Naturopathic Nutrition
Dietary Acronyms

- **DRVs** – Dietary Reference Values:
  - estimates of the requirements for *groups* of people and are not for individuals.

- **EAR** – Estimated Average Requirement:
  - an estimate of the *average* requirement for energy or a nutrient
Dietary Acronyms

- **RNI** – Reference Nutrient Intake:
  - the amount of a nutrient that is enough to ensure that the needs of nearly all the group (97.5%) are being met. Many within the group will need less.

- **LRNI** – Lower Reference Nutrient Intake:
  - the amount of a nutrient that is enough for only the small number of people who have low requirements (2.5%). The majority need more.
Dietary Reference Values

IDEAL:

- determine average requirements of healthy and representative segments of each age group and sex for the nutrient under consideration
Dietary Reference Values

REALITY:

- Data is collected on nutrient intake from apparently healthy adults - usually male.
- Biochemical measurements regarding adequate uptake are not used.
- Nutrient status in relation to intake is not examined.
- Human studies are limited due to costs.
Dietary Reference Values

Therefore

- Creates the myth that a balanced diet is enough
- Does not consider unique biochemical makeup
  - *individual* needs
- Does not consider variety in foodstuffs: quality
- Does not take into consideration lifestyle factors - smoking, alcohol, stress and exercise
- Does not take into account environmental factors
  i.e. pollution, living near radiation
Vitamins - Overview

- chemically disparate group of compounds with a variety of functions
- common feature – compounds required for maintenance of normal health and metabolism
- required in very small amounts
  - milligrams (mg) or micrograms (mcg/µg) per day
- predominantly ‘essential’ as can’t be synthesised by the body (bar vitamin D and niacin)
Vitamins - Overview

How to classify as a vitamin?

Need to demonstrate:

1. Lack will lead to a more or less specific clinical deficiency disease and abnormal metabolic signs
2. Supplementing will prevent or cure the deficiency and normalise metabolic abnormalities
Why the crazy naming convention?

- 1911, Cassius Funk identified the substances in natural foods that contain nitrogen
- ‘Vitamine’ = ‘vital amines’
- ‘vita’ = life ‘amine’ = containing nitrogen
- ‘Vitamine’ to ‘vitamin’ as it was later discovered that not all compounds contained nitrogen
Vitamins - Overview

• Other studies showed there was something ‘essential’ in milk for the growth of animals fed a diet of purified fat, carbohydrate, protein and mineral salts.

• 2 factors were found
  • Factor A – fat soluble in cream
  • Factor B – water soluble in water
Vitamins - Overview

- Further studies showed Factor B was a mixture of a number of compounds – thus given a numerical code as well as alpha e.g. B1, B2…

- One reason for the gaps in the numerical convention due to that vitamin later shown not to be a vitamin
Vitamin Classification

- Soluble in fat or water
  - Fat soluble – A, D, E and K
  - Water soluble – B’s and C

- Further breakdown of B’s
  - Energy production – B1, B2, B3, B5, B6
  - Hematopoisis – folic acid, B12, B6, B5
  - And other metabolic actions – B1, B2, B3, B6, B12, biotin, folic acid
Fat Soluble

Vitamins - A, D, E, K

- Significant storage capacity
- Deficiencies develop slowly
- Toxicity can develop due to storage capacity
- Not essential in diet every day
- Not excreted
- Found in lipid content of both plant and animal products
Water Soluble

Vitamins - B group and C

- Minimal storage capacity
- Deficiency develops quickly
- Necessary in the diet every day
- Are excreted rapidly
- Have no precursors
- Stable in raw foods
- Easily lost in cooking and processing
- Main source is from plants; less from animal products
Conversion for Fat Soluble Vitamins

Vitamin measurements:

- Gram = 1000 mg
- 1 mg = 1000 mcg / µg
- IU = International Unit
  - based on the biological activity or effect
  - different vitamins have different weights
    - 1 IU vitamin E not the same mg as 1 IU vitamin A
Vitamin A

**Retinoids**
Animal sourced, especially from liver
Toxic in high doses

**ßCarotene**
Bright yellow pigment in plants / foods
Not a vitamin but a phyto-nutrient
Beta-Carotene is converted to the Retinal form of Vitamin A within the body. This conversion occurs primarily in the intestinal mucosa but also in the liver. This retinal is then converted within the body to retinol.
# Vitamin A (and the carotenoids)

| Functions | • Growth and development during childhood and adolescence  
| Cell production / maintenance – skin and mucus membranes  
| Vision – transformation of light energy into nerve impulses  
| Adrenal hormone synthesis – oestrogens, androgens, corticosteroids  
| Bone growth and repair  
| Antibody production by white blood cells and activity of T cells |
| S/S | • Skin – dryness, itching, rough  
| Night blindness, tired / burning eyes, other eye problems  
| Dull hair / brittle nails  
| Poor skeletal growth / bone malformation  
| increased vulnerability to infections |
| At risk | • childhood and adolescence  
| stress, infection, or surgery  
| fat malabsorption  
| heavy alcohol and cigarette smoking |
| RDI | Adult male 700 µg, Adult female 600 µg (Beta carotene 2-6mg)  
Therapeutic – 10-200mg (Beta carotene 15-45mg) |
| NB | High doses can produce severe toxicity – esp. in children  
A tetrogen – therefore may cause birth defects - not exceed 2400 µg during pregnancy.  
Best given in beta carotene form to minimise potentially toxic effect |
Vitamin A

Sources

• Cod liver oil, halibut, salmon
• Animal livers
• All yellow / orange vegetables such as carrots, sweet potato, etc
  • Processing losses – boiling vegetables 15-35%
• All yellow / orange fruits: apricots, mangos, peach
• Green leafy vegetables and herbs: parsley, mint, chives, watercress
• A group of Red Algae that grow in high temperature environments where sunlight is very strong.
Vitamin D

- a group of related fat-soluble vitamins
- ultra-violet radiation (sunlight) on the skin stimulates the synthesis of Vitamin D3 whereas Vitamin D2 comes from food (Vitamin D3 is the more potent, bioavailable form)

Sources
- synthesised in skin
- fatty fish / fish liver oils – cod, halibut, tuna
- eggs, dairy products
# Vitamin D

| Functions                  | Calcium absorption and mineral deposition into the skeleton  
|                           | Cell growth and development – esp. white blood cells and epithelial cells  
|                           | Activity and response of white blood cells against infection  
| S/S                       | Bone malformation (Rickett’s in children), bone pain / tenderness  
|                           | Constipation / decreased muscle tone  
|                           | Hypothyroidism  
|                           | Decreased growth - needed for calcification of newly formed bone which is present at growing ends  
|                           | Muscle weakness and Tetany (Cramps) including menstrual  
|                           | Impaired immune response  
| At risk                   | Vegetarians  
|                           | Inadequate sunlight exposure  
|                           | Fat malabsorption  
|                           | Chronic kidney disease  
| RDI                       | Adult male and female - 0-10 ug / 200-400 IU  
|                           | Therapeutic - 10-40 ug / 400-1600 IU  
| NB                        | In the UK, vitamin A and D must, by law, be added to margarine  
|                           | Children and young adults – sunlight exposure of face, arms and hands for 10-15 minutes – 5 ug vitamin D  

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Latest Vitamin D Research

- Technically not a "vitamin," vitamin D is in a class by itself. Its metabolic product, calcitriol, is actually a hormone that targets over 2000 genes (about 10% of the human genome) in the human body. Current research has implicated vitamin D deficiency as a major factor in the pathology of at least 17 varieties of cancer as well as heart disease, stroke, hypertension, autoimmune diseases, diabetes, depression, chronic pain, osteoarthritis, osteoporosis, muscle weakness, muscle wasting, birth defects, periodontal disease, and more.

- Vitamin D's influence on key biological functions vital to one's health and well-being mandates that vitamin D no longer be ignored by the health care industry nor by individuals striving to achieve and maintain a greater state of health.

