

### Oxygen into the Mitochondria and where it Functions

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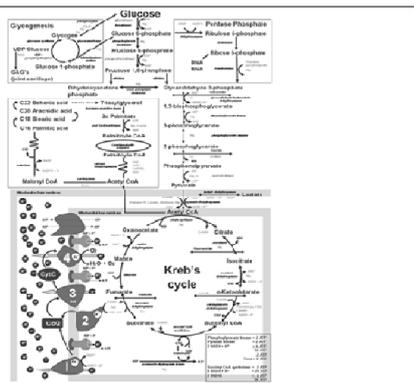
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### Energy pathway



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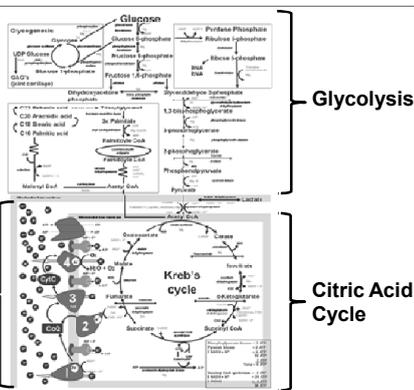
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### Energy pathway



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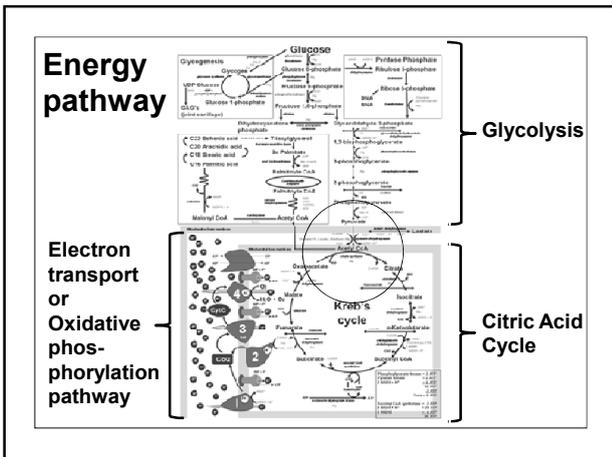
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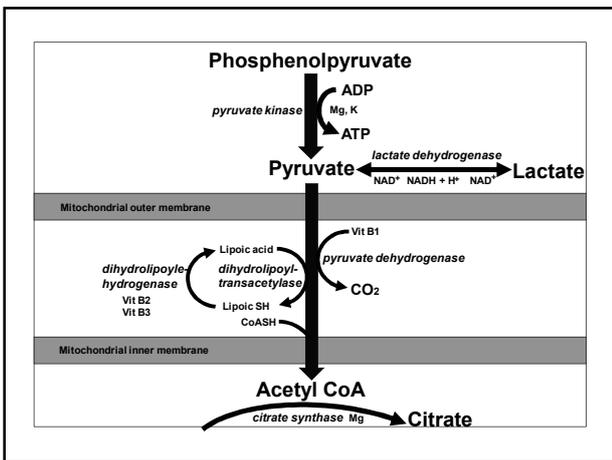
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**Lactic acid**  
**Tissues that function under hypoxic conditions produce lactic acid.**

**D/L Lactic acid – RED body types**  
**L.Lactic acid – GREEN body types**  
**D.Lactic acid- BLUE body types**

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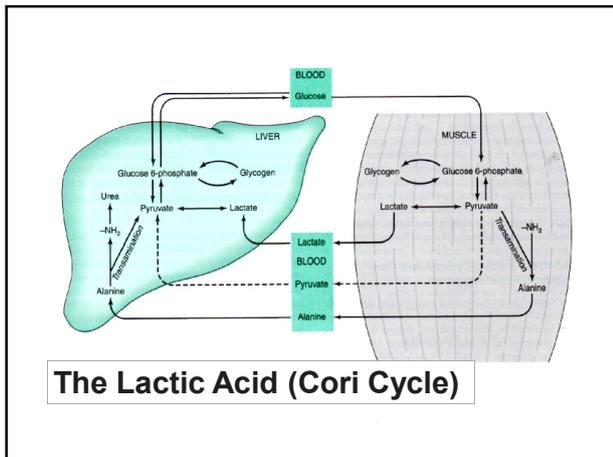
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The Lactic Acid (Cori Cycle)

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**Under anaerobic conditions NADH cannot be reoxidized through the respiratory chain to oxygen. Pyruvate is reduced by NADH to lactate catalysed by *lactate dehydrogenase*. There are three different specific isoenzymes of *lactate dehydrogenase* that have clinical significance.**

