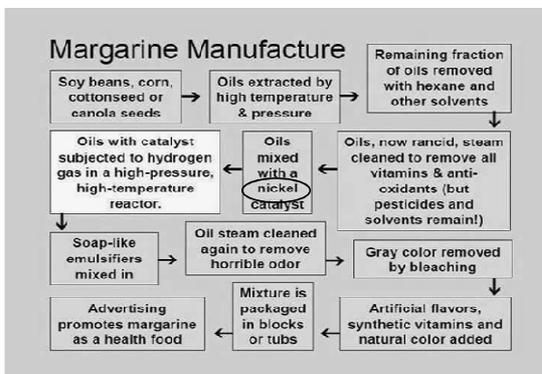
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**Margarine Manufacture**




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At last, the truth: Butter is GOOD for you - and margarine is chemical gunk Mail on line 15<sup>th</sup> September 2013  
Taking a sample of middle-aged Australian men who had either experienced a heart attack or -suffered from angina, half were advised to cut their animal fat intake and replace it with safflower oil (which is similar to sunflower oil) and safflower oil margarine, while the other half continued to eat as normal.

If the unholy alliance of Government nutritionists and the food processing industry were right — and margarine really was better for you, as they've been claiming for decades — you'd expect the men who switched to safflower oil to live longer and have better health outcomes.

The exact opposite turned out to be true. Those who ate more of the safflower-derived products were almost twice as likely to die from all causes, including heart disease.

Suddenly, margarine isn't looking the healthy option that those expensive marketing campaigns claim it to be.

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### **RANCID FATS**

**Oxidative rancidity is associated with the degradation by oxygen in the air. Via a free radical process, the double bonds of an unsaturated fatty acid can undergo cleavage, releasing volatile aldehydes and ketones.**

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**This process can be suppressed by the exclusion of oxygen or by the addition of antioxidants Vit E → Vit C → Glutathione (α-Lipoic acid, Sel ). Oxidation primarily occurs with unsaturated fats.**

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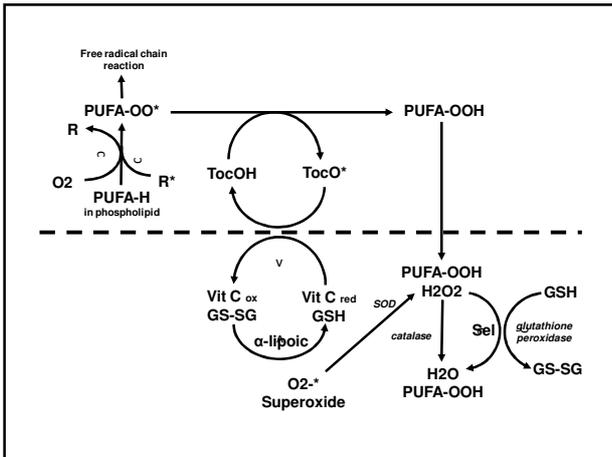
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µg/(100 g)		Some foods with vitamin E content <sup>(5)</sup>
low	high	
150		Wheat germ oil
41		Sunflower oil
34		Safflower oil
15	26	Nuts and nut oils, such as almonds and hazelnuts <sup>(note 2)</sup>
15		Palm oil <sup>(3,4)</sup>
1.5	3.4	High-value green, leafy vegetables: spinach, turnip, beet greens, collard greens, and dandelion greens <sup>(note 2)</sup>
2.1		Avocados
1.1	1.5	Asparagus <sup>(note 4)</sup>
1.5		Kiwifruit (green)
0.76	1.5	Broccoli <sup>(note 2)</sup>
0.3	1	Pumpkin <sup>(note 8)</sup>
0.26	0.94	Sweet potato <sup>(note 7)(note 8)</sup> Soy
0.9		Mangoes
0.54	0.55	Tomatoes <sup>(note 9)</sup>
0.36	0.44	Rockfish <sup>(note 10)</sup>
0.3		Papayas
0.13	0.22	Low-value green, leafy vegetables: lettuce <sup>(note 11)</sup>

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**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.

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**Measurement of oxidative stability**  
Oxidative stability is a measure of an oil or fat's resistance to oxidation. Because the process takes place through a chain reaction, the oxidation reaction has a period when it is relatively slow, before it suddenly speeds up.

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The time for this to happen is called the "induction time", and it is repeatable under identical conditions (temperature, air flow, etc.). There are a number of ways to measure the progress of the oxidation reaction. One of the most popular methods currently in use is the Rancimat method.

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The Rancimat method is carried out using an air current at temperatures between 50 and 220 C. The volatile oxidation products (largely formic acid) are carried by the air current into the measuring vessel, where they are absorbed (dissolve) in the measuring fluid (distilled water).

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By continuous measurement of the conductivity of this solution, oxidation curves can be generated. The cusp point of the oxidation curve (the point where a rapid rise in the conductivity starts) gives the induction time of the rancidification reaction, and can be taken as an indication of the oxidative stability of the sample.

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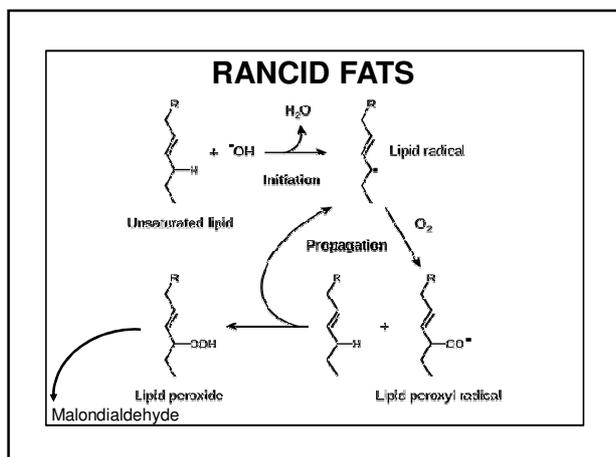
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Reactive oxygen species degrade polyunsaturated lipids, forming malondialdehyde. This compound is a reactive aldehyde and is one of the many *reactive electrophile species* that cause toxic stress in cells and form covalent protein adducts referred to as advanced lipoxidation end-products (ALE).

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**The production of this aldehyde is used as a biomarker to measure the level of oxidative stress in an organism.**

**Malondialdehyde reacts with deoxyadenosine and deoxyguanosine in DNA, forming DNA adducts, the primary one being M<sub>1</sub>G, which is mutagenic.**

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**The guanidine group of arginine residues condense with malondialdehyde to give 2-aminopyrimidines.**

**Human ALDH1A1 aldehyde dehydrogenase ( Vit B3 and Zn) is capable of oxidizing malondialdehyde.**

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**Hydroperoxides and Peroxidised lipids**

**ROS chemically bind to the unsaturations in fatty acids forming hydroperoxides. The formation of peroxidised lipids induces the generation of malondialdehyde, a short chain difunctional molecule, which acts as a cross-linking agent**

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causing protein (including collagen) to bind together. They lead to loss of membrane integrity. Peroxidised lipids may also come exogenously from ingested heated fat. Ingested hydroperoxides causes a suppression of DNA synthesis in thymocytes and a resulting impairment of immunocompetent systems.

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**Trans fatty acid** is the common name for unsaturated fat with *trans*-isomer (E-isomer) fatty acid(s). Because the term describes the configuration of a double carbon-carbon bond, trans fats are sometimes monounsaturated or polyunsaturated, but never saturated.

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Trans fats exist in nature and also occur during the processing of polyunsaturated fatty acids in food production. In humans, consumption of trans fats increases the risk of coronary heart disease by raising levels of LDL cholesterol and lowering levels of "good" HDL cholesterol.

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**There is an on-going debate about a possible differentiation between trans fats of natural origin and trans fats of man-made origin, but so far no scientific consensus has been found. Two Canadian studies, which received funding by the Alberta Livestock and Meat Agency and the Dairy Farmers of Canada, have shown that the natural trans fat**

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**vaccenic acid, found in beef and dairy products, may have an opposite health effect and could actually be beneficial compared to hydrogenated vegetable shortening, or a mixture of pork lard and soy fat, by lowering total and LDL cholesterol and triglyceride levels.**

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**In lack of recognized evidence and scientific agreement, nutritional authorities consider all trans fats as equally harmful for health and recommend that consumption of trans fats be reduced to trace amounts.**

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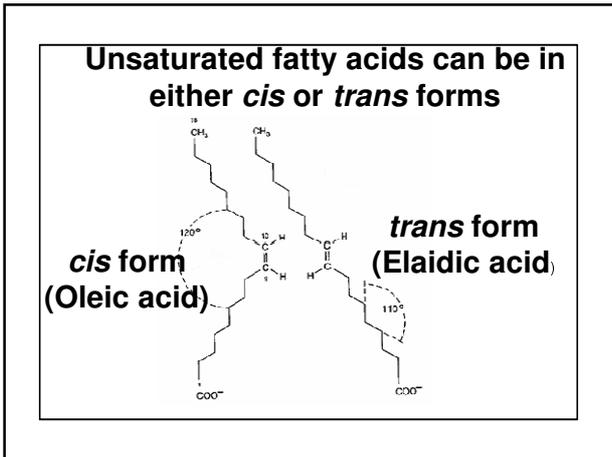
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Trans (Elaidic acid)	Cis (Oleic acid)	Saturated (Stearic acid)
Elaidic acid is the principal <i>trans</i> unsaturated fatty acid often found in partially hydrogenated vegetable oils. <sup>[15]</sup>	Oleic acid is a <i>cis</i> unsaturated fatty acid that comprises 55–80% of olive oil. <sup>[16]</sup>	Stearic acid is a saturated fatty acid found in animal fats and is the intended product in full hydrogenation. Stearic acid is neither <i>cis</i> nor <i>trans</i> because it has no carbon-carbon double bonds.

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**Hydrogenated fatty Acids**  
**The largest scale application of hydrogenation is for the processing of vegetable oils. Typical vegetable oils are derived from polyunsaturated fatty acids. Their partial hydrogenation reduces most but not all, of these carbon-carbon double bonds.**

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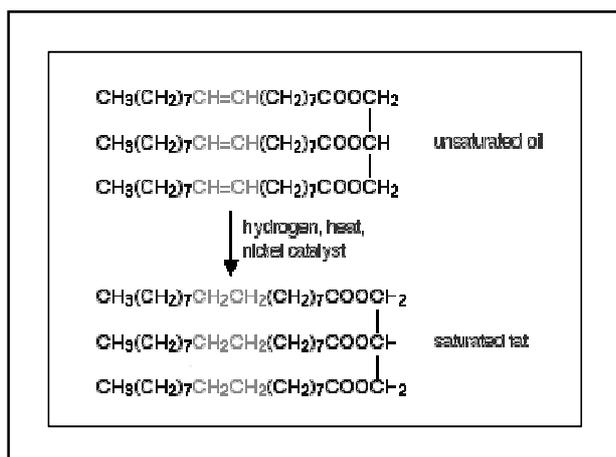
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The degree of hydrogenation is controlled by restricting the amount of hydrogen, reaction temperature and time, and the catalyst (Nickel). Partial hydrogenation of a typical plant oil to a typical component of margarine. Most of the C=C double bonds are removed in this process, which elevates the melting point of the product.

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Hydrogenation converts liquid vegetable oils into solid or semi-solid fats, such as those present in margarine. Changing the degree of saturation of the fat changes some important physical properties such as the melting range, which is why liquid oils become semi-solid.

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Solid or semi-solid fats are preferred for baking because the way the fat mixes with flour produces a more desirable texture in the baked product. Because partially hydrogenated vegetable oils are cheaper than animal source fats, are available in a wide range of consistencies, and have other desirable characteristics e.g.--

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(e.g., increased oxidative stability/longer shelf life), they are the predominant fats used as shortening in most commercial baked goods.

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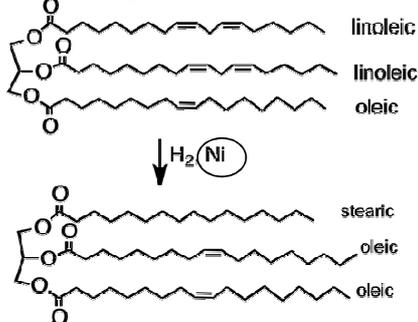
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### Hydrogenated Fatty Acids



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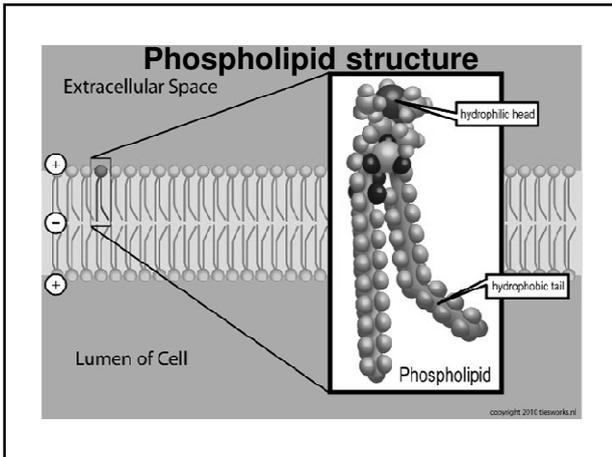
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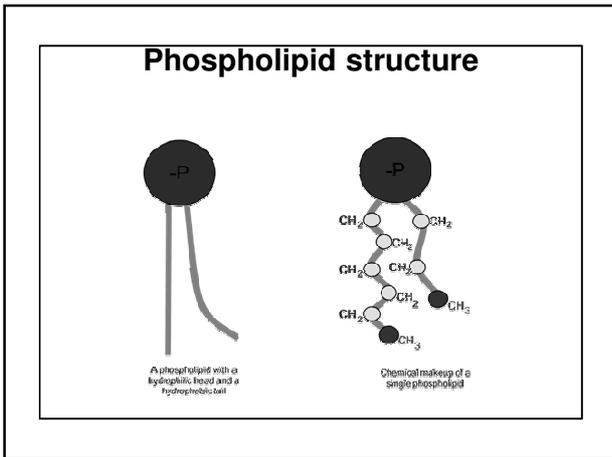
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**Link Between Omega-3 Fatty Acids and Increased Prostate Cancer Risk Confirmed (Science Daily)**