- Vitamin D council research
Vitamin E

- 8 naturally occurring compounds
- The compound with the highest biological activity is Alpha-Tocopherol
- Processing losses
  - Sensitive to alkali, light and heat
  - Milling flour – 80% loss
# Vitamin E

<table>
<thead>
<tr>
<th>Functions</th>
<th>Anti-oxidant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protects other fatty substances (vitamin A)</td>
</tr>
<tr>
<td></td>
<td>Protection against free radicals, pollution, radiation</td>
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<tr>
<td></td>
<td>DNA regulation</td>
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<tr>
<td></td>
<td>Reproduction</td>
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<tr>
<td></td>
<td>CV system, protects heart muscle, arteries, inhibits clotting</td>
</tr>
<tr>
<td></td>
<td>Wound /scar tissue healing</td>
</tr>
<tr>
<td></td>
<td>Thyroid hormone production</td>
</tr>
</tbody>
</table>

| S/S             | Not common, no true S / S that can be relied upon |
|                 | Clinical or suspected pathology such as atherosclerosis, stroke, cancer |

| At risk         | Consumption of only processed refined cereals |
|                 | High intake of PUFAs |
|                 | Selenium deficiency |
|                 | Repeated strenuous exercise |

| RDI             | Adult male and female 30 mg |
|                 | Therapeutic - 100-800 mg |

| NB              | Long term - use as a mixed tocopherol formulae |
Vitamin E

Sources
- most vegetable oils
- nuts and seeds – almonds, hazelnuts, sunflower seeds
- soybeans
- egg yolk
- wheat germ

Cautions
- Those on anti-coagulant medication should not use vitamin E unless under strict supervision by a medical practitioner
- haemophiliacs should not use vitamin E
- beware of people combining vitamin E, fish oils and Ginkgo biloba as all these have an anti-coagulant action. If bruising, especially of lower extremities, appears, review supplementation and lower dose, or discontinue
- stop intake of vitamin E 10 days before scheduled surgery
Vitamin K

- Unstable to light or alkali

- Standard testing of newborn babies to detect value of vitamin K. If low / none, injection / oral administration of 1-5 mcg to prevent haemorrhage in the first few days of life
# Vitamin K

| Functions | Production of blood clotting factors – prothrombin  
| Prevenion of haemorrhage  
| Reduces blood flow in menorrhagia / prolonged menstruation  
| Reduces menstrual clots, decreases menstrual cramps  
| Prevention cerebral palsy  
| Production of structural and regulatory proteins in bone – e.g. osteocalcin |
| S/S | Prolonged bleeding  
| Small amounts of blood in stool  
| Easy bruising |
| At risk | Liver disease  
| Heavy alcohol use |
| RDI | Adult male and female 1ug / kg of body weight  
| Therapeutic – 30-100 ug |
| NB | K1 – taken with meals |
| Sources | Broccoli, lettuce, cabbage, kale, spinach, Kelp  
| Eggs, liver, pork |
Vitamin B1 - Thiamine

• absorption increased by alliin (garlic, onion) and by calcium
• absorption inhibited by excess alcohol
• easily depleted by over-consumption of refined CHO’s
• large losses in cooking, milling (40 – 80%)
• sulphur dioxide and sulfites destroy
• quickly excreted in urine, very limited body storage (in liver)
• unstable to heat and light
# Vitamin B1 - Thiamine

<table>
<thead>
<tr>
<th>Functions</th>
<th>Energy metabolism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nerve transmission in the brain and peripheral nerves</td>
</tr>
<tr>
<td></td>
<td>Neurotransmitter metabolism - serotonin and acetylcholine</td>
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<tr>
<td></td>
<td>Carbohydrate metabolism</td>
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<tr>
<td></td>
<td>Production of hydrochloric acid</td>
</tr>
<tr>
<td>S/S</td>
<td>Numbness and tingling in hands and feet</td>
</tr>
<tr>
<td></td>
<td>Impaired sensations and reflexes</td>
</tr>
<tr>
<td></td>
<td>Staggering gait, poor balance</td>
</tr>
<tr>
<td></td>
<td>Mental confusion, learning and memory issues, headaches, insomnia</td>
</tr>
<tr>
<td></td>
<td>Impaired energy production and fatigue</td>
</tr>
<tr>
<td>At risk</td>
<td>Heavy alcohol consumption</td>
</tr>
<tr>
<td></td>
<td>High coffee, black tea and raw fish intake - thiamin antagonists</td>
</tr>
<tr>
<td></td>
<td>Folate deficiency - impairs absorption of B1</td>
</tr>
<tr>
<td></td>
<td>Oral contraceptive use</td>
</tr>
<tr>
<td>RDI</td>
<td>Adult male and female 1-5 mg</td>
</tr>
<tr>
<td></td>
<td>Therapeutic - 5 - 150 mg</td>
</tr>
<tr>
<td>NB</td>
<td>&gt; 200 mg can cause drowsiness</td>
</tr>
</tbody>
</table>
Vitamin B1 - Thiamine

Sources
- brewer’s yeast
- rice bran, wheat germ
- legumes
- whole grains
- nuts and seeds
- eggs
- beef, pork, liver, lamb
- asparagus
Vitamin B2 - Riboflavin

- not completely water soluble
- fluorescent yellow / orange colour, visible in urine (yes that’s the reason…)
- unstable to light
- meat and vegetable cooking – 10-20% loss
# Vitamin B2 - Riboflavin

<table>
<thead>
<tr>
<th>Functions</th>
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<tbody>
<tr>
<td>Energy production</td>
<td></td>
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<tr>
<td>Normal growth and reproduction</td>
<td></td>
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<tr>
<td>Tissue maintenance of mucosa, eyes and epithelium</td>
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<tr>
<td>Cofactor to glutathione reductase (antioxidant – for detox)</td>
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</tbody>
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<table>
<thead>
<tr>
<th>S/S</th>
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<tbody>
<tr>
<td>Trembling, muscle weakness</td>
<td></td>
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<tr>
<td>Cheilosis (Cracks in corners of mouth / lips)</td>
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<tr>
<td>Oily skin</td>
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<tr>
<td>Alopecia</td>
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<tr>
<td>Digestive disturbance</td>
<td></td>
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<tr>
<td>Impaired growth in children</td>
<td></td>
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<tr>
<td>Eye problems (Watery, bloodshot, sensitivity to light)</td>
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<tr>
<td>Magenta tongue</td>
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<table>
<thead>
<tr>
<th>At risk</th>
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<tbody>
<tr>
<td>Periods of rapid growth</td>
<td></td>
</tr>
<tr>
<td>Heavy alcohol use</td>
<td></td>
</tr>
<tr>
<td>Chronic illness, fever, cancer</td>
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</tbody>
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<table>
<thead>
<tr>
<th>RDI</th>
<th></th>
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<tbody>
<tr>
<td>Adult male and female - 1.5 - 2 mg</td>
<td></td>
</tr>
<tr>
<td>Therapeutic - 10 - 200 mg</td>
<td></td>
</tr>
</tbody>
</table>
Vitamin B2 - Riboflavin

Sources
- milk and dairy products
- eggs
- Liver and organ meats
- brewer’s yeast
- avocados
- sprouts
- beans
- broccoli
- almonds
- asparagus
- barley grass
Vitamin B3 - Niacin

- Niacin / Nicotinic acid / Nicotinamide / Nicotinamide adenine dinucleotide (NAD) (Active form)
- Stable to heat, light
- Pellagra: deficiency disease that purely arises through lack of B3. (Corn as sole grain staple)
  - Leading to the 4 D’s: Dermatitis, Diarrhoea, Dementia, Death
- Nicotinic acid leads to flushing / reddening of the extremities and face, and may be itchy and give rise to discomfort
- Note: If B3 is low in the diet, the body can produce it from B1, B2, B6 and Tryptophan.
  - 60 mg Tryp. → 1 mg B3 conversion
# Vitamin B3 - Niacin

| Functions | Essential as co-enzyme for energy production in all living cells  
| DNA replication and repair  
| Healthy of skin and mucus membranes, nervous system and digestive system  
| Blood sugar regulation  
| Fat and cholesterol metabolism  
| Production of Hcl |
| Sx | Mental disturbances - anxiety, fear, gloom, depression, etc  
| Dermatitis  
| “Strawberry tip” tongue  
| Abdominal pains, poorly formed, ‘offensive’ stool  
| Insomnia and poor memory |
| At risk | Low protein intake  
| Deficiencies in B6 or B2  
| Heavy alcohol use |
| RDI | Adult male and female - 15 - 20 mg  
| Therapeutic - 100 - 3000 mg |
Vitamin B3 - Niacin

Sources

- meat
- fish – halibut, mackerel, salmon, sardines
- chicken
- nuts and seeds – almonds, peanuts, sunflower seeds
- all types of bran
Acid

- yellow viscous oil
- unstable to heat, light
- high losses in cooking, milling, etc
  - frozen vegetables 50%
  - cooking up to 44%
  - canning 75%
- deficiencies supposedly rare
  - deficiency signs and symptoms very general due to central role in metabolism
### Vitamin B5 - Pantothenic Acid

| Functions | Co - enzyme in energy production  
|           | Essential in lipid synthesis, including cholesterol  
|           | Essential in steroid synthesis  
|           | Immune system - antibody synthesis  
|           | Synthesis of acetylcholine (nerve transmitter for most peripheral nerves)  
|           | “anti-stress vitamin”  
| S/S | Fatigue, adrenal exhaustion  
|     | Diarrhoea, constipation, cramps, heartburn  
|     | Poor resistance to infection  
|     | Burning feet, tenderness of heels  
|     | Hypo-tension  
|     | Recurring respiratory illness  
| At risk | Chronic illness  
|         | Heavy alcohol use  
|         | Strenuous diets for weight loss  
| RDI | Adult male and female - 5 - 10 mg  
|     | Therapeutic - 20 - 500 mg  