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**The re-oxidation of NADH via lactate formation allows glycolysis to proceed in the absence of oxygen by regenerating sufficient NAD for another cycle of the reaction catalysed by *glyceraldehyde-3-phosphate dehydrogenase*.**

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Some tissues derive much of their energy from glycolysis and produce lactate –

Erythrocytes	Brain
GI tract	Renal medulla
Retina	Skin

The liver, kidney and heart usually take up lactate and oxidize it but will produce it under hypoxic conditions

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**Hemoglobin.** The heme proteins myoglobin and hemoglobin maintain a supply of oxygen essential for oxidative metabolism. Myoglobin is in red muscle tissue stores O<sub>2</sub> as a reserve against oxygen deprivation. Hemoglobin a protein in erythrocytes transports oxygen to the tissues and returns CO<sub>2</sub> and protons to the lungs.

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**BAD FATS and OILS**

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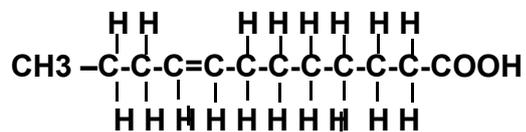
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**An unsaturated fatty acid  
(Omega 3)**



(Methyl (w) end                      Carboxyl end)

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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<sub>3</sub> -----COOH
- b) Unsaturated (mono or poly double bonds)**  
CH<sub>3</sub> ----=----- COOH  
(Methyl (w) end      Carboxyl end)

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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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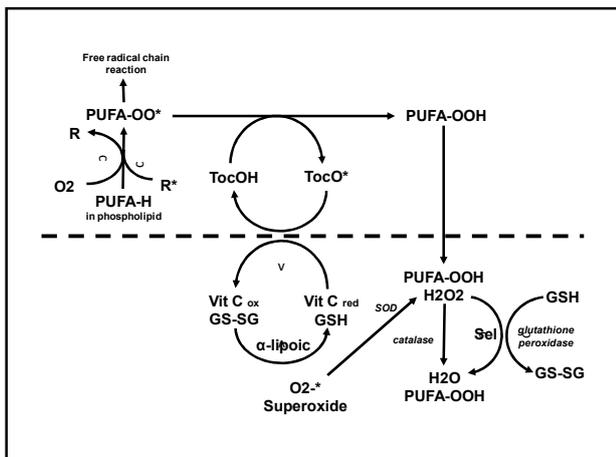
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mg/(100 g)		Some foods with vitamin E content <sup>(2)</sup>	
low	high		
150		Wheat germ oil	
41		Sunflower oil	
34		Safflower oil	
15	26	Nuts and nut oils, such as almonds and hazelnuts <sup>(note 2)</sup>	
15		Palm oil <sup>(24)</sup>	
1.5	2.4	High-value green, leafy vegetables: spinach, turnip, beet greens, collard greens, and dandelion greens <sup>(note 3)</sup>	
2.1		Avocados	
1.1	1.8	Asparagus <sup>(note 4)</sup>	
1.6		Kiwifruit (green) Soy	
0.78	1.4	Rice <sup>(note 5)</sup>	
0.3	1	Pumpkin <sup>(note 5)</sup>	
0.56	0.94	Sweet potato <sup>(note 7)(note 8)</sup> Soy	
0.9		Mangoes	
0.54	0.55	Tarragon <sup>(note 9)</sup>	
0.56	0.44	Radicchio <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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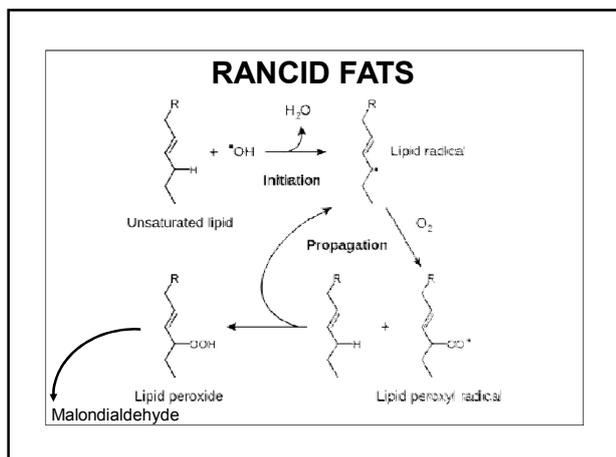
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Reactive oxygen species degrade polyunsaturated lipids, forming malondialdehyde. This compound is a reactive aldehyde and is one of the many *reactive electrophile species* that cause toxic stress in cells and form covalent protein adducts referred 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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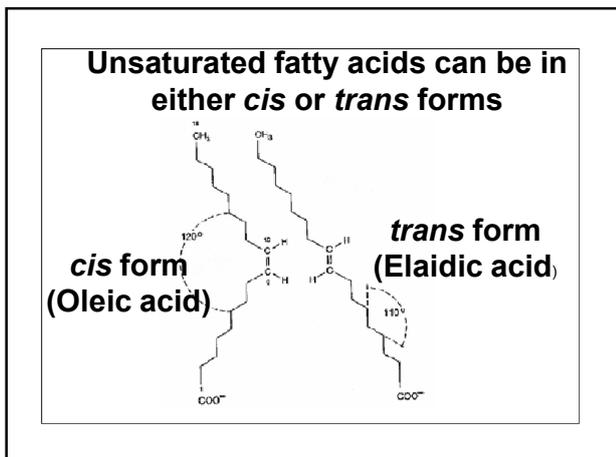
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**Hydrogenated fatty Acids**  
**The largest scale application of hydrogenation is for the processing of vegetable oils. Typical vegetable oils are derived from polyunsaturated fatty acids. Their partial hydrogenation reduces most but not all, of these carbon-carbon double bonds.**