**Omega-3 Supplement Taken By Millions 'Linked to Aggressive Prostate Cancer' (Huffington Post)**

**Men who take omega-3 supplements at 71% higher risk of prostate cancer (NY Daily News)**

**Omega-3 supplements may trigger prostate cancer (Nursing Times)**

**Hold the salmon: Omega-3 fatty acids linked to higher risk of cancer (Time Magazine)**

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**Story at-a-glance**

A recent case-cohort study found that men with higher blood concentrations of omega-3 fat had a 44 percent increased risk of developing low-grade prostate cancer compared to those with the lowest levels

Specifically, higher blood levels of the omega-3 fat DHA correlated to higher prostate cancer risk, while no correlation was found for EPA and ALA. They also had a 71 percent higher risk of developing high-grade prostate cancer

The elevated blood levels of DHA found in the featured study is not necessarily indicative of higher fish consumption. In fact, low-fat diets can increase DHA levels in much the same way omega-3 supplementation can

While the researchers warn that fish oil supplements may be dangerous based on their findings, this study cannot show causation. Furthermore, no fish oil supplements were actually given as part of this study

Foods rich in omega-3 fats have previously been shown to prevent prostate cancer from spreading, and one recent meta-analysis found that fish consumption was associated with a 63 percent reduction in prostate cancer-specific mortality

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**Cancer and Epigenetics**

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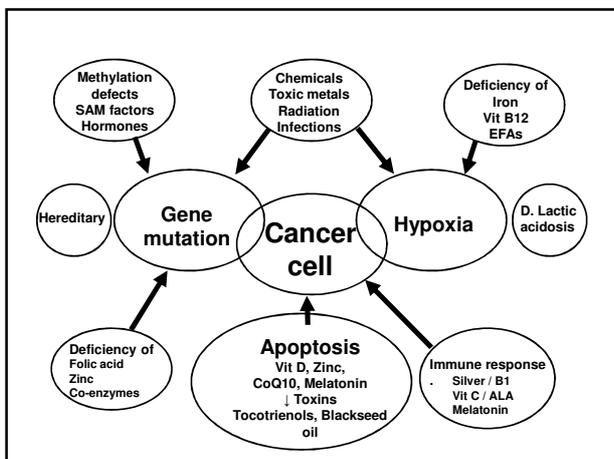
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### Genetic Body Types predisposing to Cancer

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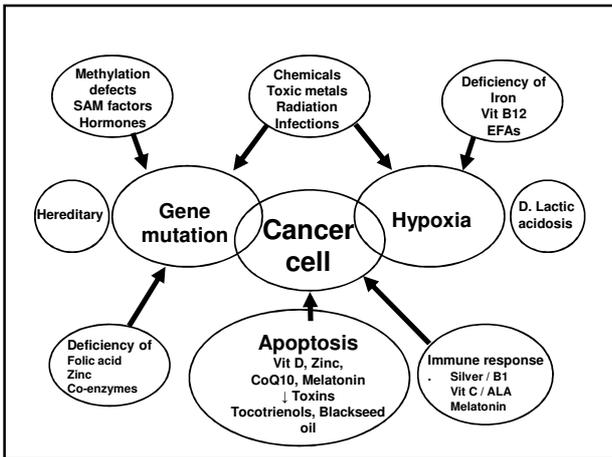
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### BLUE body types

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**Mutations maybe**

- 1. Single Point Mutations (SNIPs).**
- 2. Deletions, Insertions and Rearrangements of DNA (Cut and Pastes).**

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**Single base point mutations (SNIPs) maybe**

- 1. Transitions where a given purine is changed to the other purine or a given pyrimidine is changed to the other pyrimidine.**

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**PURINES**

**ADENINE ↔ GUANINE**

**PYRIMIDINE**

**CYTOSINE ↔ THYMINE**

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or where Uracil from (dUMP) is incorporated into the Thymine (dTMP) position in DNA.

**URACIL → THYMINE**

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2. Transversions are changes from a purine to either of the two pyrimidines or the change of a pyrimidine into either of the two purines.

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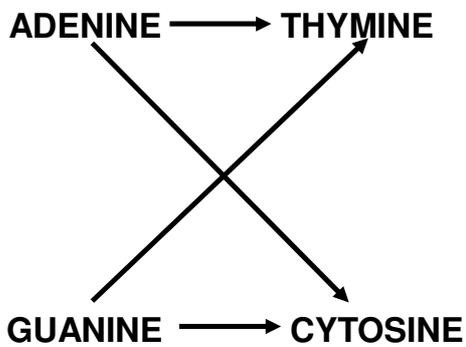
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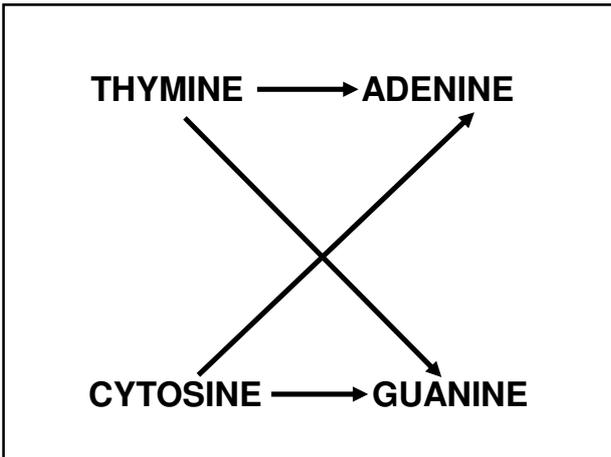
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Single base changes will be replicated within the mRNA transcription.

There maybe

1. No detectable effect.
2. A mis-sense effect
3. A nonsense codon effect.

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**SNIP Challenge**

1. Challenge each vial of nucleotide bases from strength to weakening over lower abdomen.
2. Note which one weakens.

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**Nucleotide bases**

- 1. Adenine**
- 2. Cytosine**
- 3. Guanine**
- 4. Thymine**
- 5. Uracil**

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**3. Challenge weakening nucleotide base against each of the other nucleotide bases to identify which negates.  
e.g. G>T**

**This will indicate the specific single nucleotide polymorphism (SNIP).**

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**There is always an associated co-enzyme with each SNIP.**

**This indicates that a greater than normal amount of the coenzyme is required to bring an enzyme up to a more correct rate of reaction.**

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**Each SNIP defect maybe apparent to Nutritional deficiency of the necessary substrates and Cofactors to activate the vitamin to become a coenzyme.**

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- Each SNIP defect is caused by**
- 1. Inherited polymorphism (Miasm)**
  - 2. Acquired – Due to Zinc deficiency leading to reduced DNA / RNA polymerase function for the repair caused by ROS as a result of exposure to pathogens especially viruses, toxic metals, mycotoxins, chemicals and / or ionising radiation.**

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Coding DNA Standard code

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	Stop	TGA	Stop
TTG	Leu (i)	TCG	Ser	TAG	Stop	TGG	Trp
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
TTA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CTG	Leu (i)	CCG	Pro	CAG	Gln	CGG	Arg
ATT	Ile	ACT	Thr	AAT	Asn	AGT	Ser
ATC	Ile	ACC	Thr	AAC	Asn	AGC	Ser
ATA	Ile	ACA	Thr	AAA	Lys	AGA	Arg
ATG	Met (i)	ACG	Thr	AAG	Lys	AGG	Arg
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly

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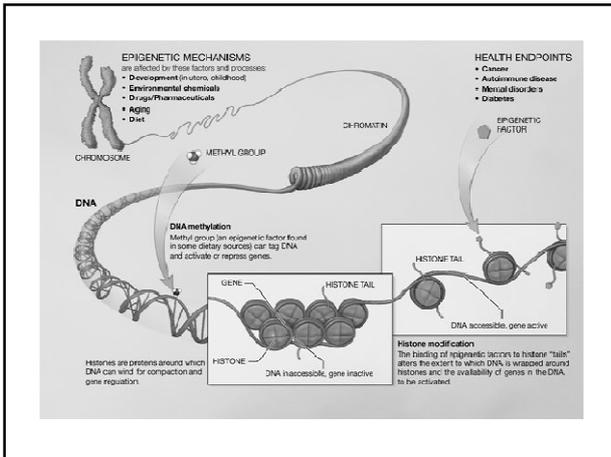
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**Each histone has a loose end or “tail” to which certain chemicals can attach which alter how tightly coiled the DNA is around the histone.**  
**So long as the DNA remains tightly coiled the, gene does not activate, but to activate it the DNA must be partially unwound.**

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**The gene needs outside instruction from acetyl and methyl groups. Sometimes acetyl groups (COCH3) are added to the tail near a gene causing the histone to loosen their grip on the DNA allowing the expression of that gene.**

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Removing the acetyl group causes the histones to tighten their grip on the DNA thereby stopping the expression of the gene.  
Put simply, adding a methyl group switches the genes off and removing a methyl group switches it back on.

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### Methylation defects

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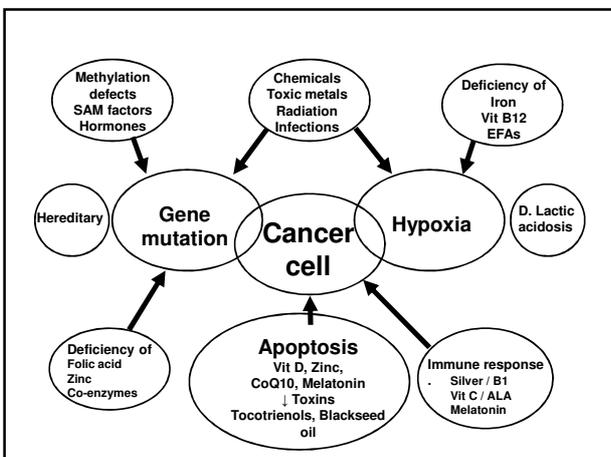
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# Cancer and Toxins

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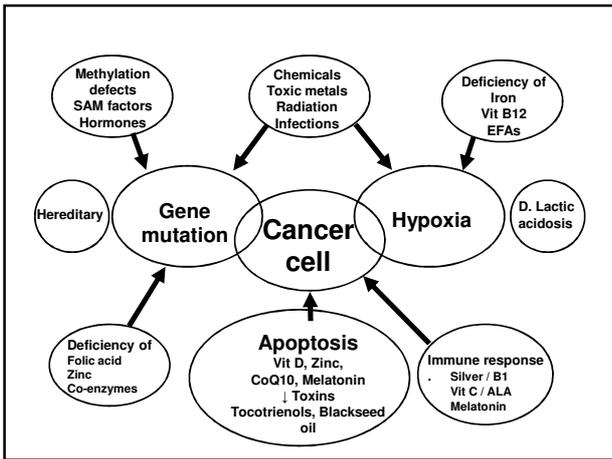
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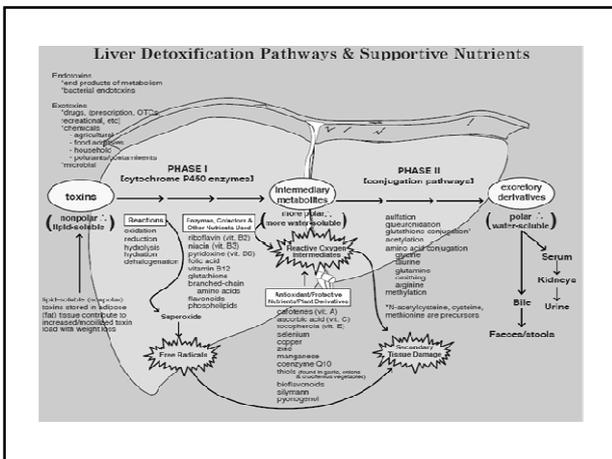
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**Optimal nutrients for promoting detoxification**

- Foods** Beetroot  
Cruciferous vegetables  
Radish and watercress  
Globe artichoke leaf
- Herbs** Yarrow  
Black walnut tincture  
Milk thistle (Silymarin)  
Turmeric. BLUE mix

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**Hypoxia**

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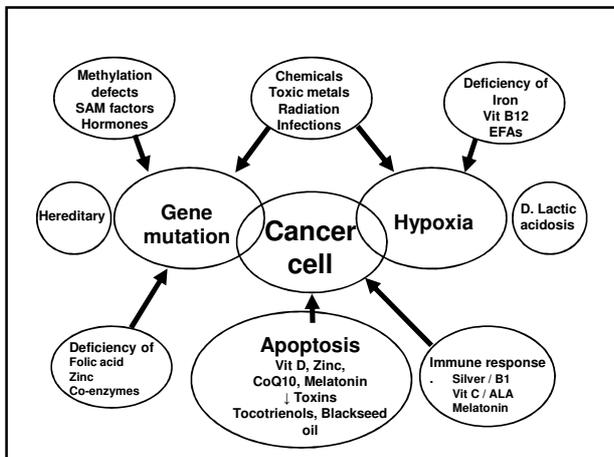
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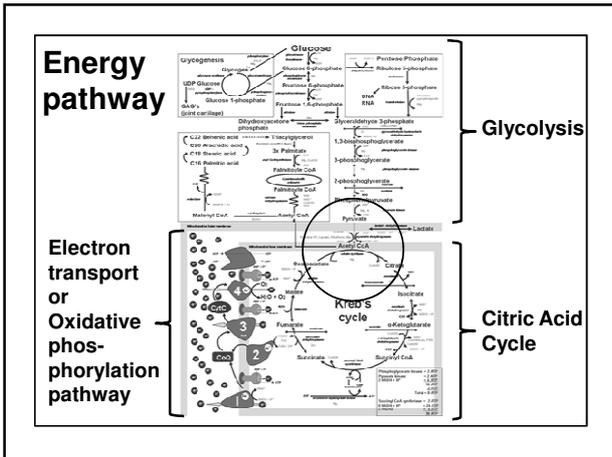
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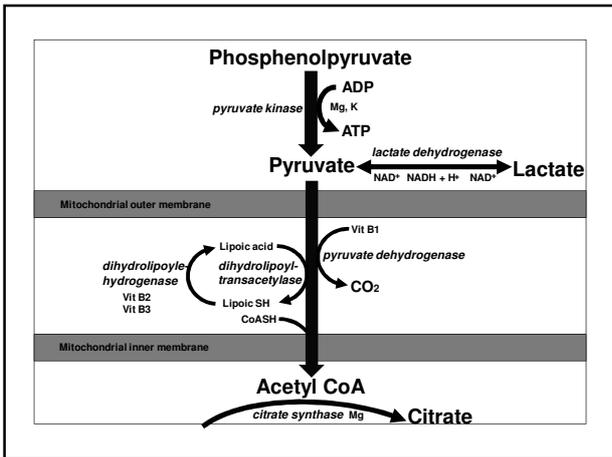
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**Getting Oxygen to the cells requires mature red blood cells containing adequate amounts of haemoglobin. Vital nutrients**