Vitamin B5 - Pantothenic Acid

Sources
- Avocados
- Beans
- Egg yolk
- Green vegetables
- Mushrooms
- Sweet potatoes
- Brewer’s yeast
- Organ meats
- Whole grain cereals
Vitamin B6 - Pyridoxine

- OCP depletes
- Unstable to light
- Medium to high losses in cooking 30-40%, milling 75%
- Recreational drug use of marijuana and amphetamines affects B6 status
- People using L-Dopa for the treatment of Parkinson's disease should not use supplemental vitamin B6 except under the supervision of a physician (as supplemental vitamin B6 inactivates L-Dopa within the intestines)
- Vitamin B6 is often combined with magnesium for PMT, and with ginger to alleviate nausea and vomiting of early pregnancy
**Vitamin B6 - Pyridoxine**

| Functions                                      | Protein synthesis                                      |
|                                                | Blood glucose regulation                               |
|                                                | Niacin formation from tryptophan                        |
|                                                | Lipid synthesis - myelin sheath, PUFA's (polyunsaturated fatty acids) in cell membranes |
|                                                | Haemoglobin synthesis and oxygen transport by RBC's     |
|                                                | Neurotransmitter synthesis (serotonin, dopamine, noradrenalin, GABA, histamine) * |

| S/S                                            | Oily facial skin (Around nose, behind ears), Acne       |
|                                                | Hypoglycaemia                                          |
|                                                | Anaemia                                                |
|                                                | Cheilosis, angular stomatitis, glossitis               |
|                                                | Fatigue                                                |
|                                                | Irritability, confusion, depression                    |

| At risk                                        | High alcohol and caffeine intake                       |
|                                                | Oral contraceptives                                    |
|                                                | Chronic digestive disorders                            |

| RDI                                             | Adult male and female - 1.6 - 2.6 mg                   |
|                                                 | Therapeutic - 10 - 150 mg                              |
Vitamin B6 - Pyridoxine

Sources
- brewer’s yeast
- chicken
- egg yolk
- legumes
- peanuts, walnuts
- meats - especially organ meats
- fish
- fresh fruit - especially bananas
Cobalamin is a general term for all Vitamin B12-like compounds.

B12 is unstable to heat, light, acid, and alkali - losses 10 – 90%

Absorption of B12 is dependent on intrinsic factor binding - secreted by the gastric mucosa as a component of gastric juice
# Vitamin B12 - Cobalamin

| Functions | Essential for RBC formation  
|-----------|--------------------------|
|           | Decreases homocysteine levels  
|           | Essential for the integrity of cell membranes.  
|           | Essential for the production of all epithelial cells.  
|           | Enhances the general health of the digestive system.  
|           | Increases energy  
|           | CHO and lipid metabolism  
|           | Assists in nervous system functioning  

| S/S | Pernicious anaemia  
|-----|-------------------|
|     | Glossitis, angular stomatitis, mouth ulcers, dry mouth  
|     | Unsteady gait, loss of reflexes, numbness and tingling  
|     | Mental illness  
|     | Excessive homocysteine levels (Implicated in dementia, aging process, CV disease, etc)  

| At risk | High alcohol and caffeine intake  
|---------|---------------------------------|
|         | Oral contraceptives  
|         | Chronic digestive disorders  

| RDI | Adult male and female - 2 - 50 ug  
|-----|-----------------------------------|
|     | Therapeutic - 300 - 8000 ug  

Vitamin B12 - Cobalamin

Sources

- Bacterial synthesis in the gut
- Organ meats
- Fish
- Milk and dairy products
- Brewer’s yeast

- True vegetarians/vegans are prone to B12 deficiency
- This problem increases in infants of vegan mothers with B12 deficiencies and reflects on the quality of the breast milk
- Problems as severe as convulsions in the infant may arise, while the mother usually only shows subclinical, asymptomatic cobalamin deficiency
Folic Acid

- Historically linked with B12, as far back as 1877’s first description of megaloblastic anaemia

- Unstable to heat, acid, light.
- Storage loss 20 – 70%, cooking 65%

- Fortification of food with folic acid is common since 1998 - cereals
# Folic Acid

| Functions | Essential for RBC formation  
|           | Normal growth – synthesis of structural and functional proteins  
|           | Prevention of neural tube defects (Spina Bifida) in pregnancy  
|           | Digestive function  
|           | Homocysteine control  
|           | DNA and RNA synthesis and repair  
| S/S       | Megaloblastic anaemia  
|           | Slow mental processes (Forgetful, apathy, slow though processing)  
|           | Angular stomatitis, cheilosis  
|           | Skin disorders  
|           | Weakness, fatigue  
|           | Intestinal disturbances  
|           | Headaches  
|           | Restless legs  
| At risk   | Diets low in green leafy vegetables and whole grains  
|           | Cigarette smoking  
|           | Deficiency in B12 and vitamin C  
| RDI       | Adult male and female – 400 ug  
|           | Therapeutic – 1 - 5 mg  

Folic Acid

Sources

- Predominant in all green leafy vegetables (hence the "Folate", from foliage) - broccoli, Brussels sprouts
- Eggs
- Organ meats
- Yeast
- Lentils, lima beans, kidney beans
- Peanuts
Vitamin C

- Already described by Hippocrates in 500BC as curative of scurvy

- Very unstable to heat, light, oxidation and alkali, and to metals such as copper and iron.

- Losses in processing 10 - 90%

- Ascorbic is natural form, but calcium ascorbate (vit C bound to calcium) is more buffered and better tolerated.
# Vitamin C

| Functions | Connective tissue collagen formation (skin, blood vessels, ligaments, bone matrix)  
|           | Folic acid conversion  
|           | Energy metabolism  
|           | Immune system function  
|           | Adrenal function  
|           | Lipid metabolism  
| S/S       | Bruising / Varicose veins  
|           | Bleeding gums  
|           | Fatigue, listlessness, weakness and depression  
|           | Increased susceptibility to infection  
|           | Skin problems / poor healing  
|           | Joint pain  
| At risk   | Increased physical stress  
|           | Heavy alcohol, cigarettes  
|           | Increase oxidant stress  
| RDI       | Adult male and female – 75 – 125 mg  
|           | Therapeutic – 250 - 2000 mg |
Vitamin C

Sources

- citrus fruits, kiwis, berries, pineapples, papaya, strawberries
- green vegetables, broccoli, parsley, peppers, tomatoes, raw cabbage, sweet potatoes, Brussel sprouts
- Rosehip – CV formulas
- sprouted seeds and grains
## Vitamin Summary

<table>
<thead>
<tr>
<th></th>
<th>Vitamin</th>
<th>Functions</th>
<th>Deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>retinol</td>
<td>visual pigments in retina; cell differentiation; b-carotene – antioxidant; antibody and T cell production</td>
<td>Night blindness; keratinisation of skin; lowered immunity</td>
</tr>
<tr>
<td></td>
<td>b-carotene</td>
<td></td>
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</tr>
<tr>
<td><strong>D</strong></td>
<td>calciferol</td>
<td>Maintenance of calcium balance; enhances intestinal absorption of calcium; mobilises bone mineral</td>
<td>Rickets, osteomalacia [demineralisation of bones]</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>tocopherol</td>
<td>Antioxidant – esp. cell membranes</td>
<td>neurological dysfunctions -Rare</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td></td>
<td>Coenzyme in formation of clotting factors</td>
<td>Impaired blood clotting</td>
</tr>
<tr>
<td><strong>B1</strong></td>
<td>thiamin</td>
<td>Energy production; nerve conduction</td>
<td>Peripheral or central nervous system lesions</td>
</tr>
<tr>
<td><strong>B2</strong></td>
<td>riboflavin</td>
<td>Energy production; antioxidant [glutathione reductase]</td>
<td>Lesions at corner of mouth, lips, tongue; serbhorreic dermatitis</td>
</tr>
<tr>
<td><strong>Niacin</strong></td>
<td>nitotinic acid/ nicotinomide</td>
<td>Energy production; mucous membrane – GIT, skin;</td>
<td>Pellegra; photosensitive dermatitis; depression</td>
</tr>
</tbody>
</table>
## Vitamin Summary