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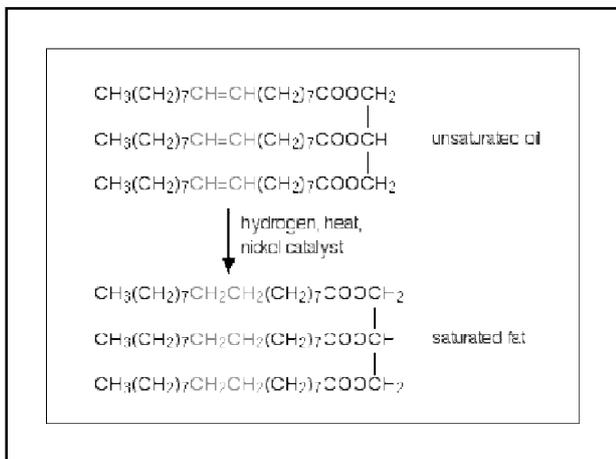
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**The degree of hydrogenation is controlled by restricting the amount of hydrogen, reaction temperature and time, and the catalyst (Nickel). Partial hydrogenation of a typical plant oil to a typical component of margarine. Most of the C=C double bonds 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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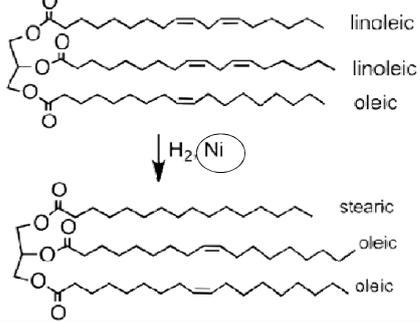
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### Hydrogenated Fatty Acids



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**Coenzyme Q10**

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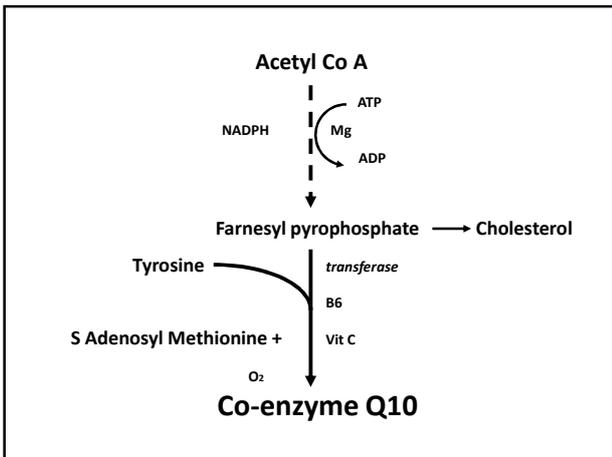
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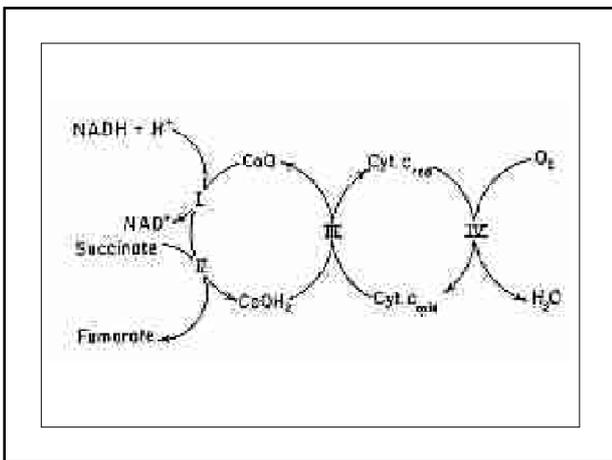
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**Coenzyme Q10 (ubiquinone) is a lipid-soluble compound that occurs in all kinds of cell membranes in the human body. It has several biochemical functions:**