- Iron**
- Vit B12's**
- Folic + Zinc**
- Essential fatty acids**
- Vit A and Vitamin B6**
- Vit C complex**
- Iodine, Selenium**

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**Thus a functional challenge for hypoxia would be**

**A weak muscle strengthens to being challenged with oxygen.**

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**The link between oxygen and cancer is clear. In fact an underlying cause of cancer is low cellular oxygenation levels. In newly formed cells, low levels of oxygen damage respiration enzymes so that those cells cannot produce energy using oxygen. These cells can then turn cancerous.**

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**Discovering the Real Cause of Cancer  
Doctor Otto Warburg discovered the real cause of cancer in 1923 and he received the Nobel Prize for doing so in 1931.**

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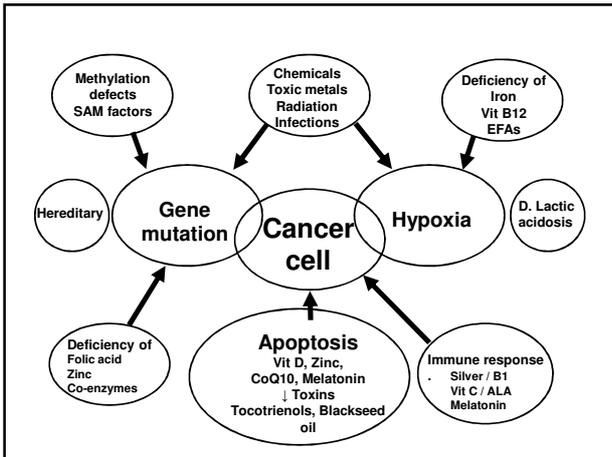
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There are several reasons cells become poorly oxygenated. An overload of toxins clogging up the cells, poor quality cell walls (EFAs) that don't allow nutrients into the cells, the lack of nutrients (Iron / B12) needed for respiration, poor circulation and perhaps even low levels of oxygen in the air we breathe (mechanics).

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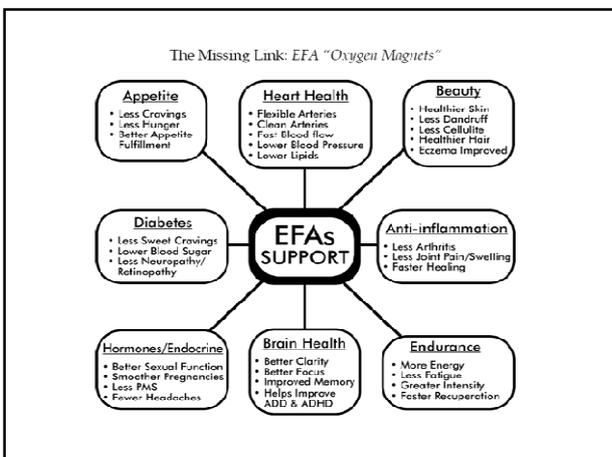
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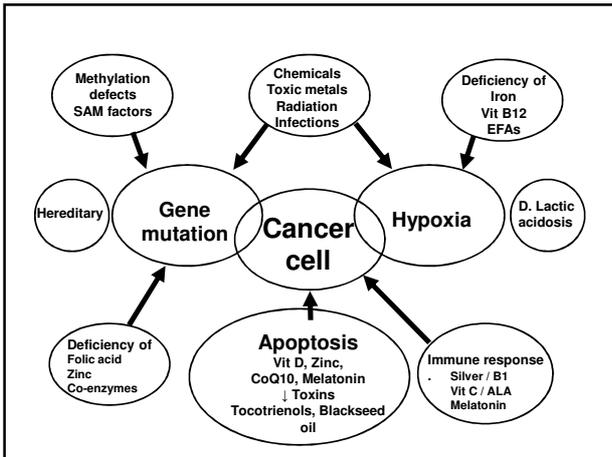
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**Cancer cells produce *excess D. Lactic acid* as they ferment energy. D. Lactic acid is toxic, and *tends to prevent the transport of oxygen into neighbouring normal cells*.**

**Over time as these cells replicate, the cancer may spread if not destroyed by the immune system.**

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**The ensuing acideamia tends to persist, since D-Lactic is not metabolized by *L-lactic dehydrogenase*, the enzyme that catalyzes the conversion of the physiologically occurring L-Lactic into pyruvate. Thus, D-Lactic is slowly metabolized in humans.**

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**Virtually *everyone* with cancer has low pH levels. This is because cancer is created, and thrives, in a body that has low pH levels, a body that is acidic. Low pH causes the body to store more toxins in cells, and reduces oxygen levels, both of which are fundamental to the development of cancer.**

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**When cancer cells grow, they produce even more acid. Making it very difficult to raise pH levels, especially when cancer is present.**

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**Circadian disruption**

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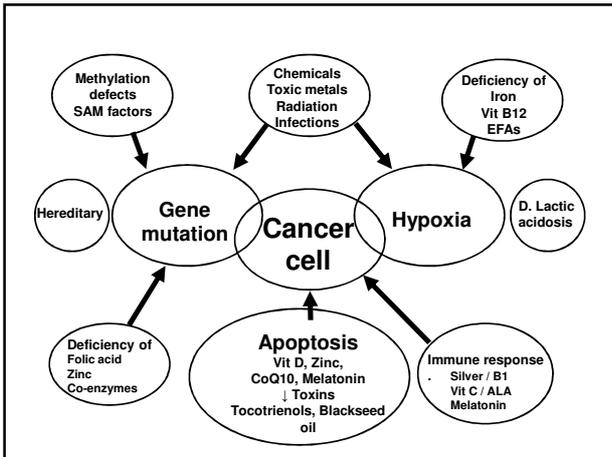
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### Circadian disruption

"Shiftwork that involves circadian disruption" was listed, in 2007, as a probable carcinogen by the World Health Organization's International Agency for Research on Cancer. (IARC Press release No. 180). Multiple studies have documented a link between night shift work and the increased incidence of breast cancer. Circadian disruption by exposure to light at night suppresses the production of the hormone melatonin which leads to reduction in cellular immune defence and surveillance necessary for protection from development of cancers. Melatonin also seems to have a direct protective effect against cancer, possibly in part because of its strong antioxidant properties.

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Recent research carried in *Cancer Watch* suggested that circadian rhythms might even control the effectiveness of chemotherapy drugs and the time of day they should be taken.

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**Research shows that the immune system needs 9 ½ hours of sleep in *total* darkness to recharge completely -- the authors of the book *Lights Out* explain. When was the last time you had this much sleep?**

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**Melatonin functions to destroy cancer in multiple ways. First, because it is toxic to cancer cells, it induces apoptosis, or cancer cell auto-destruction, as well as directly kills cancer cells. It also slows tumour growth through a variety of mechanisms, such as by inhibiting epidermal growth factor receptors on cancer cells**

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**Melatonin also stimulates the immune system and increases the cancer-killing activity of macrophages, monocytes, natural killer cells, T-helper cells and eosinophils, all of which are involved in cancer cell destruction.**

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**Additionally, melatonin inhibits angiogenesis (new tumour blood vessel creation) from existing blood vessels. Tumours get their nutrition through blood vessels, and as they grow, they require an increasingly greater supply of blood vessels to feed themselves.**

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**Melatonin has properties which enable it to block the effects of estrogen upon cancer cells; this is important because estrogen derivatives stimulate the growth of hormonally-influenced cancers, such as breast, endometrial, ovarian and uterine cancers.**

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**Finally, as an antioxidant, melatonin reduces inflammation, a condition that enables cancer's survival, and it scavenges free radicals so that they don't damage normal cells and make them vulnerable to further genetic mutations.**

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**Melatonin is the pineal hormone of most biological significance.**

**It is synthesized from serotonin.**

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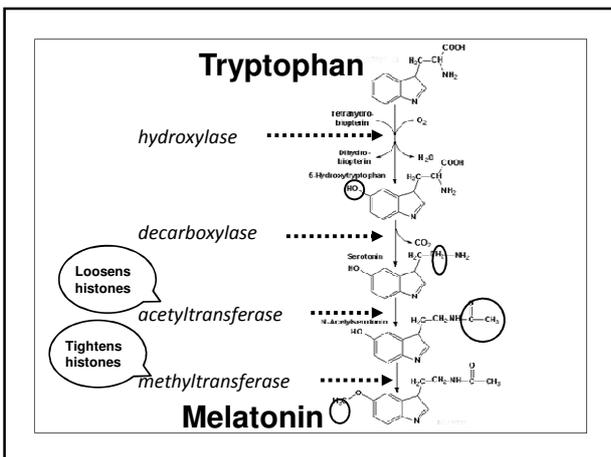
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**Synthesising N. Acetylserotonin from Serotonin**  
**Vit B5, Vit B1, Magnesium, α-Lipoic acid, Vit B2, Vit B3**

**Synthesising Melatonin from N. Acetylserotonin**  
**SAM – (Vit B12's, Folic acid, Vit B6, Zinc, Magnesium)**

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**It is most abundant and active in total darkness peaking at 2am and declining to half levels by 5am.**

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**Melatonin is found naturally in Wheat grass, Barley grass Bananas, Morello cherries, Porridge oats,.**

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**Melatonin is also secreted by bone marrow, the retina, the gastrointestinal tract, the liver, lungs, skin and certain lymphocytes.**

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**Melatonin has an immuno-modulatory effect on the thymus gland by differentiating undifferentiated white cells into mature T, B and NK cells.**

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**It is a powerful antioxidant against the hydroxyl radical.**

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**The Hormonal Connection**

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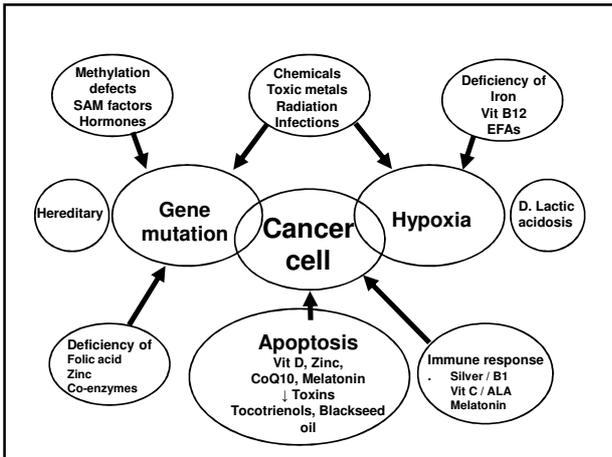
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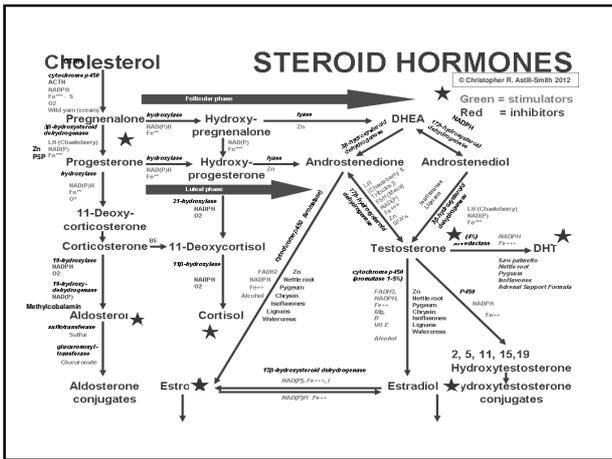
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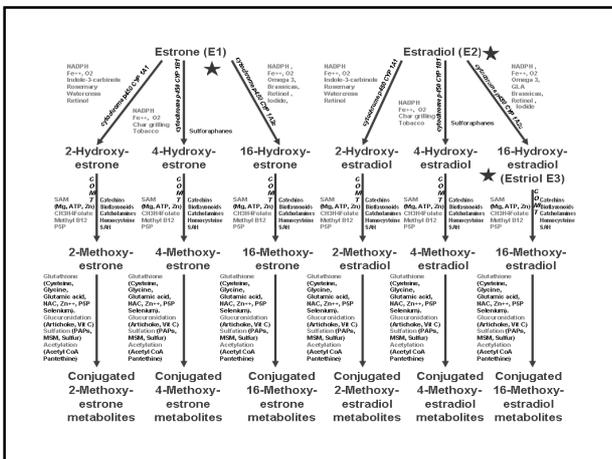
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**The synthesis of  
PREGNENALONE**