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Function</th>
<th>Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B6</strong> [P-5- P]</td>
<td>Metabolism of amino acids and glycogen; synthesis of lipids; decreases homocysteine</td>
<td>Oily facial skin; chelosis..;</td>
</tr>
<tr>
<td>pyridoxine</td>
<td></td>
<td></td>
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<tr>
<td>pyridoxal</td>
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<tr>
<td><strong>B12</strong></td>
<td>DNA; RBC formation; decreases homocysteine</td>
<td>Pernicious anaemia</td>
</tr>
<tr>
<td>cobalamin</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H</strong> biotin</td>
<td>Fat and carbohydrate metabolism</td>
<td>Dermatitis</td>
</tr>
<tr>
<td><strong>Folic acid</strong></td>
<td>DNA; structural and functional proteins</td>
<td>Megaloblastic anaemia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pregnancy</td>
</tr>
<tr>
<td><strong>C</strong> ascorbic acid</td>
<td>Antioxidant; enhances iron absorption; collagen formation; immune</td>
<td>Bruising; varicose veins; bleeding gums; infection</td>
</tr>
<tr>
<td><strong>Choline</strong></td>
<td>Cell membrane integrity; methyl donor; cell signaling; fat metabolism</td>
<td>Dyslipidemia; memory</td>
</tr>
<tr>
<td><strong>Alpha Lipoic Acid</strong></td>
<td>Antioxidant + recycles other antioxidants; energy production; improves insulin sensitivity; heavy metal chelator</td>
<td>Uses: DM, IR, heavy metal detox, ageing</td>
</tr>
</tbody>
</table>
Minerals - Overview

- Human physiological function involves approximately 18 different minerals – yet only will discuss the ‘essential’
  - ‘essential’ – can not be missing from the diet without deficiency symptoms appearing
  - ‘Major’ – 100 mg plus per day
  - ‘Minor/Trace’ – less 100 mg per day
Minerals - Overview

- Proposed that the environment in which living organisms evolved – primordial sea around hydrothermal vents – was a primary determinant of which elements became essential for life by providing structural integrity and catalytic ability to the first complex organic molecules.

- As life evolved from oceans to land, a natural selection process may have resulted in some elements becoming relatively more important because of superior catalytic abilities over other elements.
Minerals - Overview

- Uneven distribution of elements in a land based environment meant that efficient homeostatic mechanism had to be in place to conserve essential elements and to eliminate excesses.
- Absorption from GIT and excretion with body fluids are major ways in which concentrations are controlled.
- Storage can prevent dietary insufficiency.
Minerals - Classification

Major:
- Calcium
- Phosphorous
- Magnesium
- Potassium
- Sodium
- Chloride

Trace – arsenic, boron, chromium, cobalt, copper, fluoride, iodine, manganese, molybdenum, nickel, selenium, silicon, tin, vanadium, zinc
Minerals - Roles

Roles:

- Co-enzymes
- Initiating or facilitating biochemical reactions
- Alter electrical currents - nerve impulses, muscle contraction
- Open channels for transport across selectively permeable cellular membranes
- Excretory and immune function

nearly every system relies on minerals...
Chelated Minerals

- firmly attached to an amino acid or other organic compound so the two don’t dissociate in the GIT
- increase passage through intestinal wall to blood and avoid binding to other substances eg. phytic acid
## Calcium (Ca)

| Functions | • Main structural component of skeleton + teeth  
|           | • Blood clotting - activation of prothrombin, fibrinogen to fibrin  
|           | • Intracellular messenger triggering contraction of muscle fibres  
|           | • Nerve transmission  
| Sx        | • Poor bone mineralisation, osteoporosis  
|           | • Muscle cramping, spasm  
|           | • Increased irritability of nerve cells  
|           | • Abnormal clotting and increase bleeding post trauma  
| At risk   | • Menopause  
|           | • Xs protein, phosphorus, sodium, alcohol, caffeine – ↑ urine loss  
|           | • Antacids, laxatives, steroids  
|           | • Fat malabsorption – fats bind Ca reducing absorption  
|           | • Vit D deficiency  
| Sources   | Cheese – Swiss + cheddar, kelp, sardines with bones, soybeans, cabbage family, collard greens  
|           | broccoli, walnuts, dried peas + beans  
| RDI       | Men and Women – 700 mg  
|           | Therapeutic – 1000-2500 mg  
| Form      | gluconate, aspartate, citrate, chelated  

# Magnesium (Mg)

| Functions | • Energy metabolism - oxidation of glucose, fat + proteins  
|           | • Important electrolyte  
|           | • Regulation of Ca triggered contraction of heart + muscle cells  
|           | • Vasodilation of coronary and peripheral arteries  
|           | • Nerve depolarisation and transmission  
|           | • Structure of bones and teeth  
| Sx        | • Muscle cramps, spasm, trembling  
|           | • Fatigue  
|           | • Low K + Ca - (hypokalemia and hypocalcemia)  
|           | • Irritability, depression, difficulty concentrating, anxiety, stress  
|           | • Increased blood triglycerides and cholesterol  
|           | • Sodium and water retention  
| At risk   | • Strenuous training  
|           | • Xs processed, refined grains, low vegetables  
|           | • Diuretics, steroids, laxatives  
|           | • Diabetes, hyperparathyroidism  
|           | • Intestinal malabsorption - IBS, pancreatic disease |
# Magnesium (Mg)

<table>
<thead>
<tr>
<th>Sources</th>
<th>Soy flour, wheat bran, sunflower seeds, wholegrain rice, legumes, seafood, green vegetables – chlorophyll, almonds, cashews, figs</th>
</tr>
</thead>
</table>
| RDI     | Men 300 mg  
          | Women 270-300 mg  
          | Therapeutic 300-800 mg |
| Form    | orotate, gluconate, aspartate, citrate or chelate |
# Phosphorus (P)

| Functions | • structure of bone  
|           | • energy – stored within molecule as ATP – within the phosphate bonds  
|           | • regulate calcitriol production – kidneys – therefore calcium excretion absorption  
|           | • pH of blood and tissues – important buffer  
|           | • muscle and nerve function  
|           | • cell membrane structure and permeability  
| Sx | • muscle weakness  
|    | • fatigue  
|    | • bone weakness and pain  
|    | • peripheral neuropathy  
| Sources | grains, seeds – pumpkin, sunflower, nuts - Brazil, legumes, meat, fish, chicken, wheat bran, wheat germ, brewer’s yeast, lecithin  
| RDI | Men + Women - 800 – 1200 mg  
|    | Therapeutic  400-3000 mg  
| NB | 2\textsuperscript{nd} most abundant mineral in the body - calcium 1\textsuperscript{st}  
|    | High phosphorus leads to Ca + Mg deficiency  

High phosphorus leads to Ca + Mg deficiency.
# Potassium (K)

| Functions | • energy production  
|           | • membrane excitability  
|           | • nerve transmission, muscle contractions  
|           | • important electrolyte – intracellular \[sodium and chloride - extracellular\]  |
| Sx        | • fatigue, lethargy  
|           | • muscle weakness  
|           | • delayed gastric emptying  
|           | • constipation  
|           | • decreased blood pressure  
|           | • cardiac arrythmias  |
| At risk   | • deficiency in magnesium  
|           | • chronic kidney failure  
|           | • IBS or gastroenteritis  |
| Sources   | Soy flour, white beans, lentils, bananas, spinach, vegetables, sunflower seeds, almonds, raisins  |
| RDI       | 2g - average intake 2-3 g  
|           | Hypertension, stroke, heart disease – 4-5 g  |
# Iron (Fe)

| Functions | • oxygen transport as hemoglobin and storage as myoglobin in muscle cells  
|           | • energy production in mitochondria  
|           | • cofactor for multiple enzymes – inc. cytochrome P450 in liver, antioxidant peroxidases..  
|           | • production of neurotransmitters and thyroid hormone |
| Sx        | • anaemia, pallor, dry skin, poorly formed upturned nails, brittle hair  
|           | • easily tired, weak, lack of energy  
|           | • increased susceptibility to infection  
|           | • learning disabilities |
| At risk   | • menstruating women  
|           | • vegetarian / vegan  
|           | • high intake of black tea or coffee with meals  
|           | • chronic use of antacids |
| RDI       | 9mg men 9-15mg women  
|           | Therapeutic – 10-200mg |
| NB        | Not easily excreted therefore excess can build up and deposit in soft tissue  
|           | – blood tests prior to prescribing – serrum ferritin + total iron binding capability |
## Iron

