

Good diet is essential to a healthy visual system

There are many vitamins, minerals and phytochemicals that are essential to good vision. These nutrients can be either synthesised by the body or obtained from dietary sources. Often the body cannot synthesise the appropriate nutrients or cannot do so in sufficient quantities for the body's needs.

If the quantity of nutrient is insufficient then function is impaired, either temporarily or permanently. This can have catastrophic consequences with regards to eyes and vision.

In this issue we take a look at vitamins

Vitamins are organic compounds necessary for normal physiologic functioning. The amount required varies for each vitamin. Vitamins that are essential to the eyes and vision include fat-soluble vitamins and water-soluble vitamins:

Vitamin A

Dietary sources of vitamin A and b-carotene include eggs, fish, liver, whole milk, cheese, butter and green leafy or yellow vegetables.

Vitamin A is important:

- To the structure and function of epithelial cells.
- In the regeneration of retinal photopigments, especially for dark adaptation.
- For the lens membrane and lens epithelium, a function that helps to prevent cataract formation.

A deficiency of Vitamin A can be

responsible for:

- Dry eyes (loss of goblet cells)
- Corneal epithelial defects/ulceration
- A decrease in conjunctival wound healing
- And an associated increased risk of infection
- Night blindness/nyctalopia
- Progressive retinal degeneration
- Cataract

Oral Vitamin A palmitate has been demonstrated to slow the deterioration in common forms of Retinitis Pigmentosa¹. However the same study indicated that Vitamin E alone had a detrimental effect. The study recommended RP patients take 15 000 IU/day (4.5mg/day) of Vitamin A palmitate (not b-carotene). This is about 3x the RDI. It was suggested that this dosage could provide a further 7 years of useful vision to the average RP patient who begins this treatment at age 32.

The finding that vitamin E has an adverse effect on Retinitis Pigmentosa reminds us that not all nutrients use is beneficial and the negative effects of b-carotene for smokers is now well known. A 1994 study showed that b-carotene supplementation in male smokers was associated with an 18% increase in incidence of lung cancer². This finding has been confirmed in subsequent studies. There are also indications that B-carotene supplementation in diabetic patients increases the risk of more severe diabetic retinopathy³.

Vitamin B₁

Also known as thiamine, vitamin B₁ is an essential part of enzyme systems that metabolise carbohydrates. It also plays an

important part in the maintenance of neurons. This is very important with respect to the eye. Dietary sources include meats, yeast, unpolished grains and nuts.

Thiamine deficiency can have significant effects on the cardiovascular system and also neurological effects. In the eye these effects include

- Degeneration of myelin sheathing on the optic nerve and optic tract,
- Nystagmus,
- Ophthalmoplegia
- Altered blood flow to the brain, eye, skeletal muscles and the muscles of the eye.

Vitamin B₂

Is also known as riboflavin, and is also involved in the metabolism of carbohydrates as well as proteins and fats.

Vitamin B₂ deficiency affects the eye and has signs/symptoms such as

- Photophobia,
- Corneal vascularization,
- Decreased visual acuity,
- Cataract, and
- Keratoconjunctivitis sicca (inflammatory dry eye).

Vitamin B₁₂

Also known as cyanocobalamin, vitamin B₁₂ is converted into cofactors involved in:

- Carbohydrate metabolism,
- Production of:
- Red blood cells,
- Lipids,
- Amino acids
- Nucleic acids
- Myelin sheath for neurons

“The notion that healthy eating may be beneficial to eye health is still not commonly recognised”

'If the quantity of nutrient is insufficient then function may be impaired'

Dietary sources of B₁₂ include liver, red meat, milk and milk products. Vitamin B₁₂ deficiency can produce clinical manifestations of

- Pernicious anaemia
- Ultimately permanent neurological damage.

This neurological damage is manifested as

- Paraesthesia of the hands and feet,
- Loss of memory,
- Mental confusion,
- Nystagmus and
- Loss of central vision.

Vitamin C

Also known as ascorbic acid, vitamin C is obtained from dietary sources such as citrus fruits, potatoes, tomatoes, cabbage, kiwifruit and strawberries. The eye has 20x greater concentration of vitamin C than blood plasma.

Vitamin C:

- Facilitates the absorption of iron from the GI tract.
- Has antioxidant properties.
- Acts as a cofactor in many enzymatic reactions throughout the body.

Diabetics again must be aware of the greater risk of increased diabetic retinopathy with increased vitamin C intake³. No studies have conclusively shown that vitamin C helps prevent or treat viral, bacterial, or malignant diseases.

Vitamin E

Dietary sources include legumes, egg yolk, vegetable oils, leafy vegetables, margarine and wheat germ.

Vitamin E acts as an antioxidant, and may also have an anti-inflammatory effect. Tocopherols occur in retinal tissues and are shown to offer protection from UV radiation and some drugs, metals and chemicals that can initiate the formation of free radicals. Excess vitamin E can be toxic to lungs, liver and blood. Diabetic patients not taking insulin may have an increased risk of increased severity of diabetic retinopathy.

Folic Acid

Folic acid is an essential supplement prenatally and through the first trimester of pregnancy. Results from studies show that prenatal supplementation with 400mg/day of folic acid significantly reduced the incidence of neural tube defects in newborns.

1. *Arch Ophthalmol* 1993; 111(6): 761–72.
2. *N Eng J Med* 1994; 330(15):1029-35.
3. *Ophthalmology* 1998; 105(12):2264-70.

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