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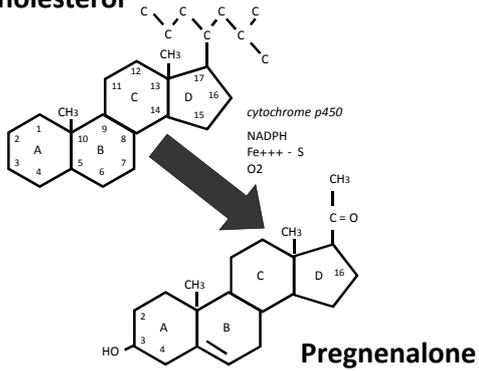
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**Cholesterol**



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**The synthesis of  
PROGESTERONE**

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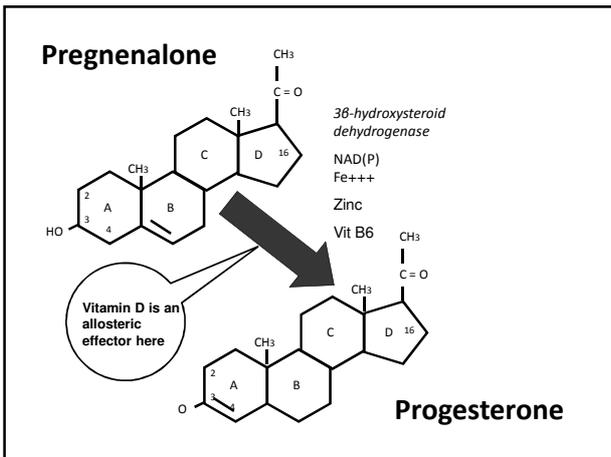
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**Progesterone**

- 1. Enhances the acinar portions of the breasts.**
- 2. Decrease peripheral blood flow thereby decreasing heat loss during the luteal phase and in pregnancy.**
- 3. Requires estrogens to stimulate their receptor sites.**
- 4. Progesterone but not estrogen *depolarizes natural killer cells.***

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**The Metabolism of  
17β-ESTRADIOL**

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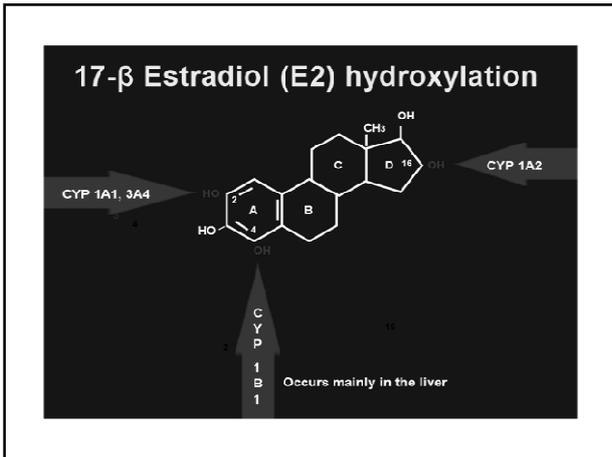
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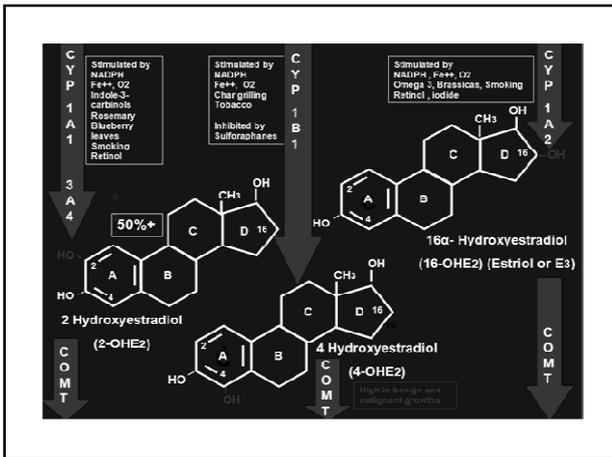
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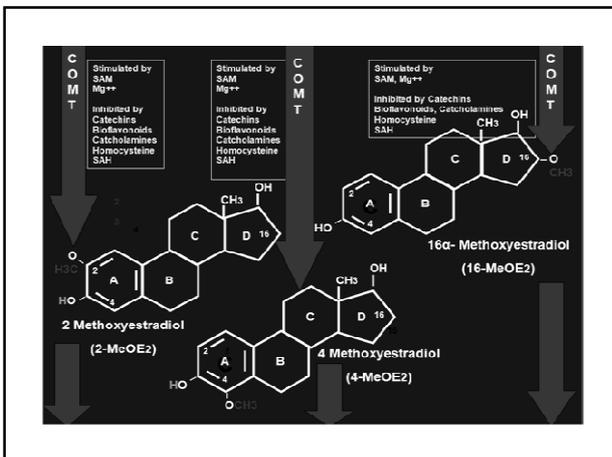
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Glutathione conjugation from various *glutathione-S-transferase* enzymes using glutathione as the cofactor. NAC, Zn<sup>++</sup>, P5P, Selenium. Spinach, Onion, Garlic, Rosemary, Watercress.

Sulfation from various *sulfotransferase* enzymes using PAPs or Sulfur as the cofactor. MSM. Broccoli, Asparagus, Garlic, Onions, Dill, Parsnip, Horseradish, Cabbage, Stinging nettle.

Glucuronidation from various *glucuronosyl transferase* enzymes using UDP-glucuronic acid as the cofactor. Cashew, Soy, Licorice, Flax, Alfalfa.

Acetylation using AcetylCoA as the acetyl donor. Pantethine, Endive, Pea, Cucumber, Watercress, Tomato.

**Methoxyestradiol conjugates excreted in the urine and bile**

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### Estrone (E1) hydroxylation

Occurs mainly in the liver

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High in lungs and malignant growths

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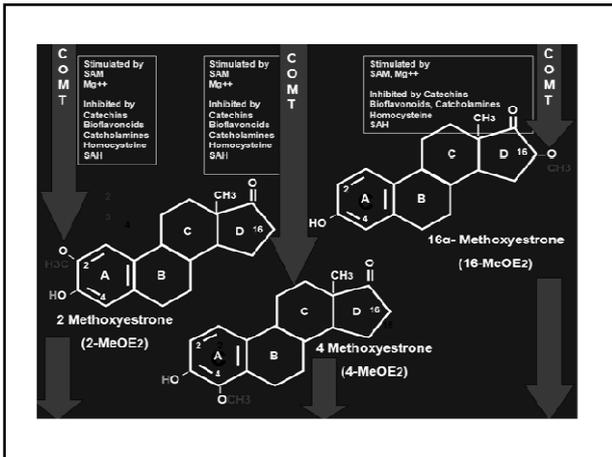
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Glutathione conjugation from various *glutathione-S-transferase* enzymes using glutathione as the cofactor. NAC, Zn<sup>++</sup>, P5P, Selenium. Spinach, Onion, Garlic, Rosemary, Watercress.

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Acetylation using AcetylCoA as the acetyl donor. Pantethine. Endive, Pea, Cucumber, Watercress, Tomato.

**Methoxyestrone conjugates excreted in the urine and bile**

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**Fungi**

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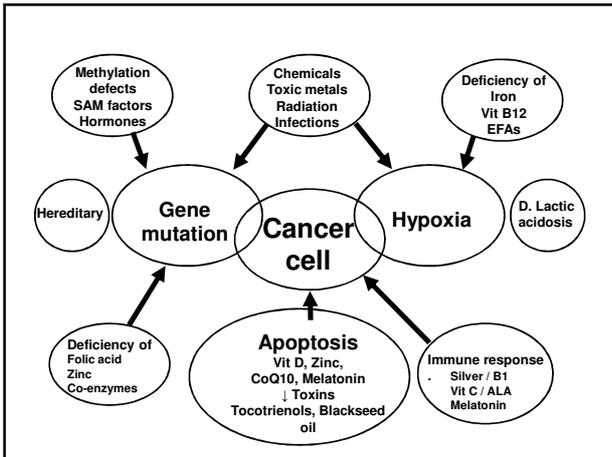
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**Grains such as corn, wheat, barley, sorghum, and other foods such as peanuts, are commonly contaminated with cancer-causing fungal poisons called mycotoxins. One of them, called aflatoxin, just happens to be the most carcinogenic substance on earth. we consume, on average, from 0.15mg to 0.5mg of aflatoxin per day.**

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**Antifungals  
 Ionic citrated silver + Vit B1  
 Urea  
 Castor oil extracts  
 Coconut oil extracts  
 Apple cider vinegar  
 Grapefruit seed extract  
 BLUE spice mix  
*Always check for Essential fatty acids and Zinc***

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# Cell Apoptosis

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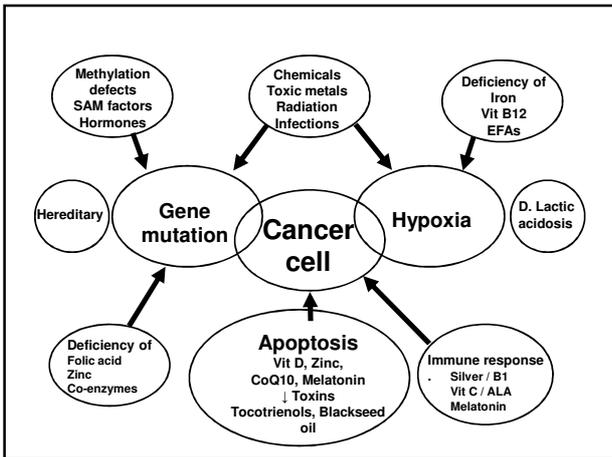
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# Vitamin D

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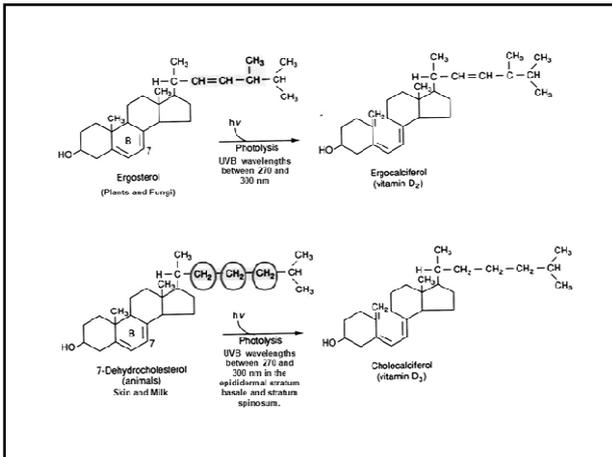
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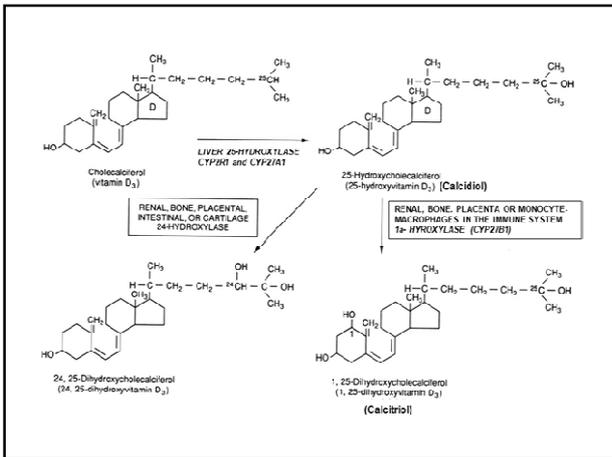
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**Vitamin D function**  
**Calcitriol is transported by Vitamin D binding protein (VDBP). It binds to the Vitamin D receptor (VDR) in nuclear membrane of target tissues including brain, heart, gonads, prostate and breast.**

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**Vitamin D increases expression of the tyrosine hydroxylase gene in adrenal medullary cells to synthesise L.DOPA. Dopamine and Noradrenalin.**

**Probably also tryptophan hydroxylase to synthesise serotonin and melatonin levels.**

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**It also is involved in the biosynthesis of neurotrophic factors, synthesis of nitric oxide synthase, and increased glutathione levels.  
Calcidiol is also converted to calcitriol outside of the kidneys for other purposes, such as the proliferation, differentiation and apoptosis of cells.**

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**Health benefits  
Cancer  
Cardiovascular disease  
Hypertension  
Diabetes  
Mortality  
Bone health  
Multiple sclerosis  
Immune system  
Muscle function Inflammatory response**

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**Vitamin D food sources**

**Plant – UV exposed mushrooms  
UV exposed yeast  
Alfalfa**

**Animal – Fish liver oil  
Fatty fish  
Whole egg  
Beef liver**

**Sun - 10,000 to 20,000 IU of vitamin D  
are produced in 30 minutes of whole-  
body exposure.**

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**Vitamin D EU RDA**

**The recommended daily amount  
for vitamin D in the European  
Union is 5 µg (200 IU).**

**The European Menopause and Andropause  
Society (EMAS) recommended 15 µg (600  
IU) until age 70, and 20 µg (800 IU) in older  
than 71 years, in postmenopausal women.  
This dose should be increased up to 4,000  
IU/day in some patients with very low  
vitamin D status or in case of co-morbid  
conditions.**

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**Epigenetics Vitamin D3 in Organic  
Hemp oil**

**1 drop delivers 2.5mcg (100 IU)  
= 50% EURDA**

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**Zinc**

**Poly (ADP-ribose) polymerase (PARP) is a family of proteins involved in a number of cellular processes involving mainly DNA repair and programmed cell death.**

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**PARP is composed of four domains of interest: a DNA-binding domain, a caspase-cleaved domain(see below), an auto-modification domain, and a catalytic domain. The DNA-binding domain is composed of two zinc finger motifs.**

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**It is interesting to note that NAD<sup>+</sup> is required as substrate for generating ADP-ribose monomers. PARP is synthesized using nicotinamide as the leaving group. PARP also has the ability to induce programmed cell death, via the production of PAR, which stimulates mitochondria to release Apoptosis Inducing Factor (AIF)**