<table>
<thead>
<tr>
<th>Sources</th>
<th>Heme - animal tissue - absorbed best -- liver, organ meats, oysters, beef</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-heme - plant tissue -- lentils, pumpkin seeds, wheat germ, wheat bran, brewer’s yeast</td>
</tr>
</tbody>
</table>
# Zinc (Zn)

| Functions | • cofactor for multiple enzymes – RNA polymerases (synthesis of new proteins), neurotransmitter metabolism, metabolism growth hormone, sex hormones, insulin, thyroid hormone  
|           | • cell growth and differentiation  
|           | • production and regulation of cellular and humoral immune response  
|           | • antioxidant – part of superoxide dimustase  
| Sx | • dermatitis, inflammatory acne, reduced wound healing, hair loss  
|     | • reduced sense of smell and taste  
|     | • depression, irritability, difficulty concentrating, learning difficulties  
|     | • poor sperm production, disordered ovulation, reduced fertility  
|     | • poor immune response  
| At risk | • vegetarian  
|         | • digestive – pancreatic insufficiency, IBS, diarrhoea  
|         | • high dose calcium supplements  
|         | • chronic infection or inflammatory disease eg. RA  
| RDI | Men 9.5g Women 7mg  
|     | Therapeutic – 20-150 mg gluconate, orotate, chelated vs sulfate  
| Sources | liver, lamb chops, oysters, lentils, green peas, whole wheat bread, pecans, Brazil nuts, PUMPKIN SEEDS |
## Chromium (Cr)

| Functions | • major component of GTF - glucose tolerance factor  
|           | • potentiates the action of insulin - improves glucose tolerance, increase uptake of amino acids into muscles, heart and liver, enhances protein synthesis  
|           | • regulation of blood lipids - decreases total cholesterol [TC] and LDL and increase HDL  
|           | • may decrease serum cortisol and increase immunoglobulins  
| Sx | • impaired glucose tolerance and reduced insulin actions  
|    | • elevated TC + LDL  
| RDI | 25 mcg  
|    | Therapeutic - 200 – 3000mcg  
| Sources | Meats - calf liver, whole grains, brewer’s yeast, rye bread  

Water

- Most vital nutrient – making up 60% of body

- Distributed in 3 compartments:
  1. Intracellular – within cells 40%
  2. Extracellular – round cells 15%
  3. Plasma – blood 5%

- Thirst – drop in bodys water $\rightarrow$ decrease in blood volume $\rightarrow$ + hypothalamus $\rightarrow$ increase Na in the blood AND + vasopressin - to conserve water
Water

- Water should be consumed at 6-8 glasses daily (minimum) – slow sips vs gulps
- Drinking excess much better than little as easier for the body to excrete than conserve
- A further way to calculate the need for water in the body is by multiplying body weight in kg by 35 ml
- Best not with meals, but 20 minutes before or after - dilutes digestive juice and decreases digestive fire (TCM)
- Hot water is a good way of increasing water intake in colder seasons. Add lemon juice or fresh herbs such as ginger or rosemary to improve digestion and circulation
- You can start your day with a glass of warm water with the juice of ½ a lemon
Water - Functions

- Carry nutrients and waste products throughout the body
- Serves as solvent for minerals, vitamins, amino acids, glucose, and other smaller molecules.
- Acts as a lubricant and cushion around joints, eyes, spinal cord, in pregnancy and in the amniotic sac for the foetus in the womb
- Regulate body temperature
- Maintains blood volume
Water - Fluoridation

- aim of reducing tooth decay among children in “deprived” areas
- “those who remain adamantly opposed would be able to use water filters that remove fluoride or buy bottled drinking water”

Issues raised:
- quality of the research demonstrating its efficacy and safety
- evidence suggesting that it may cause serious health problems
- compulsory 'mass medication' which takes away an individual's right to choose
Water - Fluoridation

Health risks associated:

- **dental fluorosis** - Dental fluorosis is fluoride poisoning that causes hypomineralization (irregular calcification) and a disorder of ameloblasts (enamel forming cells) that mottle, weaken and discolour childrens' teeth

- bone fracture
- bone cancer
- joint pain
- skin rash
- reduced thyroid activity
- IQ deficits

Water - Fluoridation

- 1ppm (part per million) level of fluoride in UK water supplies deemed “safe” by government is 100 times higher than normally found in mothers' milk.
- Hydrofluosilic acid (H₂SiF₆) and other fluorosilicates are not naturally occurring - waste products derived from the industrial manufacture of aluminium, zinc, uranium, aerosols, insecticides, fertilizers, plastics, lubricants and pharmaceuticals.
- Austria, Belgium, Denmark, France, Finland, Luxembourg, Norway, Switzerland, West Germany, Netherlands and Italy have all banned the addition of hydrofluorosilic acid to drinking water.
- Susceptibility to toxins are particularly high.
- “We accept that dental fluorosis is a manifestation of systemic toxicity.”
A summary of a study made by the past president of The American Medical Association states:

“The plain fact that fluoride is an insidious poison, harmful and toxic and cumulative in its effects, even when ingested in minimal amounts, will remain unchanged no matter how many times it will be repeated in print that the fluoridation of the water supply is safe”
When to take Supplements

<table>
<thead>
<tr>
<th>Nutrient Type</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat soluble nutrients</td>
<td>With food</td>
</tr>
<tr>
<td></td>
<td>Divided doses if &gt; 1 capsule</td>
</tr>
<tr>
<td>Water soluble vitamins</td>
<td>C and B group – alone or with meals</td>
</tr>
<tr>
<td></td>
<td>Divided doses if &gt; 1 capsule</td>
</tr>
<tr>
<td>Minerals</td>
<td>Can be taken on an empty stomach</td>
</tr>
<tr>
<td></td>
<td>Some prefer Zn last thing at night</td>
</tr>
<tr>
<td>Amino acids</td>
<td>At least ½ hour away from foods</td>
</tr>
<tr>
<td></td>
<td>Minimise antagonism by dietary sources</td>
</tr>
</tbody>
</table>
ORAC Scale

- Oxygen Radical Absorbance Capacity
- Oxidative stress – Cancer, CVD, ageing, Alzheimer's, Parkinsons, DM...
- Reactive Oxygen Species – damage proteins, lipids and DNA
- Body has mechanisms to quench – but not 100% sure-fire - thus the inclusion of Anti-Oxidant rich food is recommended
- 59 fruits, nuts, vegetables, vitamins + minerals tested
## ORAC Scale

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving size</th>
<th>Antioxidant capacity per serving size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cinnamon, ground</td>
<td>100 grams</td>
<td>267,536</td>
</tr>
<tr>
<td>Aronia black (<em>Aronia melanocarpa</em>)</td>
<td>100 grams</td>
<td>16062</td>
</tr>
<tr>
<td>Small Red Bean</td>
<td>½ cup dried beans</td>
<td>13727</td>
</tr>
<tr>
<td>Wild blueberry</td>
<td>1 cup</td>
<td>13427</td>
</tr>
<tr>
<td>Red kidney bean</td>
<td>½ cup dried beans</td>
<td>13259</td>
</tr>
<tr>
<td>Pinto bean</td>
<td>½ cup</td>
<td>11864</td>
</tr>
<tr>
<td>Blueberry</td>
<td>1 cup (cultivated berries)</td>
<td>9019</td>
</tr>
<tr>
<td>Cranberry</td>
<td>1 cup (whole berries)</td>
<td>8983</td>
</tr>
<tr>
<td>Artichoke hearts</td>
<td>1 cup, cooked</td>
<td>7904</td>
</tr>
<tr>
<td>Blackberry</td>
<td>1 cup (cultivated berries)</td>
<td>7701</td>
</tr>
<tr>
<td>Prune</td>
<td>½ cup</td>
<td>7291</td>
</tr>
<tr>
<td>Raspberry</td>
<td>1 cup</td>
<td>6058</td>
</tr>
<tr>
<td>Strawberry</td>
<td>1 cup</td>
<td>5938</td>
</tr>
<tr>
<td>Red Delicious apple</td>
<td>1 apple</td>
<td>5900</td>
</tr>
<tr>
<td>Granny Smith apple</td>
<td>1 apple</td>
<td>5381</td>
</tr>
<tr>
<td>Pecan</td>
<td>1 oz</td>
<td>5095</td>
</tr>
<tr>
<td>Sweet cherry</td>
<td>1 cup</td>
<td>4873</td>
</tr>
<tr>
<td>Black plum</td>
<td>1 plum</td>
<td>4844</td>
</tr>
<tr>
<td>Russet potato</td>
<td>1, cooked</td>
<td>4649</td>
</tr>
<tr>
<td>Black bean</td>
<td>½ cup dried beans</td>
<td>4181</td>
</tr>
<tr>
<td>Plum</td>
<td>1 plum</td>
<td>4118</td>
</tr>
<tr>
<td>Gala apple</td>
<td>1 apple</td>
<td>3903</td>
</tr>
</tbody>
</table>
Naturopathic Study
– Nutrition
Life Stages
Pregnancy