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- it is indispensable for producing energy in the cells in the form of ATP
- it is an essential fat soluble antioxidant
- it helps regenerate other antioxidants esp Vit E
- it stimulates cell growth and inhibits cell death

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- It is beneficial for the prevention of cell damage in hypoxia, especially in the cardiac muscle. It has been used for the protection of myocardium in different cardiovascular disorders, such as angina pectoris, hypertension, arrhythmia and congestive heart failure.

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- It has been proven to have anti-tumour and immune system enhancing properties when tested in animals.
- Genetic mutations, ageing, cancer and statin-type drugs can cause a decrease in the levels of coenzyme Q10 in tissues and blood.

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• **Low ratio of coenzyme Q10 to low-density lipoprotein (LDL) cholesterol is a strong indicator of risk of atherosclerosis (clogging of the arteries)**

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**Best sources mg / Kg**  
**Beef, pork and chicken heart 113+**  
**Beef, pork and chicken liver 50+**  
**Sardines and red flesh fish 50+**  
**Soy, olive, grape seed oils 50+**  
**Peanuts, sesame, pistachio, hazelnuts 20+**  
**Parsley 20+**  
**Avocado 10+**

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**Toxins**

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**Toxins**

**Toxic metals – Coriander herb  
Yarrow**

**Chemicals - NAC  
Lemon balm  
Yarrow**

**Radiation - Yarrow**

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**Muscle Oxygen Requirements  
during Exercise**

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**A muscle requires approximately  
50x more oxygen per minute when  
active than when at rest. This is  
achieved by**

**1. An increase in lung blood flow  
and cardiac output from 5 litres per  
minute to 50 litres per minute. This  
gives an increase of 6x.**

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**2. Redistribution of the blood flow to the active muscles. This gives an increase of 3x.**

**3. More oxygen is extracted from every 100ml of blood passing through the muscle as a result of lowered oxygen tension in the muscles. This gives an increase of 3x.**

**Total increase is thus  $6 \times 3 \times 3 = 54$**

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**Optimal products  
Dosing  
Timing**

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**Optimal products  
Must remain strong to cross  
therapy localisation to**

- 1. CV22**
- 2. GV21**
- 3. GV28**

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**Dosing**  
Amount of liquid or capsules that strengthen weak muscle(s)

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**Timing**  
Cross therapy localise to the alarm points for remaining strong. Those that remain strong are the optimal times of dosing.

Usually St, SI, Cx or TW

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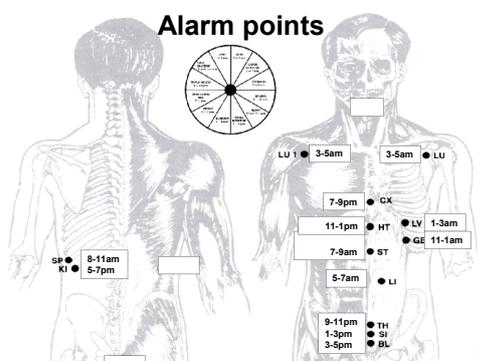
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Applied Kinesiology Synopsis by David Walther 2<sup>nd</sup> Edition

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**Timing**

- 1. Amino acids 15 minutes before breakfast**
- 2. Vitamins and Minerals with meals**
- 3. Fatty acids with evening meal**
- 4. Probiotics, CoQ10, Folic acid last thing at night.**
- 5. Herbs and spices between or before meals.**

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**EPIGENETICS LTD**

**Optimising Human Performance  
(Phonocardiography 3)**

**Bristol 14<sup>th</sup> June 2014  
Crawley 5<sup>th</sup> July 2014**

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**Products**

**All products, laminates, test kits, biomarker, DVDs, Online video education available at [www.epigenetics-international.com](http://www.epigenetics-international.com)**

**[sales@epigenetics-international.com](mailto:sales@epigenetics-international.com)**

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