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**Apoptosis Inducing Factor (AIF) is a FAD protein that triggers chromatin condensation and DNA degradation in a cell in order to induce programmed cell death. The mitochondrial AIF protein was found to be a caspase-independent death effector that can allow independent nuclei to undergo apoptotic changes.**

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**The process triggering apoptosis starts when the mitochondria releases AIF, which exits through the mitochondrial membrane, enters the cytosol, and finally ends up in the cell nucleus where it signals the cell to condense its chromosomes and fragment its DNA molecules in order to prepare for cell death.**

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**Isozymes  
Human genes encoding apoptosis inducing factor isozymes are:  
AIFM1  
AIFM2  
AIFM3**

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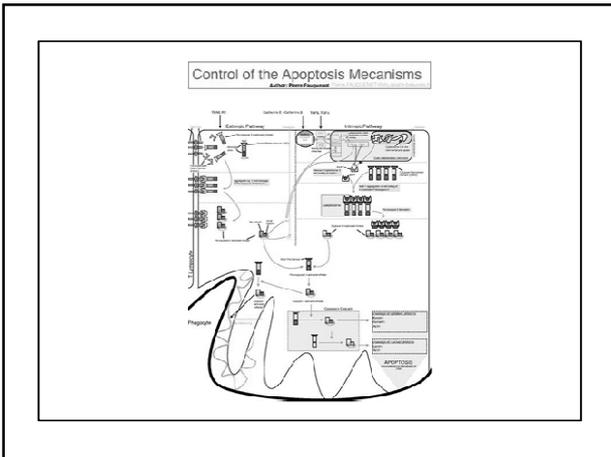
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**Researchers reported that in laboratory and animal studies where CoQ10 was delivered to cancer cells and tissues, it induced apoptosis, which is the normal programmed cell death that goes awry in the disease process.**

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**Co-Enzyme Q10**  
**Optimal absorption is Co-Q10 mixed in Wonder oil (equal portions of organic Peanut and Sesame seed oil).**

**5ml of oil delivers 30mg Co-Q10**

**Best taken last thing at night.**

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**Melatonin can kill directly many different types of tumour cells. It is a naturally produced cytotoxin, which can induce tumour cell death (apoptosis). In instances where the tumour has already established itself in the body, melatonin has been shown to inhibit the tumour's growth rate.**

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**Colon cleansing will usually include psyllium, internal cleansing herbs and other natural colon cleansing products. When detoxifying the colon, it is also important to incorporate probiotics in your diet to replenish intestinal flora.**

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**New Epigenetics Colon Cleanse  
Organic psyllium husk  
Organic psyllium seeds  
Organic rice bran  
Nettle root  
Bentonite clay**

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**Epigenetics Immune Formula**

**Citrated Ionic Silver +  
Citrated Vitamin B1 (Thiamine)**

**Usually 15 squirts once a day  
before breakfast**

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**Vitamin C + a-Lipoic acid (450mg +  
50mg)**

**a-Lipoic acid is a co-enzyme and an  
antioxidant. alpha Lipoic acid is  
unique in that it functions in water  
and fat, and it appears to be able to  
recycle Vitamin C and Glutathione  
after they have been used up. It  
increases the formation of  
glutathione.**

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**Epigenetics New Vitamin C Complex**

**Ascorbic acid 250mg  
Organ Reishi mushroom 50mg  
Organic Shiitaki mushroom 50mg  
Organic Beetroot 50mg  
Hesperidin 25mg  
Rutin 25mg  
α-Lipoic acid 25mg**

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**Vitamin A**

**Get plenty of natural vitamin A. There is evidence that vitamin A also plays a role in helping prevent breast cancer. The best sources are organic turkey and chicken liver, organic egg yolks, raw butter, raw whole milk, and organic beef liver.**

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**We highly recommend that your alternative cancer treatment include at least one dietary cancer treatment such as the Johanna Budwig Diet, the Gerson Therapy Diet, the Bill Henderson Diet Protocol (which is based on the Budwig Diet) or the Brandt Grape Cure (if you are up to it). Also the new Ketogenic diet..**

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Common combination chemotherapy regimens<sup>[15]</sup>

Cancer type	Drugs	Acronym
Breast cancer	Cyclophosphamide, methotrexate, 5-fluorouracil	CMF
Breast cancer	Doxorubicin, cyclophosphamide	AC
Hodgkin's disease	Musine, vincristine, procarbazine, prednisolone	MOPP
Hodgkin's disease	Doxorubicin, bleomycin, vinblastine, dacarbazine	ABVD
Non-Hodgkin's lymphoma	Cyclophosphamide, doxorubicin, vincristine, prednisolone	CHOP
Germ cell tumor	Bleomycin, etoposide, cisplatin	BEP
Stomach cancer	Epirubicin, cisplatin, 5-fluorouracil	ECF
Stomach cancer	Epirubicin, cisplatin, capecitabine	ECX
Bladder cancer	Methotrexate, vincristine, doxorubicin, cisplatin	MVAC
Lung cancer	Cyclophosphamide, doxorubicin, vincristine,	CAV
Colorectal cancer	5-fluorouracil, folinic acid, oxaliplatin	FOLF-OX

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**Diets**

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**Rainbow diet**  
Resveratrol from grape skins, polyphenols in olive oil, allicin in garlic, ellagic acid in berries, quercetin in onions and apples, vitamin K and indole-3-carbinol released by beneficial bacteria from greens and broccoli, anthocyanidins from deep purple foods like beetroot and figs and so many, many more, that when combined by eating different ones across a few days can make a significant contribution to defeating the process that is called cancer.

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**Johanna Budwig Diet**  
Dr. Budwig found that by combining flaxseed oil with the sulphurated amino acids found in cottage cheese – the flaxseed oil would become water-soluble, and immediately available for use by the body's cells. Cottage cheese contains sulphur for detoxification and L. Lactic acid

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**The Gerson Therapy – Cancer Diet**

The Gerson Therapy is a safe, natural treatment developed by Dr. Max Gerson in the 1920's that uses organic foods, juicing, coffee enemas, detoxification and natural supplements to activate the body's ability to heal itself. According to the Gerson Institute, "Over the past 60 years, thousands of people have used the Gerson Therapy to recover from so-called "incurable" diseases such as cancer, diabetes, heart disease and arthritis."

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**The Brandt Grape Cure**

The original Brandt Grape Cure diet, developed by Johanna Brandt in the 1920's, involves 12 hours of fasting every day, followed by 12 hours where you consume absolutely nothing except grapes (and/or grape juice). Purple (Concord) grapes (with their skin and seeds), contain several nutrients that are known to kill cancer cells.

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**The New Ketogenic Diet**

Many cancer patients have reportedly overcome the disease by adopting a ketogenic diet, which calls for eliminating carbohydrates, replacing them with healthy fats and protein .

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**Animal studies have shown that mice fed a carb-free diet survived highly aggressive metastatic cancer even better than those treated with chemotherapy.**

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**Your normal cells have the metabolic flexibility to adapt from using glucose to using ketone bodies. Cancer cells lack this metabolic flexibility, so when you eliminate carbs, which turn into sugar, you effectively starve the cancer.**

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**Provocative question**

**Is cancer a nuclear genetic disease or a mitochondrial metabolic disease?**

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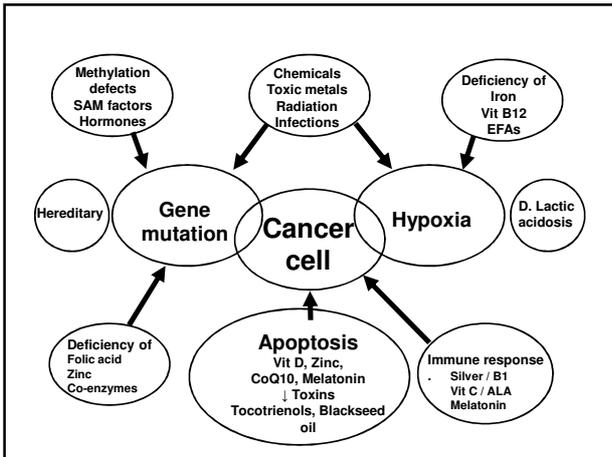
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**Always choose a diet you enjoy, as it is important that everything you do in your life bring you joy, not misery.**

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**pH Balance**

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**New Complex Products**

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Vitamin B 1 Complex (Thiamine, Adenine (Vit B4), Pantothenic acid, B12)  
 Soluble in alcohol. Heat stable. Associated with the nervous system. Acts as a vasoconstrictor. Increases blood pressure and enhances blood vessel tone. Destroyed by *thiaminase* in clams and salted herring.  
 Deficiency - Most symptoms due to high lactic acid levels. Burning in soles of feet. Tenderness of the calf muscles, Back pain at night. Poor breath holding less than 20 seconds, low body temperature, frequent yawning, fatigue, lack of appetite, bloating. Symptoms worse with exercise.  
 Increased psychotic tendency, intolerance to noise, apprehension. Bradycardia, irregular heart beat, atrial fibrillation, heart block. Split S1 and / or S2. Increased body weight.  
 Lack of vibration sense. Hat on or tight band sensation around the head.  
 Lack of appetite. Drowsiness after meals. Enhances salivary glands and pancreas to produce their alkaline enzymes thus aiding carbohydrate metabolism. Helps overly acidic patient.  
 Goes to sleep but wakes up and cannot get back to sleep. Nocturnal frequency.

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**Thiamine + Magnesium enables thiamine to be activated to thiamine pyrophosphate and thiamine triphosphate**

**Vitamin B1**

Thiamine  
 $\xrightarrow[\text{Mg, ATP}]{\text{thiamine diphosphotransferase}}$  Thiamine monophosphate (Thiamine ATP)  
 $\xrightarrow[\text{Mg, ATP}]{\text{thiamine diphosphotransferase}}$  Thiamine diphosphate\* (pyrophosphate)  
 $\xrightarrow[\text{Mg, ATP}]{\text{thiamine ATP phosphotransferase}}$  Thiamine triphosphate\*

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**Vitamin B2 Complex (Riboflavin, Niacin, Folic acid, Choline, Inositol, Betaine)**  
 Insoluble in alcohol, heat labile.  
 Nerve relaxing, acts as a vasodilator, aids hypertension.  
**Deficiency**  
 Excessively worried, moody, apprehensive, suspicious, depression.  
 Tachycardia, Ventricular ectopic beats, pre angina pectoris, Pre-myocardial infarction. S1 and S2 equally spaced.  
 Aids in stomach HCl production. Helps overly alkaline patient. Spastic gall bladder. Bright red tip of the tongue. Purple or strawberry tongue with Vit B2 deficiency.  
 Rectal and vaginal irritation.  
 Frequent crying for no cause.  
 Cracking of the lips especially in the corners. Loss of substance in the upper lip.  
 Loss of capillary tone. Bloodshot eyes. Spider nervi.  
 Regulates oxygen / hydrogen. Role in sugar and aids fat metabolism. Deficiency leading to photophobia, burning, itching and blepharospasm. Things go in and out of vision.  
 Stimulates both acetylcholine synthesis and metabolism. Stimulates acetylcholinesterase so deficiency leads to spasms, atherosclerosis including coronary vessels, restless legs- jumpy or shaky legs.  
 Low levels of tissue choline as lecithinase is R/N dependant. Leads to fat deposition.

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**Vitamin E**  
 Vitamin E refers to a group of eight fat-soluble compounds that include both tocopherols and tocotrienols. It functions -  
 1. As an antioxidant, vitamin E acts as a peroxy radical scavenger, preventing the propagation of free radicals in tissues, by reacting with them to form a tocopheryl radical, which will then be reduced by a hydrogen donor (such as vitamin C) and thus return to its reduced state. As it is fat-soluble, it is incorporated into cell membranes, which protects them from oxidative damage.  
 2. As an enzymatic activity regulator, for instance, protein kinase C (PKC), which plays a role in smooth muscle growth, can be inhibited by  $\alpha$ -tocopherol.  $\alpha$ -Tocopherol has a stimulatory effect on the dephosphorylation enzyme, protein phosphatase 2A, which in turn, cleaves phosphate groups from PKC, leading to its deactivation, bringing the smooth muscle growth to a halt.

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3. Vitamin E also has an effect on gene expression. Macrophages rich in cholesterol are found in the atherogenic tissue. Scavenger receptor CD36 is a class B scavenger receptor found to be up-regulated by oxidized low density lipoprotein (LDL) and binds it. Treatment with  $\alpha$ -tocopherol was found to downregulate the expression of the CD36 scavenger receptor gene and the scavenger receptor class A (SR-A) and modulates expression of the connective tissue growth factor (CTGF). The CTGF gene, when expressed, is responsible for the repair of wounds and regeneration of the extracellular tissue lost or damaged during atherosclerosis.  
 4. Vitamin E also plays a role in neurological functions, and inhibition of platelet aggregation.  
 5. Vitamin E also protects lipids and prevents the oxidation of polyunsaturated fatty acids.