- increase 300 kcal from 2nd trimester, esp. protein for ‘building the baby’

- weight gain
  no more than 22-35 pounds or 8-12 kg

- focus on – calcium, B12, iron, vitamin C, zinc, iodine, folic acid, vitamin D, essential fatty acids (esp DHA from omega 3), water, probiotics
Lactation

• as per pregnancy

• increase water intake to 3 L

• focus on –
  • essential fatty acids
  • probiotics
  • iron
Introduction of Solids

Limit exposure of the immature intestine to allergens by the timed introduction of foods to the children of atopic families:

- At or after 4mths - milk free baby rice
- Followed by pureed root vegetables  
  eg. pot carrot turnip
- then pureed fruit  [at least 9 months - citrus fruit]
- other vegetables
- cereals esp. iron enriched infant cereals  
  [at least 8 months – wheat]
- lamb, turkey + other meats
- dairy - 10+ months
- eggs – 12 months
Children and Adolescents

Children
- this is when lifelong dietary habits start
- chewing food well
- soy – not less than 3 years old – iron absorption and possible hormonal effects

Adolescents
- iron deficiency
- calcium deficiency
- vitamins C and E, zinc, iron, essential fatty acids
Elderly

- fat – minimise saturated fats
  increase omega 3 + 6
- fibre – psyllium, rice bran, vegetables
- sugar – minimise refined and processed
- iron – ensure with vitamin C
- zinc, calcium, vit D, antioxidants, protein
- support digestion and absorption
Food Labeling
Influences on Food Labelling

- Legislation (UK & EU)
- Consumers
- Manufacturers & retailers

- Voluntary recommendations & bodies
- Media

British Nutrition Foundation 2003
What must be on a label?

- list of ingredients (in descending order of weight)
- QUID information (if ingredient is in a photo on the packaging or a description of the quantity of the ingredient in the product must be listed)
- net quantity of food present (unless under 5g)
- date mark (*use by* and *best before*)
- any special conditions or conditions of use
- name & address of manufacturer, packager or seller
- place of origin (if leaving out would mislead)
- any necessary instructions for use
What **must** be on a label?

- 25% rule
  not required to list individual ingredients if they were part of a compound ingredient *if* the compound ingredients made up less than 25% of the product — MSG!

British Nutrition Foundation 2003
Other Information

- information on additives & other ingredients
  *not* legally required to be labelled
- nutrients present in food
- nutrition &/or health claims
- information on allergens present in food
- processing or production methods (*e.g.* organic)
- logos & endorsements
- guideline daily amounts

British Nutrition Foundation 2003
### List of Ingredients

<table>
<thead>
<tr>
<th>INGREDIENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>VENISON (62%), PORK (28%), REDCURRANT JELLY (4%)</td>
</tr>
<tr>
<td>(SUGAR, GLUCOSE SYRUP, REDCURRANT JUICE, GELLING AGENT: PECTIN, ACIDITY REGULATORS: CITRIC ACID, SODIUM CITRATES); RED WINE, SALT, MALTODEXTRIN, SAGE, BLACK PEPPER, GARLIC, PRESERVATIVE: SODIUM METABISULPHITE; CHILLI POWDER, HERBS, ANTIOXIDANT: SODIUM ASCORBATE; CLOVES. (MADE WITH 90% MEAT) FILLED INTO NATURAL PORK CASINGS.</td>
</tr>
</tbody>
</table>

**Gluten Free**

---

British Nutrition Foundation 2003
Allergy Labelling

Prepackaged and alcoholic drinks
November 2005

- Celery
- Cereals containing gluten – wheat, barley, rye and oats
- Crustaceans
- Eggs
- Fish
- Milk
- Mustard
- Nuts – almonds, hazel, walnuts, Brazil, cashews...
- Peanuts
- Sesame seeds
- Soybeans
- Sulphur dioxide and sulphites > 10mg per kg or L
Allergy Labelling

- If any of the 12 are highly processed and ‘no longer able’ to cause allergic reactions they don’t need to be listed

- “May Contain” – not deliberately included yet the manufacturer can’t be 100% sure
Allergy Labelling

Gluten free

- manufacturers are not required to state how much gluten is present
- if maize or wheat with gluten removed – may claim ‘gluten free’ or ‘low gluten’
- impossible to remove all gluten from wheat, therefore ‘gluten free’ will have small traces
- there is no law governing how much gluten is allowed in these foods except baby foods – all food for < 6mths year olds must have 100% disclosure
Nutrition Labelling

- not mandatory unless a nutrition claim is made

- must be in 1 of 2 formats:
  
  Group 1 declaration – *The Big Four*
  - energy, protein, carbohydrate and fat

  Group 2 declaration – *The Full Eight*
  - as above plus sugars, saturates, fibre and sodium

British Nutrition Foundation 2003
Nutrition Labelling

- In addition, these nutrients can be included in a nutrient declaration on a voluntary basis:
  - starch
  - monounsaturates, polyunsaturates or cholesterol
  - specified vitamins and nutrients present in significant amounts

- If a claim is made about these nutrients they MUST be labelled

British Nutrition Foundation 2003
Nutrition Claim

- Any representation that states or implies that a food contains, or has a high or low amount of one or more nutrients

- If a nutrition claim is made, nutrition labelling is mandatory

British Nutrition Foundation 2003
Nutrition Claim

- Nutrient (or content) claims
  refers to the level of a nutrient in a food
  e.g. source of calcium

- Comparative claims
  comparison of nutrient levels of 2 or more foods,
  using descriptors such as ‘higher’ or ‘lower’,
  e.g. contains % more calcium

British Nutrition Foundation 2003
Nutrition Claim

- Nutrient function claims refers to physiological role of nutrient in its relationship to growth, development or other normal functions
  e.g. aids in the development of strong bones & teeth

- Medical claims are illegal
  e.g. prevents osteoporosis hence “may help prevent”

British Nutrition Foundation 2003
Nutrition Claim

- RDA - recommended daily allowance
- label declarations - these minimum levels apply ‘as a rule’ although exceptions have not been defined but are generally considered to be situations in which single servings differ significantly from 100g
- if claim is for ‘vitamins & minerals’ without naming them then, every vitamin & mineral must be in table and at least 2 must meet criteria for claim
- in the absence of a claim can include vitamins & minerals on labelling only if present in significant amounts i.e. 15% of RDA – is this significant for us?

British Nutrition Foundation 2003
## Nutrition Claim

<table>
<thead>
<tr>
<th></th>
<th>Source Claim</th>
<th>Rich Source Claim</th>
<th>Label declarations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RDA</td>
<td>Minimum amount per daily serving (1/6 of the RDA)</td>
<td>Minimum amount per daily serving (50% of the RDA)</td>
</tr>
<tr>
<td>Vitamin A (μg)</td>
<td>800</td>
<td>133</td>
<td>400</td>
</tr>
<tr>
<td>Vitamin D (μg)</td>
<td>5</td>
<td>0.83</td>
<td>2.5</td>
</tr>
<tr>
<td>Vitamin E (mg)</td>
<td>10</td>
<td>1.7</td>
<td>5</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>60</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Thiamin (Vitamin B1) (mg)</td>
<td>1.4</td>
<td>0.23</td>
<td>0.7</td>
</tr>
<tr>
<td>Riboflavin (Vitamin B2) (mg)</td>
<td>1.6</td>
<td>0.27</td>
<td>0.8</td>
</tr>
<tr>
<td>Niacin (mg)</td>
<td>18</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Vitamin B6 (mg)</td>
<td>2</td>
<td>0.3</td>
<td>1</td>
</tr>
<tr>
<td>Folic acid (μg)</td>
<td>200</td>
<td>33.3</td>
<td>100</td>
</tr>
<tr>
<td>Vitamin B12 (μg)</td>
<td>1</td>
<td>0.16</td>
<td>0.5</td>
</tr>
<tr>
<td>Biotin (mg)</td>
<td>0.15</td>
<td>0.025</td>
<td>0.075</td>
</tr>
<tr>
<td>Pantothentic acid (mg)</td>
<td>6</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>800</td>
<td>133</td>
<td>400</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>800</td>
<td>133</td>
<td>400</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>14</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Magnesium (mg)</td>
<td>300</td>
<td>33.3</td>
<td>150</td>
</tr>
<tr>
<td>Zinc (mg)</td>
<td>15</td>
<td>2.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Iodine (μg)</td>
<td>150</td>
<td>25</td>
<td>75</td>
</tr>
</tbody>
</table>
## Nutrition Claim