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Signs of vitamin E deficiency include neuromuscular problems such as spinocerebellar ataxia and myopathies. Other neurological signs may include dysarthria, absence of deep tendon reflexes, loss of vibratory sensation and proprioception, and positive Babinski sign. Deficiency can also cause anemia due to oxidative damage to red blood cells, retinopathy and impairment of the immune response. There is also some laboratory evidence that vitamin E deficiency can cause male infertility. **VITAMIN E DEFICIENCY LEADS TO NECROSIS OF HEART TISSUE**

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**Dietary sources** [edit source]

mg(100 g)		Some foods with vitamin E content <sup>[3]</sup>
low	high	
160		Wheat germ oil
41		Sunflower oil
34		Safflower oil
16	25	Nut and nut oils, such as almonds and hazelnuts <sup>[39]</sup>
15		Palm oil <sup>[20]</sup>
12.2		Common purslane <sup>[38]</sup>
1.5	3.4	High-value green, leafy vegetables: spinach, turnip, beet greens, collard greens, and dandelion greens <sup>[39]</sup>
2.1		Avocado
1.1	1.5	Asparagus <sup>[39]</sup>
1.5		Kiwifruit (green)
0.78	1.5	Broccoli <sup>[39]</sup>
0.4	1	Pumpkin <sup>[39]</sup>
0.26	0.84	Sweet potato <sup>[39]</sup>
0.9		Mangoes
0.54	0.36	Tomatoes <sup>[39]</sup>
0.36	0.44	Rockfish <sup>[39]</sup>
0.3		Papayas
0.13	0.22	Low-value green, leafy vegetables: lettuce <sup>[39]</sup>

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**Tocotrienols are members of the vitamin E family. An essential nutrient for the body, vitamin E is made up of four tocopherols (alpha, beta, gamma, delta) and four tocotrienols (alpha, beta, gamma, delta). The slight difference between tocotrienols and tocopherols lie in the unsaturated side chain having three double bonds in its farnesyl isoprenoid tail. Tocotrienols are natural compounds found in select rice bran, coconut oils, wheat germ, barley, saw palmetto, and certain types of nuts and grains. Sunflower, peanut, walnut, sesame, and olive oils, however contain only tocopherols. This variant of vitamin E typically only occurs at very low levels in nature. Tocotrienols are forms of natural vitamin E that can protect against brain cell damage, protection against strokes, prevent pancreatic, breast, prostate and skin cancer and reduce cholesterol. They do so by dialing down HMG-CoA reductase, the enzyme in the liver responsible for cholesterol synthesis. These biological characteristics, however, are not present in tocopherols.**

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In the past six years, the Armed Forces Radiobiology Research Institute (AFRRI) has performed extensive research on tocotrienol—a form of vitamin E—as radiation countermeasure agent. Tocotrienols occur naturally as four distinct molecules designated  $\alpha$ -,  $\beta$ -,  $\gamma$ - and  $\delta$ -tocotrienol. Of these,  $\delta$ - and  $\gamma$ -tocotrienol are the most effective radioactive countermeasure agents. Reactive oxygen species (ROS) and reactive nitrogen species (RNS) are the primary source of radiation-induced damage, and—as potent antioxidants—tocotrienols are effective radioprotectors, supporting the hypothesis that “strong antioxidants make strong radioprotectors”. However, amelioration of radiation lethality goes beyond tocotrienol’s antioxidant properties.  $\delta$ - and  $\gamma$ -tocotrienol display an unambiguous stimulatory effect on hematopoietic (blood-forming) tissue, with delta-tocotrienol performing better than gamma-tocotrienol.

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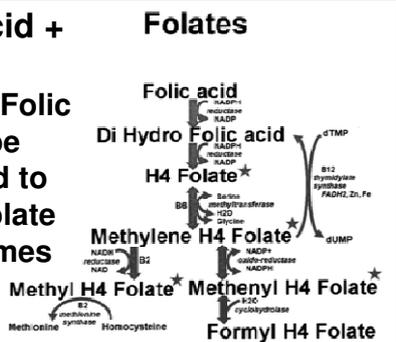
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**Folic acid + Zinc enables Folic acid to be activated to all the folate co-enzymes**




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- Colon Cleanse**
- Organic Psyllium husk**
- Organic Psyllium seed**
- Organic Rice bran**
- Organic Nettle leaf**
- Bentonite clay**

Take 1-2 teaspoons. Stir well in 250ml water and swallow last thing at night or first thing in the morning.

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**Co-Enzymes now available**  
**Vitamin B1 – Thiamine + Zinc**  
**Vitamin B2 - Riboflavin-5-phosphate**  
**Vitamin B3 – NADH**  
**Vitamin B6 – Pyridoxal-5-phosphate**  
**Folic acid + Zinc**  
**Vitamin B12 – Adenosylcobalamin**  
**Vitamin B12 – Methylcobalamin**  
**Vitamin C + α-Lipoic acid**  
**Vitamin C Complex**  
**Co-Enzyme Q10 in Wonder oil 30mg/5ml**

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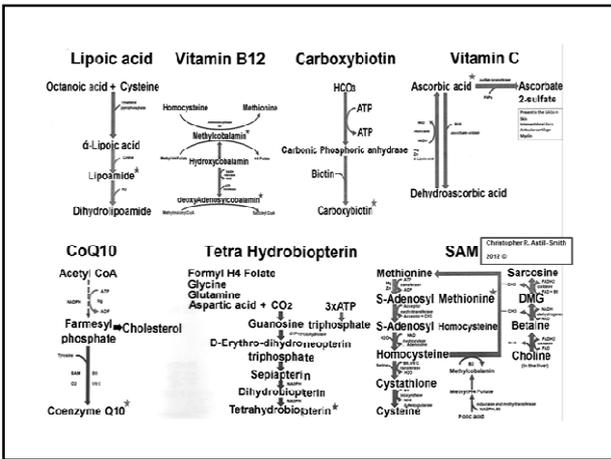
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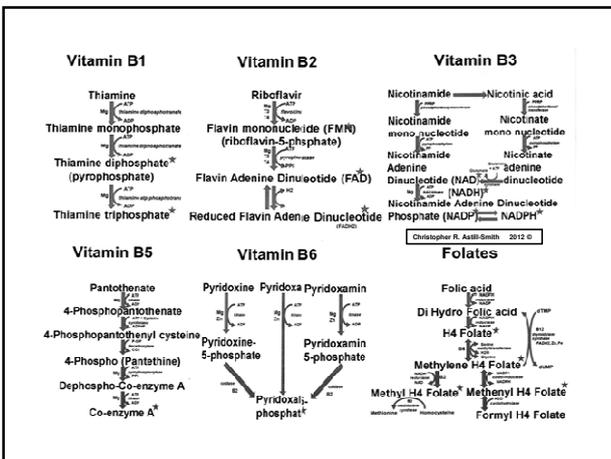
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**VITAMIN C**  
much more than just ascorbic acid

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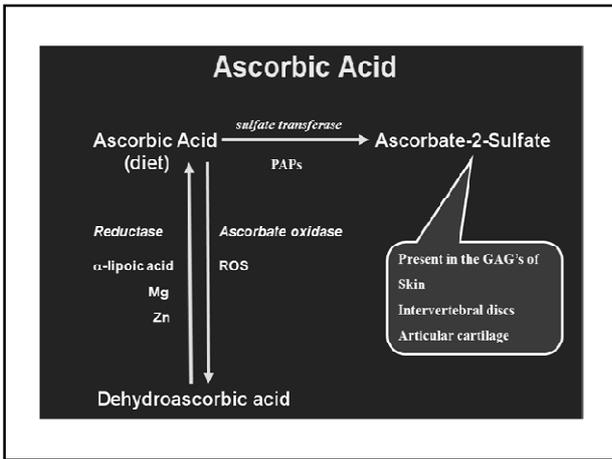
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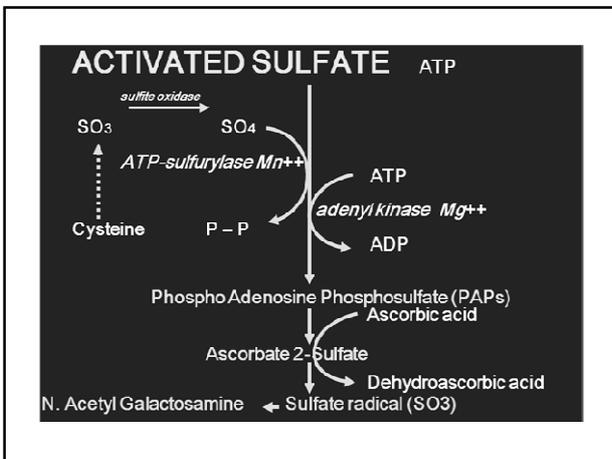
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**Vitamin C Complex**  
**is**  
**Ascorbic acid – protective part.**  
***Tyrosinase* enzyme – Cu<sup>++</sup>**  
**dependant. Rich in Shiitaki and**  
**Reishi mushrooms, beetroot and**  
**potato juice.**  
**Vitamin P – from rutin**  
**(buckwheat), citrus bioflavonoids.**

Fagio – John Hopkins University 1932

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**Shiitake  
mushroom**

**Reishi  
mushroom**



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**The white blood cells contain the**  
**highest content of Vitamin C of**  
**any tissue. It stimulates**  
**phagocytosis.**  
**It works with Vitamin E to protect**  
**against free radicals.**  
**Important in the synthesis of**  
**cortisol and hemoglobin.**  
**Metabolises histamine.**

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**Richest tissues**  
**Lymphocytes**  
**Adrenal glands**  
**The eye**  
**Gonads**  
**Pituitary gland**  
**Brain**  
**Liver**  
**Spleen**  
**Pancreas**

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Vitamin C acts as an electron donor for eight different enzymes

Three enzymes (prolyl-3-hydroxylase, prolyl-4-hydroxylase, and lysyl hydroxylase) that are required for the hydroxylation proline and lysine in the synthesis of collagen hydroxylation. These reactions add hydroxyl groups to the amino acids proline or lysine in the collagen molecule via prolyl hydroxylase and lysyl hydroxylase, both requiring vitamin C as a cofactor. Hydroxylation allows the collagen molecule to assume its triple helix structure, and thus vitamin C is essential to the development and maintenance of scar tissue, blood vessels, and cartilage.

Two enzymes ( $\epsilon$ -N-trimethyl-L-lysine hydroxylase and  $\gamma$ -butyrobetaine hydroxylase) that are necessary for synthesis of carnitine. Carnitine is essential for the transport of fatty acids into mitochondria for ATP generation.

The remaining three enzymes have the following functions in common, but have other functions as well:  
 dopamine beta hydroxylase participates in the biosynthesis of noradrenalin from dopamine.  
 another enzyme (peptidylglycine  $\alpha$ -amidatimonooxygenase) adds amide groups to peptide hormones, greatly increasing their stability.  
 4-hydroxyphenylpyruvate dioxygenase modulates tyrosine metabolism.

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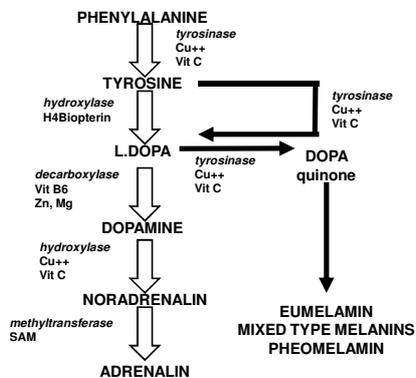
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**Deficiency**

**A deficiency of Vitamin C complex reduces the capacity of the blood stream to carry oxygen. May drop by 50%.**

**It primarily causes a degeneration of the intercellular substance of bone and teeth. It causes a fatigued state.**

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**It is responsible for the reduction in the germicidal enzymes in the saliva. All infections exhaust vitamin C supply. Hence why good teeth equate with lack of infections.**

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**Epigenetics new Vitamin C Complex  
Ascorbic acid 250mg  
Organ Reishi mushroom 50mg  
Organic Shiitaki mushroom 50mg  
Organic Beetroot 50mg  
Hesperidin 25mg  
Rutin 25mg  
 $\alpha$ -Lipoic acid 25mg**

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**Co-Enzyme Q10**  
**Optimal absorption is Co-Q10**  
**mixed in Wonder oil (equal**  
**portions of organic Peanut and**  
**Sesame seed oil).**

**5ml of oil delivers 30mg Co-Q10**

**Best taken last thing at night.**

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**Black Cumin Seed Oil (*Nigella***  
***sativa*)**

**from Ranunculaceae (Buttercup)**  
**family**

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**Isaiah 28:25 Does he not, after he has leveled its**  
**surface, scatter the dill and sow cumin, and put in**  
**wheat and barley and rye in its borders.**  
**Isaiah 28:27 For dill is not threshed under the feet**  
**of oxen, nor is a threshing instrument turned about**  
**upon cumin, but dill is beaten out with a staff and**  
**cumin with a rod.**

**The holy prophet Muhammad calls blackseed “a**  
**remedy for every illness except death.”**

**According to Zohary and Hopf, report *N. sativa***  
**seeds have been found in several sites from**  
**ancient Egypt, including Tutankhamun’s tomb.**

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The seeds of the black cumin plant contain over 100 chemical compounds, including some yet to be identified. In addition to what is believed to be the primary active ingredient, crystalline nigellone, black cumin seeds contain: thymoquinone, beta sitosterol, myristic acid, palmitic acid, palmitoleic acid, stearic acid, oleic acid, linoleic acid, linolenic acid, arachidonic acid, protein, vitamin B1, vitamin B2, vitamin B3, folic acid, calcium, iron, copper, zinc, and phosphorous.

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*Nigella sativa* oil also contains an abundance of conjugated linoleic (18:2) acid, nigellone (dithymoquinone), melanthin, nigilline, damascenine, and tannins.

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*Nigella sativa* oil also contains an abundance of conjugated linoleic (18:2) acid, nigellone (dithymoquinone), melanthin, nigilline, damascenine, and tannins.

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**Immune stimulant –** ↑T.cell ratios  
↑NK cells  
↑ Interferons  
↑ Bone marrow

**Migraines**  
**Asthma**  
**Allergies – natural antihistamine**  
**Menstrual flow**  
**Parasites**  
**Cancers**

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**Autoimmune including R/A**  
**Stimulate breast milk**  
**Abscesses – beta sitosterol**  
**Hypertension and ↑ Cholesterol**  
**Eczema, acne, psoriasis and boils**  
**Fatigue**  
**Pink eye**  
**Digestive disturbances**  
**Liver**

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**Skin fungus**  
**Acne**  
**Hair loss**  
**Colic in babies**

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Research conducted at the Cancer Research Laboratory of Hilton Head Island in South Carolina showed that oil of black cummin fought cancerous tumours without the negative side effects chemotherapy. Research showed that it

- Increased the growth rate of bone marrow cells by a staggering 250%
- Inhibited tumor growth by 50%
- Stimulated immune cells and raised the interferon production (which protects cells from the destructive effect of viruses)
- Has strongly antibacterial effects
- Lowers the blood glucose level

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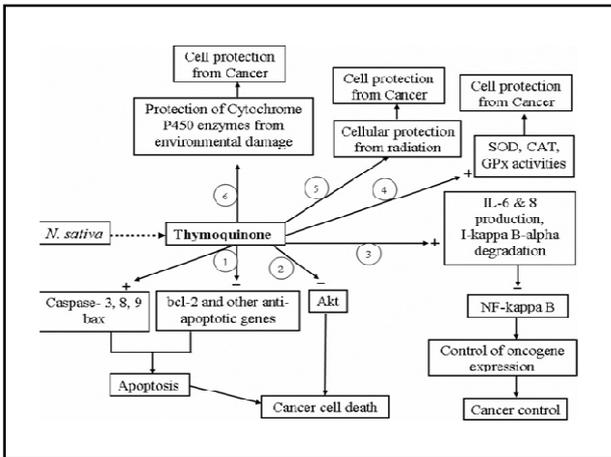
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**How to take black cummin and dosage requirements**  
 It is imperative to purchase organic, cold pressed oil that is free of additives. To improve your immune system, take one teaspoon daily mixed with raw honey or fresh juice one hour before breakfast. For cancer, take three teaspoons daily in divided doses combined with a healthy cancer diet and exercise program. Both immune problems and cancer are treated with the addition of fresh garlic. Black cummin should be taken daily as a preventative measure for all diseases.

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**SPORTS INJURY**

**Three phases of healing**

- 1. Inflammation**
- 2. Proliferation – repair**
- 3. Remodelling**

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**!. INFLAMMATION**

**Alteration to the microcirculation and accumulation of inflammatory cells are the hallmarks of inflammation.**

**PAIN, REDNESS, OEDEMA, HEAT, LOSS OF USE.**

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**The processes are largely initiated by resident macrophages that secrete the cytokines**

**TNF $\alpha$**

**IL-1**

**IL-6**

**IL-8**

**in response to tissue damage.**

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**These cytokines in turn stimulate neighbouring stromal cells, such as the endothelial cells and fibroblasts, to release mediators that induce dilation of the local microvasculature, and cause permeabilization of capillaries.**

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**The chemical mediators of inflammation are**

**Histamine**

**Bradykinin**

**Serotonin**

**Prostaglandins E2**

**Leukotriens B4**

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**Activated endothelial cells also facilitate the egress of circulating leukocytes into the injured tissue by releasing chemotactic cytokines and lipid products as well as by expressing on their surface adhesion molecules such as ICAM.**

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Macrophages as well as other leukocytes, recruited to the site of injury undergo a respiratory burst, producing ROS and proteolytic enzymes.

ROS are produced in three ways, each of which involves a specific enzyme.

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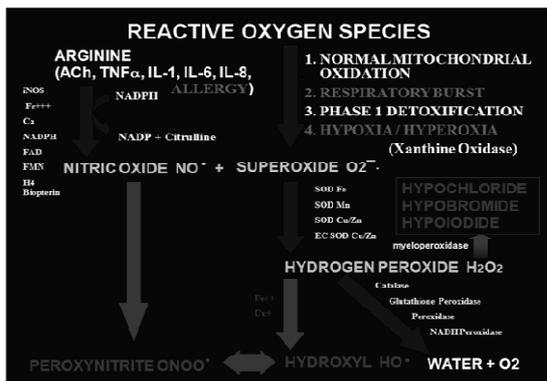
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During the respiratory burst, membrane bound NAD(P)H oxidase is activated in both macrophages and granulocytes and produces superoxide anion radicals from molecular oxygen.

Superoxide in turn is reduced to H<sub>2</sub>O<sub>2</sub> by SOD which can be further reduced to OH· by the Fenton reaction using Fe<sup>++</sup>.

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**Macrophages can also generate NO\* via the conversion of arginine mediated by inducible nitric oxide synthase.**

**This reaction is stimulated by allergens, bacterial endotoxin and the cytokines TNF $\alpha$ , IL-1, IL-6, IL-8.**

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**Subsequently nitric oxide and superoxide, both of which are products of activated macrophages, can react with each other, yielding peroxynitrite anion, which upon protonation decays to nitrogen dioxide and OH.**

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**Granulocytes (large amounts in a single shot), and macrophages (small amounts but more constant), discharge the lysosomal enzyme myeloperoxidase into engulfed extracellular spaces, the phagocytic vacuoles.**

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**Myeloperoxidase catalyses the formation of hypochlorite and other halogen derivatives from H<sub>2</sub>O<sub>2</sub> and a halogen molecule.**

**Hypochlorite anion and the other halogen derivatives can further combine with H<sub>2</sub>O<sub>2</sub> to form Singlet oxygen and OH<sup>-</sup>.**

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**Reactive Oxygen Species are necessary to**

- 1. Kill invading bacteria, viruses, fungi and parasites**
- 2. Promote cell growth**
- 3. Promote cell division**

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**Inflammation**

**Fatty acids Omega 6-3 ratio to stimulate PgE 1 and 3.**

**Also helps to inhibit *cyclooxygenase* and *lipoxigenase* which stimulate PgE2 and Leukotriens.**

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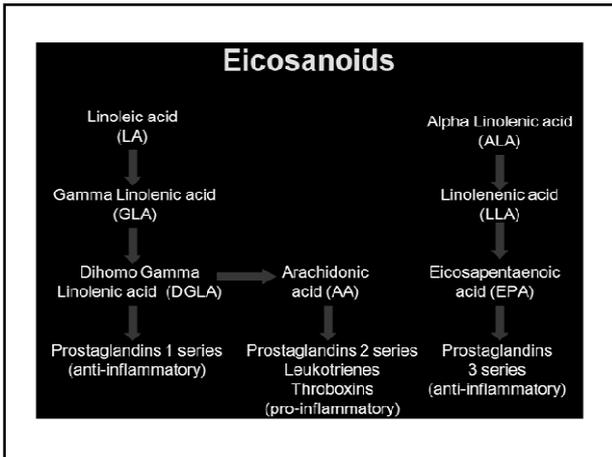
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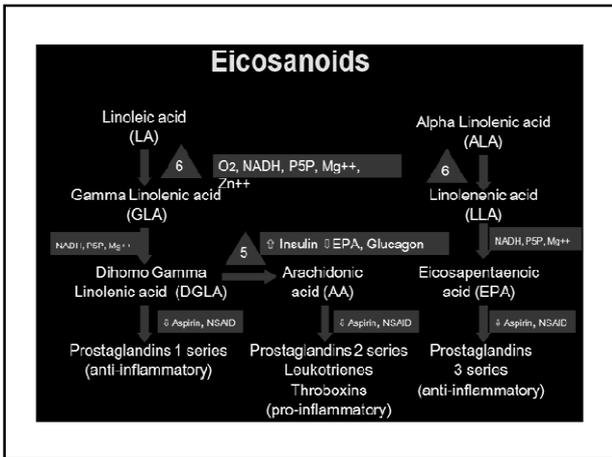
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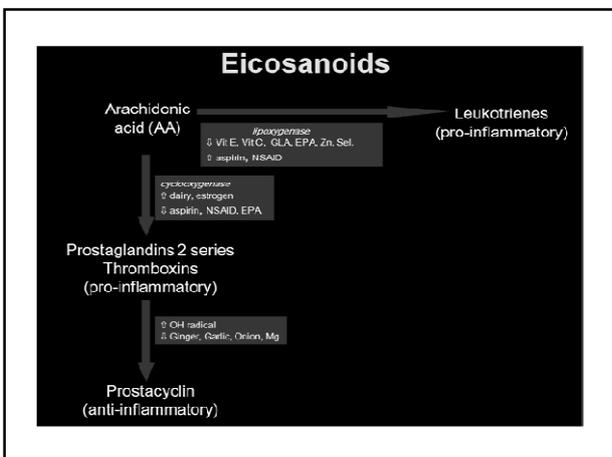
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**Anti-inflammatory foods containing bioflavonoids**

<b>Grapefruit</b>	<b>Green beans</b>
<b>Spinach</b>	<b>Garlic</b>
<b>Cauliflower</b>	<b>Lemons and limes</b>
<b>Pineapple</b>	<b>Broccoli</b>
<b>Peppers</b>	<b>Courgettes</b>
<b>Onion</b>	<b>Asparagus</b>
<b>Cinnamon</b>	<b>Turmeric</b>

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**Practical summary for early stage injury**

- 1. Don't avoid Omega 6 oils, simply replace processed foods with lean game meats, walnuts and seeds.**
- 2. Include 2-3 thumb size portions per day of good fats such as avocado, flax, olive.**

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- 3. Use 3-9 gm of Omega 3 oils.**
- 4. Consider extra Omega 6 such as EPO for the first few weeks.**
- 5. Consider a multi-strain probiotic to help with gut health and immunity.**
- 6. Use sleep naps no longer than 1 hour to reduce sleep debt from disturbed sleep.**

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**Simple dietary considerations to support healing**

- 1. To increase iron absorption combine a source of Vitamin C with foods that contain iron at the same meal.**
- 2. Avoid tea and coffee which can inhibit mineral absorption, around meal times.**

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**3. Vary breakfast alternatives to ensure very high fibre cereals are not the only choice.**

- 4. Consider high proline source such as egg whites in smoothies as a quick breakfast option with herbs and dairy based proteins.**
- 5. Use fish soups and chicken wings or fresh stocks to get the benefit of natural collagen.**

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**2. TISSUE REPAIR starts after the first initial phase of the inflammatory cascade which usually lasts 48-72 hours.**

**The initial phase is accompanied by pain as the same chemicals that drive the acute inflammatory process also sensitise the nociceptors.**

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**The second phase of inflammation is called the repair phase and commences from the end of the first phase (48-72 hours) and lasts up to 6 weeks.**

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**As the chemicals that drive the acute phase have now subsided so does pain.**

**So a reduction in pain indicates a change from the acute phase to the repair phase.**

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**Repair versus Regeneration**

**All tissues are capable of repair except the teeth but not all are capable of regeneration.**

**Bone for instance can both repair and regenerate without a scar.**

**It is initiated by certain cytokines such as TNF- $\alpha$ , IL-1 and IL-6.**

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**The process can be inhibited by glucocorticoids, cytotoxic agents, anti-neoplastic agents, anticoagulants, immunosuppressive agents, penicillamine, female sex hormones and broad spectrum antibiotics.**

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**Granulation is stimulated by macrophages and covers the entire complex of inflammatory cells such as the fibroblasts which secrete glycoproteins and proteoglycans and endothelia which stimulate new capillary growth. It is resistant to infection and pain and has a rich blood supply.**

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**Angiogenesis is the production of new blood vessels from endothelial cell migration, proliferation and maturation. It is stimulated by hypoxia, the acute inflammatory cytokines and Vitamin C. It is inhibited by shark cartilage, collagen, Irish Moss, genisteine and modified citrus pectins.**

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**Fibroblast activity can only occur if the acute phase has resolved.**

**They arrive at the site of injury, adhere to the extracellular matrix and synthesise collagen, fibronectin and proteoglycans.**

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**Fibrin is the end product of the coagulation cascade that is formed from fibrinogen. It acts as a scaffolding on which collagen can be deposited.**

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**Excess and haphazard laying down of fibrin and collagen may lead to joint hypomobility, pain and to excess scar tissue (adhesion). Use Green tea moisturising cream.**

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**Proliferation – Repair**  
**Excessive dietary restriction may reduce important nutrients for the repair of tissues –**  
**Vitamin A**  
**Vitamin C and Copper**  
**Vitamin D along with Calcium, Magnesium, Iron and Zinc**

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**Glutamine to reduce acid load of the diet and help improve fascial tissue quality.**

**BCAA - Leucine, Isoleucine and Proline to reduce muscle soreness and wasting.**

**Arginine to stimulate nitric oxide to aid repair. (Beetroot is a good source of arginine)**

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**3. REMODELLING**

**The speed of full resolution of an injury depends upon the degree of vascularization of the injured tissue.**

**e.g. Ligaments have poor blood supply and may take 6 months to a year.**

**Muscle has a good blood supply and may take only 6 weeks.**

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**Remodelling is a balance between collagen deposition versus degradation produced by *collagenase* released by fibroblast and macrophages.**

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**Key factor is the restoration of normal range of motion.  
Healing musculoskeletal tissues will realign themselves along the lines of stress imposed by movement.**

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**Collagen Synthesis**

**Widespread protein: provides tensile strength.**

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**COLLAGEN TYPE 1** Most connective tissues including skin, blood vessels, cornea, bone, ligaments and tendons. Thick fibres.  
**COLLAGEN TYPE 11** Cartilage (?O/A) intervertebral disc, vitreous humor and tendons. Thin fibres.  
**COLLAGEN TYPE 111** Extensible connective tissue such as skin, lung and the vascular system  
**COLLAGEN TYPE 1V** Basement membranes. Very fine fibres.  
**COLLAGEN TYPE V** Minor component of tissues containing type 1 especially tendons and bone.

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**COLLAGEN** possesses a triple helix structure containing about a 1000 amino acids. Glycine residues occur at every third position (Gly-X-Y).

X and Y can be any other amino acids but 100 or so of the X positions are Proline and a 100 of the Y positions are Hydroxyproline. Most of the other amino acids are either Lysine or Hydroxylysine.