<table>
<thead>
<tr>
<th></th>
<th>LOW</th>
<th>NO ADDED</th>
<th>X FREE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FAT</strong></td>
<td>&lt; 3g/100g or 100ml</td>
<td></td>
<td>&lt; 0.15g/100g or 100ml</td>
</tr>
<tr>
<td><strong>SATURATES</strong></td>
<td>&lt; 1.5g/100g and should not make up more than 10% total energy of the product</td>
<td></td>
<td>&lt; 0.1g/100g or 100ml</td>
</tr>
<tr>
<td><strong>SUGAR(S)</strong></td>
<td>&lt; 5g/100g or 100ml</td>
<td>No sugars or foods composed mainly of sugars added to the food or to any of its ingredients</td>
<td>&lt; 0.2g/100g or 100ml</td>
</tr>
<tr>
<td><strong>SALT/SODIUM</strong></td>
<td>&lt; 40mg sodium per 100g or 100ml</td>
<td>No salt or sodium shall have been added to the food or to any of its ingredients</td>
<td>&lt; 5mg sodium per 100g or 100ml</td>
</tr>
</tbody>
</table>

British Nutrition Foundation 2003
## Nutrition Claim

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>INCREASED</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIBRE</td>
<td>Either 3g per 100g or 100ml or at least 3g in the reasonable expected daily intake of the food</td>
<td>More than 25% more than a similar food for which no claim is made and more than 3 g in either the reasonable daily intake of a food for which this is lower than 100g or 100ml or in 100g or in 100ml</td>
</tr>
</tbody>
</table>

British Nutrition Foundation 2003
Nutrition Claim

- 1 July 2007 – now has to be substantiated via a research based list of claims
- the food industry has been given time it needs to change its processes - ? time until this is seen in shops
- labels not able to claim a food may treat, prevent or cure disease.
New EU Proposal on Claims

- Will define many nutrient claims
  - low fat - 3 g/100g or 1.5g/100ml
  - light/lite - 25% reduction in content compared to a similar product

- Will prohibit some claims
  - ‘% fat free’ claims - only 97% fat free or higher is low fat; 80% fat free - ???
  - use of the term ‘diet’ – may even be banned

British Nutrition Foundation 2003
New EU Proposal on Claims

What info do consumers want

2000 study of 1000 shoppers

British Nutrition Foundation 2003
Nutritional Information

<table>
<thead>
<tr>
<th></th>
<th>per PANCAKE</th>
<th>per 100g</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY</td>
<td>470 kJ</td>
<td>1359 kJ</td>
</tr>
<tr>
<td></td>
<td>113 kcal</td>
<td>322 kcal</td>
</tr>
<tr>
<td>PROTEIN</td>
<td>2.3g</td>
<td>6.7g</td>
</tr>
<tr>
<td>CARBOHYDRATE</td>
<td>19.3g</td>
<td>55.2g</td>
</tr>
<tr>
<td>of which sugars</td>
<td>11.4g</td>
<td>32.7g</td>
</tr>
<tr>
<td>of which starch</td>
<td>7.9g</td>
<td>22.5g</td>
</tr>
<tr>
<td>FAT</td>
<td>2.9g</td>
<td>8.3g</td>
</tr>
<tr>
<td>of which saturates</td>
<td>0.2g</td>
<td>0.6g</td>
</tr>
<tr>
<td>of which mono-unsaturates</td>
<td>1.4g</td>
<td>3.9g</td>
</tr>
<tr>
<td>of which polyunsaturates</td>
<td>0.9g</td>
<td>2.5g</td>
</tr>
<tr>
<td>FIBRE</td>
<td>0.6g</td>
<td>1.7g</td>
</tr>
<tr>
<td>SODIUM</td>
<td>0.1g</td>
<td>0.4g</td>
</tr>
</tbody>
</table>

**GUIDELINE DAILY AMOUNTS**

<table>
<thead>
<tr>
<th>EACH DAY</th>
<th>WOMEN</th>
<th>MEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALORIES</td>
<td>2000</td>
<td>2500</td>
</tr>
<tr>
<td>FAT</td>
<td>70g</td>
<td>95g</td>
</tr>
</tbody>
</table>
Energy

Recommended allowance

- 2500 kcal/d for men
- 2000 kcal/d for women
- Children, sedentary and older people require less ‘energy’ - physically active people more
Fat

Saturated Fats

- maximum daily intake of 20 – 25 grams of SFA for persons of average weight
"About 80 per cent of the salt we eat comes from the salt added in food processing and manufacture. The fact that many processed foods are not clearly labelled with their salt content per serving to allow people to assess how much salt is in their food, is a national disgrace. Without this information people cannot monitor their salt consumption."

Professor Graham McGregor, Professor of Cardiovascular Medicine St George's Hospital Medical School, University of London
Sodium

- Salt is frequently listed as sodium – but salt and sodium are not the same thing. Deliberately misleading!
- Salt \([\text{NaCl}]\) = sodium \([\text{Na}]\) x 2.5
- Goal - < 6 g per day

EG: tin of baked beans in tomato sauce
    the sodium content is listed as 0.5g/100g, but this equates to 5g salt per tin!
Traffic Light Labelling

High, medium or low amounts of fat, saturated fat, sugars and salt per serve

Recommendations that traffic light colours are used on processed convenience foods such as ready meals, pizzas, sausages, burgers, pies, sandwiches and breakfast cereals
Additives & Preservatives

Food and Drug Administration (FDA)

"any substance, the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component of food or otherwise affecting the characteristics of any food."
Additives & Preservatives

- **Direct additives** - intentionally added to foods for a specific purpose

- **Indirect additives** - the food is exposed during processing, packaging, or storing

- **Preservatives** - additives that inhibit the growth of bacteria, yeasts, and molds in foods
Additives & Preservatives

Not just a new thing...traditional methods:

- Salt - lowers the water activity of meats and other foods and inhibits bacterial growth
- Vinegar – acid that retards the growth of bacteria etc.
- Some herbs and spices, such as curry, cinnamon, and chili pepper, also contain antioxidants and may provide bactericidal effects

[n.b. excess water in foods can enhance the growth of bacteria, yeast, and fungi]
Food Additives

- **Anti-caking agents** – used in powdered foods to maintain their free-flowing characteristics e.g. flour, table salt
- **Antioxidants** – used to preserve food (their fats, colours) by retarding oxidative reactions (damage to foods caused by exposure to oxygen) and preventing rancidity e.g. ascorbic acid (vitamin C)
- **Artificial Sweetening substances** – saccharin, aspartame, acesulfame k
- **Bleaching agents** – extends storage time and accelerates the natural whitening of flour e.g. peroxide
Food Additives

- **Colours** - can be naturally occurring substances or synthetic.
- Colours – controversial. Added for cosmetic reasons – can be used to deceive consumer (can conceal inferior quality or imply the presence of expensive ingredients).
- Colour – e.g. tartrazine – skin rashes, asthma, nasal inflammation, behavioural disorders in children.
- Some synthetic colours previously permitted in food are no longer used because they have been shown to cause cancer or are suspected of doing so.
Artificial Colours Controversy

How is it that so many of the U.K. food manufacturers who have continued to make millions of pounds of profit every year, and worse still the multi-billion pound profiteers who purvey their goods, have not chosen sooner to ensure we are rid of dubious synthetic dyes from our food, and moreover our children's food and sweets?

The fact that coal-tar derived azo dyes that have long had a questionable reputation, along with other laboratory manufactured, non-natural colorants and additives, have regularly been included in our foods, must simply be unethical if not criminal. It is already way beyond time that these unpleasant, unnatural, unhealthy, lurid colorants should have been banned for use in our foodstuffs. Indeed the only possible reason for the continued use of these colours has simply been their cheapness and not because they were absolutely necessary, or irreplaceable.
Food Additives

- **Emulsifiers** – stabilise mixtures such as oil and water. Used in margarines (a water-in-oil emulsion) – lecithin (natural), polyoxyethylene
- **Enzymes** – papain, bromelain, ficin
- **Flavours** – the largest single group of additives. Naturally occurring or synthetic – most are a mixture of a large number of chemicals
Food Additives

- **Flavour enhancers** – sodium inosinate, Monosodium glutamate – MSG. Widely used, snacks, meat and fish dishes, chinese food, packet soups, canned foods. Intensify the flavour of other compounds in the food.