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**Collagen Production is as follows-**

- 1. DNA transcription of various RNA molecules, which is Zinc dependant.**
- 2. RNA instructs amino acids, mainly Glycine, Proline and Lysine to form collagen configurations in the ribosomes.**

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**3. These are then attached to the Endoplasmic Reticulum where they produce single prochains. Proline and Lysine may be hydroxylated here by prolyl hydroxylase and lysyl hydroxylase co-factored by Alpha keto glutarate, Iron and Vitamin C Tetrahydrobiopterin?**

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**4. These are then glycosylated with glucose or galactose (cofactored by Manganese and Vitamin A).**

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**5. Three pro-chains combine to form pro-collagen in the Endoplasmic Reticulum. And are then transported to the Golgi Apparatus and then to the plasma membrane. The pro-collagen intra and inter-chains are held together by disulfide bonds formed from PAPs or cysteine or sulfur.**

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**8. Thicker collagen fibres are formed by layers of microfibrils.**

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**9. Joint immobilisation leads to excess cross linking causing adhesion formation.**

**The bioflavonoid catechin (from Green Tea) stimulates the normal collagen cross linking and so helps prevent adhesion formation especially after surgery.**

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**Other polyphenolic compounds also aid normal collagen cross linking. Such as OPC's and the Anthocyanidins.**

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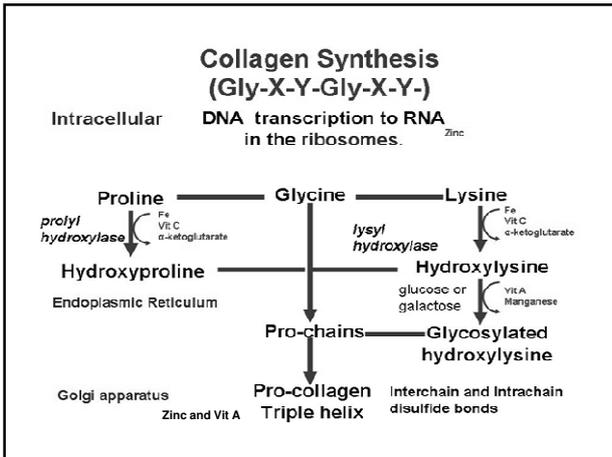
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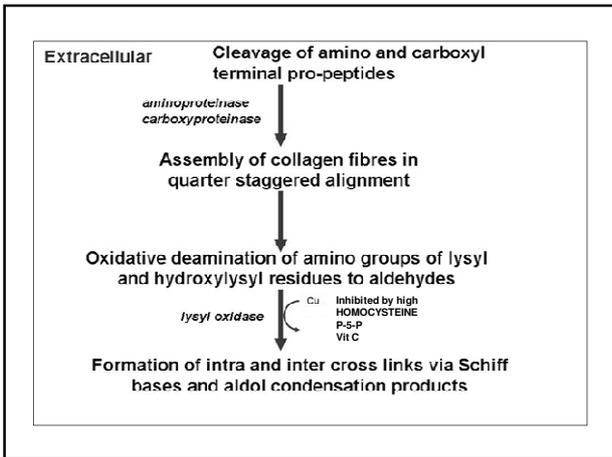
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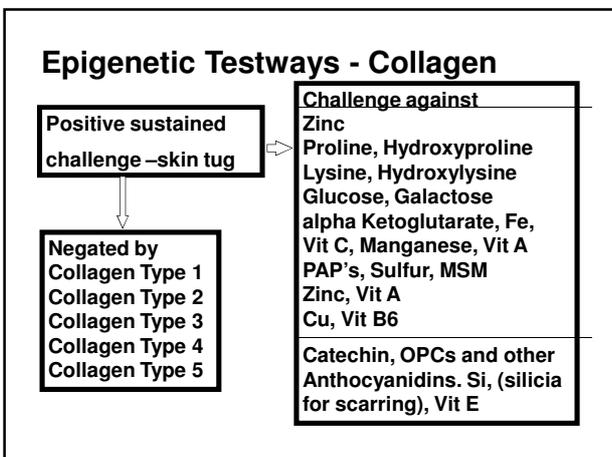
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**Elastin**

**Fibrous protein forming elastic mesh and imparts yellow colour e.g. skin, aorta**

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**Elastin is a connective tissue protein that possesses elastic recoil properties.**

**Present in ligament, lung, arteries, skin, ear cartilage**

**It is 1/3<sup>rd</sup> Glycine, 1/3<sup>rd</sup> Alanine + some Valine and Proline.**

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**It contains no hydroxyproline or hydroxylysine.**

**The covalent cross links are formed by a lysine aldol as in collagen and requires *lysyl oxidase*, the Cu<sup>+</sup> dependant enzyme. (Inhibited by high Homocysteine levels)**

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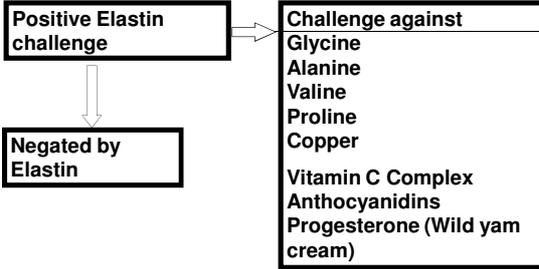
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### Epigenetic Testways - Elastin



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**Skin revitalization**  
Main skin proteins are  
Collagen – Pyridoxal-5-phosphate  
Elastin - Methylcobalamin  
Fibrin - Adenosylcobalamin  
Fibronectin – Folinic acid

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**Skin revitalization**  
Main skin proteins are  
Collagen – skin stretch challenge  
Elastin – skin twang challenge  
Fibrin – crease stretch challenge  
Fibronectin – skin pressure challenge

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**Wonder cream**

Organic cold pressed peanut oil  
Organic cold pressed sesame  
seed oil  
Cetyl alcohol from coconut  
Shea butter  
Hyaluronic acid  
Natural preserver  
Vitamin E  
Lemongrass aromatherapy oil  
Pyridoxal-5-phosp,  
Methylcobalamin,  
Adenosylcobalamin  
Folinic acid

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**3. Remodelling**

Consider    **Glucosamine sulfate**  
              **Chondroiton sulfate**  
              **MSM**  
              **Hyaluronic acid creams**

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**The Melanin Hypothesis**

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**Melanopsin is a photopigment found in specialized photosensitive ganglion cells of the retina that are involved in the regulation of circadian rhythms, pupillary light reflex, and other non-visual responses to light. In structure, melanopsin is an opsin, a retinylidene protein variety of G-protein-coupled receptor. Melanopsin is most sensitive to blue light. A melanopsin based receptor has been linked to the association between light sensitivity and migraine pain.**

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**Melanopsin was originally discovered by Ignacio Provencio and his colleagues in 1998, in the specialized light sensitive cells of frog skin. In 1999, Russell G. Foster showed that entrainment of mice to a light-dark cycle was maintained in the absence of rods and cones. Such an observation led him to the conclusion that neither rods nor cones, located in the outer retina, are necessary for circadian entrainment and that a third class of photoreceptor exists in the mammalian eye. In 2000, Provencio determined that melanopsin was expressed only in the inner retina of mammals, including humans, and that it mediated nonvisual photoreceptive tasks.**

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**The first recordings of light responses from melanopsin-containing ganglion cells were obtained by David Berson and colleagues at Brown University. They also showed that these responses persisted when pharmacological agents blocked synaptic communication in the retina, and when single melanopsin-containing ganglion cells were physically isolated from other retinal cells. These findings showed that melanopsin-containing ganglion cells are intrinsically photosensitive, and they were thus named intrinsically photosensitive Retinal Ganglion Cells (ipRGCs). They constitute a third class of photoreceptor cells in the mammalian retina, beside the already known rod and cone photoreceptors.**

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Evidence supporting prior theories that melanopsin is the photopigment responsible for the entrainment of the central "body clock", the suprachiasmatic nuclei (SCN), in mammals was provided by King-Wai Yau and colleagues at Princeton. Fluorescent immunocytochemistry was used to visualize melanopsin distribution throughout the rat retina and showed that melanopsin was found in approximately 2.5% of the total rat retinal ganglion cells (RGCs) and that these cells were indeed ipRGCs.

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Melanopsin-containing ganglion cells exhibit both light and dark adaptation, that is, that they adjust their sensitivity according to the recent history of light exposure. In this respect, they are similar to rods and cones. Whereas rods and cones are responsible for the analysis of images, patterns, motion and color, a number of studies have shown that melanopsin-containing ganglion cells contribute to various reflexive responses of the brain and body to the presence of (day)light.

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A mouse paraneuronal cell line (Neuro-2a), which normally is not photosensitive, is rendered photoreceptive by the addition of human melanopsin. Under such conditions, melanopsin acts as a sensory photopigment, performing physiological light detection. The melanopsin photoresponse is selectively sensitive to short-wavelength light (peak absorption ~480 nm), while it also has an intrinsic photoisomerase regeneration function that is chromatically shifted to longer wavelengths.

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**Melanopsin photoreceptors are sensitive to a range of light wavelengths. Melanopsin photoreceptors reach peak light absorption at blue light wavelengths around 488 nanometers. Other wavelengths of light activate the melanopsin signaling system with decreasing efficiency as they get shorter or longer than 488 nm. For example, shorter wavelengths around 445 nm (closer to violet in the visible spectrum) are half as efficient at melanopsin photoreceptor stimulation as light at 488 nm. Longer wavelengths around 529 nm (in the bluish-green part of the visible spectrum) are also half as efficient as light at 488 nm.**

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**Dopamine (DA) is a factor in the regulation of melanopsin mRNA in ipRGCs. Because DA synthesis and release in the rat retina are under the control of rods and cones, it appears that rods and cones, in conjunction with or possibly with the exclusion of direct circadian or photic input, control transcription of melanopsin.**

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**When light activates the melanopsin signaling system, the melanopsin-containing ganglion cells discharge nerve impulses, which are conducted through their axons to specific brain targets. These targets include the olivary pretectal nucleus (OPN) (a center responsible for controlling the pupil of the eye) and, through the retinohypothalamic tract, the suprachiasmatic nucleus of the hypothalamus (the master pacemaker of circadian rhythms).**

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Melanopsin-containing ganglion cells are thought to influence these targets by releasing from their axon terminals the neurotransmitters glutamate and pituitary adenylyl cyclase activating polypeptide. Melanopsin-containing ganglion cells also receive input from rods and cones that modifies or adds to the input to these pathways.

Mutation of a gene expressing melanopsin has been implicated in the risk of having Seasonal Affective Disorder (SAD).

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Experiments have shown that entrainment to light, by which periods of behavioral activity or inactivity (sleep) are synchronized with the light-dark cycle, is not as effective in melanopsin knockout mice. Entrainment is lost entirely when melanopsin-expressing cells are killed, as these cells are also required for transmission of rod-cone light information. Mice lacking rods and cones still exhibit circadian entrainment, but also show reduced response to light. Such mice can, however, distinguish between visual patterns.

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The pupillary reflex is also retained in mice lacking rods and cones but has reduced sensitivity, identifying a crucial input from the rods and cones. Without melanopsin, rods, and cones, mice fail to entrain to circadian rhythms and the pupillary reflex is lost.

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Melanopsin genes have been described in all vertebrate classes, and an extra melanopsin ortholog has been discovered in fish, bird, and amphibian genomes. Within the mammals studied thus far (which includes rodents, primates, and humans), the melanopsin protein has a similar pattern of tissue distribution; the protein is expressed only in the retina, and only in 1-2% of retinal ganglion cells. In non-mammalian vertebrates, melanopsin is found in a wider subset of retinal cells, as well as in photosensitive structures outside the retina such as the iris muscle of the eye, deep brain regions, the pineal gland, and the skin.

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The second study,<sup>3</sup> led by CNRS researcher Howard Cooper,<sup>4</sup> investigates how melanopsin responds to light stimulation. In 2005, *in vitro* studies had revealed that the transduction of light signals by melanopsin more closely resembles that of invertebrate photopigments than vertebrate rods and cones. When a photon is absorbed by melanopsin, a response is elicited but the photopigment also becomes desensitized. In contrast to rod and cone photopigments that require the enzymatic retinoid cycle to restore their light sensitivity, melanopsin uses the absorption of a second photon to regenerate the photopigment.

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This light-driven reversibility, called “bistability,” is what enables melanopsin to maintain a sustained response to light stimulation, contrary to rods and cones, which only respond to transient changes in light.

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To explore this process in vivo, the team studied the pupillary light reflex in humans. Input from all photoreceptors causes the human pupil to constrict. However, the scientists observed that rods and cones only allow an initial transient constriction of the pupil, whereas melanopsin produces a stabilized state of sustained constriction in response to light. The team suggests that "a normal sustained pupillary constriction requires melanopsin, which remains photosensitive even during extended exposure to light," says Cooper.

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The authors hypothesize that exploiting melanopsin's bi-stability and its sustained response capability could lead to clinical applications for improving phototherapy to treat dysfunctional circadian rhythms of sleep, or seasonal depression.

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For the greater part of 150 years it was assumed that the mammalian retina contained only two types of photoreceptors; rods and cones. However, a flurry of recent evidence has demonstrated the existence of a third type of mammalian photoreceptor that differs greatly from rods and cones. This type utilizes a different photopigment, is much less sensitive to light, and has far less spatial resolution; characteristics that fit perfectly with this photoreceptor's primary function of signaling changes in ambient light levels to the brain throughout the day.

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Most surprisingly, these photoreceptors are ganglion cells, and thus, have the unique ability to communicate directly with the brain. These intrinsically photosensitive retinal ganglion cells (ipRGCs) are a rare sub-population of ganglion cells (1-3%) whose primary role is to signal light for unconscious visual reflexes, such as pupillary constriction, and regulating a number of daily behavioral and physiological rhythms, collectively called circadian rhythms. This latter process, which adjusts circadian rhythms to the light/dark cycle of an animal's environment, is known as photoentrainment. The visual behaviors under ipRGC control are remarkably tonic, and require long integration times of ambient light levels.

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## Next Seminar

Functional Phono Cardiography

November 2<sup>nd</sup> 2013 Gatwick  
December 7<sup>th</sup> 2013 Bristol

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