- **Flour treatment agents** – reduce storage time and risk of spoilage – ammonium chloride

- **Food acids** – reduce browning of fruit, provide tart taste, reduce rancidity of fats and oils – citric acid, lactic acid, tartaric acid
Food Additives

- **Humectants** – control moisture levels in foods and help maintain soft and fresh consistency (cakes, marshmallow, marzipan) – sorbitol, glycerol (usually part of fats and oils –an extract) large amounts can cause mild headache, dizziness, nausea, vomiting, thirst, diarrhoea

- **Preservatives** – to control the growth of undesirable moulds, yeast and bacteria which might cause spoilage and human illness (traditionally drying, smoking, pickling, curing, sugaring used). New – chemical preservatives – in bread, soft drinks, dried fruit, fruit juices, sausages – benzoic acid, sodium metabisulphite (cause allergy-like reactions in some people) sulphur dioxide/sulphites – in wines

- **Preservative and colour fixer**: nitrites, nitrates – used to cure meats like ham and bacon (anti-bacterial). Cancer-producing in lab animals.
Food Additives

- **Chelating agents**, which are used to prevent discoloration, flavour changes, and rancidity that might occur during the processing of foods. E.G - citric acid, malic acid, and tartaric acid

- **Nutrient additives** – including vitamins and minerals - added to foods during enrichment or fortification - milk is fortified with vit D, and rice is enriched with B1, B2 and B3

- **Thickening and stabilizing agents** - to alter the texture of a food. E.g. include the emulsifier lecithin, which, keeps oil and vinegar blended in salad dressings, and carrageen, which is used as a thickener in ice creams and low-calorie jellies
E Numbers

- If a food additive has an E number this shows it has passed safety tests and been approved for use throughout the European Union.

- This approval is monitored, reviewed and amended in the light of new scientific data.

- But, some of these supposedly safe ingredients are now suspected of causing a variety of health problems!!
### E Numbers

<table>
<thead>
<tr>
<th>Category</th>
<th>E Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colours</td>
<td>E 100 – 180</td>
</tr>
<tr>
<td>Preservatives</td>
<td>E 200 – 285 + 1105</td>
</tr>
<tr>
<td>Antioxidant</td>
<td>E 300 – 321 + 586</td>
</tr>
<tr>
<td>Sweeteners</td>
<td>E 400, 421, 900s</td>
</tr>
<tr>
<td>Emulsifiers etc</td>
<td>E 400s + 332 + 1103</td>
</tr>
</tbody>
</table>

**Others** - Acid, acidity regulators, anti-caking agents, anti-foaming agents, bulking agents, carriers and carrier solvents, emulsifying salts, firming agents, flavour enhancers, flour treatment agents, foaming agents, glazing agents, humectants, modified starches, packaging gases, propellants, raising agents.

Various and many of them!!
Genetically Modified Organisms

- in the EU, if a food contains or consists of genetically modified organisms (GMOs), or contains ingredients produced from GMOs, this must be indicated on the label. For GM products sold 'loose', information must be displayed immediately next to the food to indicate that it is GM

- 18 April 2004, new rules for GM labelling came into force in all EU Member States
Genetically Modified Organisms

- this means products such as flour, oils and glucose syrups will have to be labelled as GM if they are from a GM source

- products produced with GM technology (cheese produced with GM enzymes, for example) will not have to be labelled

- products such as meat, milk and eggs from animals fed on GM animal feed will also not need to be labelled
Monsanto

- Huge corporation - Food bio technology company
- Produces 90% of the worlds’ genetically engineered products
- Designed plants- patented biotech seeds that do not reproduce – anti-life!! Dubbed Terminator Technology.
- Profit only motivation – breaks seed saving cycle, farmers must buy seeds annually – dependant!
- Crimes against nature and humanity
- Produced Agent Orange, dioxin, PCB’s
- Sue and quash whistleblowers and opposition
Monsanto

- Claim: they are trying to solve the huge problem of global hunger—worldwide poverty and hunger will be irradicated
- Reality: GM crops are creating serious damage all over the world—threat to agricultural biodiversity, cause death, despair, deforestation, increased demands for irrigation...
- Chilling: Want control of world’s food supply...
- Farmers legally bound not to save seeds (face prosecution)
"Economic globalization has become a war against nature and the poor" says Dr. Vandana Shiva (physicist, environmentalist, activist)

- "Recently I was visiting Bhatinda in Punjab because of an epidemic of farmers suicides. Punjab used to be the most prosperous agricultural region in India. **Today every farmer is in debt and despair.** Vast stretches of land have become waterlogged desert. And, as an old farmer pointed out, even the trees have stopped bearing fruit because heavy use of pesticides has killed the pollinators - the bees and butterflies.

- "And Punjab is not alone in experiencing this ecological and social disaster. Last year I was in Warangal, Andhra Pradesh, where farmers have also been committing suicide. Farmers who traditionally grew pulses and millets and paddy have been lured by seed companies to buy hybrid cotton seeds referred to as white gold, which were supposed to make them millionaires. Instead they became paupers."
Children have been used as 'lab rats' in GM rice trials that were carried out in breach of ethics rules drawn up in response to the medical crimes of Nazi Germany, it is claimed.

A group of 22 scientists are condemning a controversial trial involving feeding GM rice to children in China and the US.

Youngsters aged 6-10 were fed so-called Golden Rice, which has been modified to contain enhanced levels of beta carotene or vitamin A. The rice is being developed to combat Vitamin A deficiency, which is linked to damage to the sight, poor brain development and immune system failure.

However high consumption can also have harmful toxic effects and cause birth defects.
not put through animal feeding trials to ensure it was safe before being given to children.

The decision to use the children has been condemned as 'completely unacceptable' by a group of 22 scientists - all GM critics - from Britain and around the world.

They claim it is indicative of moves by the biotech lobby, led by the USA and biotech firms, to force GM food into the mouths of the world without proper assessment.
The project was financed and run through the US National Institutes of Health and involved children in China and America.

The scientists have written an open letter to the team behind the experiments, condemning the way they were conducted.

It states: 'We are writing to express our shock and unequivocal denunciation of the experiments being conducted by your colleagues which involve the feeding of genetically modified Golden Rice to human subjects.'

The letter says there has been 'woefully inadequate pre-clinical evaluation' of the rice.

The scientists argue there is a large body of evidence showing GM food production can trigger gene mutations which 'can result in health damaging effects when GM food products are fed to animals'.

The letter adds: 'Our greatest concern is that this rice, which is engineered to overproduce beta carotene, has never been tested in animals'.
- It says there is evidence that certain chemicals derived from beta carotene 'are both toxic and cause birth defects'.
- Critics of the GM experiments says the Nuremberg code states that children under 10 are not considered legally capable of giving consent to participation in such experiments.
- They say the code also requires that human guinea pigs should not be used if scientists have an alternative experimental method.
- Thirdly, experiments on humans should not be conducted until tests with animals have identified potential hazards.
- Among the leading bodies behind the GM Golden rice project are the biotech company Syngenta, the Rockefeller Foundation and the charitable foundation set up by Microsoft boss Bill Gates.
- The list of signatories to the protest letter includes Malcolm Hooper, emeritus professor of medicinal chemistry at Sunderland University, who said: 'This type of experimentation is frightening - children as lab rats - it is not on.'
Another is Prof David Schubert, of the Salk Institute of Biological Studies, San Diego, who said: 'It is completely immoral to feed this rice to children without proper safety testing...It's like putting a new drug on the market with no toxicology or safety trials.'

Other signatories include Prof Carlo Leifert, director of the Tesco Centre for Organic Agriculture at Newcastle University; and Dr Stanley WB Ewen.

Dr Ewen was involved in rat feeding trials in Scotland in 1999 which linked GM potatoes to harmful toxic effects.

Dr Brian John, of GM Free Cymru said: 'These irresponsible and dangerous trials must be stopped immediately, and the Golden Rice Project team must put its much-vaunted product through a full and transparent testing process before it is allowed to pass the lips of any other human being.'

Project manager at the Golden Rice Organisation, Dr Adrian Dubock, denied that the Nuremburg Code has been breached. He said the feeding trials had been approved by independent ethical review panels.
'Parents were not given financial rewards for their children's participation - to avoid undue pressure on poor families - but children were rewarded with school bags and pencils and paper as a thank you for participating,' he said.

Dr Dubock said 6,000 people around the world die every day due to illnesses related to failing immune systems where Vitamin A deficiency is a factor.

'The Golden Rice contains the food colours found everywhere in coloured natural foods and the environment...There is no possible way the trials could do any harm to the participants.'

Dr Dubock said animal experiments would not have helped. 'As humans are the designed beneficiaries of Golden Rice, animal testing could not answer the questions posed,' he said.

This appears odd as all GM foods, which are designed to be eaten by humans, are required to go through animal testing by food safety authorities in many countries.
Further Information re Labelling

- British Nutrition Foundation
  www.nutrition.org.uk

- Food Standards Agency
  www.food.gov.uk

- Institute of Grocery Distribution
  www.igd.com