

## **Nutrition and the Eye**

Oxidative damage is the leading mechanism by which eye tissues age. Both the retina and lens are believed to be at risk of oxidation from free radicals (chemically unstable atoms and molecules) produced by factors such as sunlight (UV radiation) and cigarette smoke. Our in-built repair mechanisms that fight such free radical damage become progressively less effective as we get older, and for a significant minority, these signs of ageing lead to the degeneration of the macula (the part of the retina responsible for detailed vision) resulting in the condition known as Age Related Macular Degeneration (AMD). Oxidative damage is also implicated in Cataract formation. Other conditions such as dry eye (interaction of an abnormal tear film and/or an abnormal ocular surface) have also been shown to benefit from nutritional intervention.

Scientific research has now established that good nutrition can help guard against the development of degenerative eye conditions as we age. New studies have shown that nutrients may help to prevent AMD and cataract formation. Such measures are increasingly important as the average age of the population continues to rise.

The following provides a guide to some of the more important nutrients, which can help to maintain eye health:

### **Carotenoids**

Recent studies have linked lutein and other carotenoids to the prevention of (AMD)<sup>1</sup>, the leading cause of blindness in the western world. Carotenoids are a large group of yellow, orange and red plant pigments, which help to protect plants from sunlight. They work in a similar way in our bodies, acting as powerful antioxidants, which neutralize free radicals caused by sunlight and other environmental factors.

Research increasingly supports the idea that it is the yellow carotenoids, lutein and zeaxanthin<sup>2,3</sup>, which are the most significant. It is believed they absorb harmful blue light and act as powerful antioxidants. Lutein and zeaxanthin are the

only carotenoids found in the lens and retina of the eye. They form the macular pigment, a protective layer that absorbs blue light. People with a lower density of macular pigment are believed to be at greater risk of AMD.

## **Vitamin A**

Vitamin A, also known as retinol is well known for its involvement in night vision where it is required for the formation of rhodopsin, the visual pigment of the low light density photoreceptor cells, the rods. Supplementation with vitamin A has been shown to slow the degeneration of rods, and is being used to help treat the degenerative eye disease retinitis pigmentosa<sup>4</sup>.

## **Vitamins C & E**

Vitamin C is present in high concentrations in the fluid in the aqueous humour. It is thought that vitamin C acts as a ultra-violet filter, helping to protect against cataracts and oxidative damage to the retina and the lens<sup>5</sup>.

As the major lipid soluble antioxidant of retinol membranes, vitamin E may also help prevent degenerative eye disorders such as cataracts and AMD. Damage to the retina has been detected during vitamin E deficiency<sup>6</sup>.

## **B vitamins**

Vitamin B2 (Riboflavin) is required by one of the body's enzymes - glutathione reductase whose action helps to protect lenses from photo-oxidative stress. Low riboflavin intake is associated with an increased risk of cataracts<sup>7,8</sup>. Riboflavin also appears to be the basis of a photo-pigment in the retina called cryptochrome.

The B vitamins including folic acid, which is essential for protein synthesis is associated with the health of the optic nerve. Deficiency of vitamin B1 can lead to disturbance of eye tracking and optic nerve dysfunction.

## **Other antioxidants**

Flavonoids are another important class of antioxidant compounds, which can be found in a healthy diet, occurring in various fruits and vegetables such as grapefruit, bilberry and tomatoes. They support the action of vitamin C in maintaining the integrity of the blood capillaries and contribute to the antioxidant status of cells<sup>9</sup>.

## **Zinc**

The retina of the eye contains one of the highest concentrations of zinc, which is necessary for visual pigments. Zinc also plays a role in the body's production of the essential fatty acid, GLA, which has an anti-inflammatory role<sup>10</sup>. Research indicates that zinc supplementation can reduce the risk of AMD and its associated vision loss<sup>1, 11</sup>.

## **Selenium**

Selenium is an integral part of one of the body's most important antioxidant enzymes - glutathione peroxidase. This is an important antioxidant in the lens of the eye and other body parts. Glutathione peroxidase may help to prevent the formation of cataracts and protect other eye tissues<sup>12</sup>.

## **Other Minerals**

Copper is an important component of the enzyme superoxide dismutase, which helps scavenge free radicals in the lens and reduce lipid peroxidation<sup>13</sup>.

Chromium levels are significantly lower in the lens of individuals with cataracts than in normal lenses. Lens chromium levels are also lower in people with diabetes and the elderly, indicating a greater risk of cataract development for these groups<sup>14</sup>.

## **Dietary advice**

It is recommended that we eat a healthy, balanced diet, rich in the micronutrients to maintain healthy eyes. In particular,

**brightly coloured fruits and vegetables are rich in the powerful carotenoids, essential for healthy eyes. Green leafy vegetables such as spinach, kale and cabbage are particularly rich in lutein and zeaxanthin.**

**Oysters, red meat and poultry are good dietary sources of zinc include. Other good food sources include beans, nuts, certain seafood, whole grains, fortified breakfast cereals, and dairy products.**

**The diet of individuals in Western Europe is often far from ideal. Many people do not eat a balanced diet and they may not be consuming the recommended 5-portions of fruit and vegetables a day.**

**Sometimes this is due to lifestyle other times practical difficulties in preparing the correct food (such as for those with impaired vision) may prevent people getting all the nutrients they need.**

**In such situations food supplements can provide an effective and convenient additional safeguard to the diet.**

**As more and more evidence emerges to support the role of nutrition in maintaining ocular health various manufacturers have developed supplements to help maintain eye health.**

**When making a choice, look for a comprehensive formula, which has been clinically tested. It should contain the key ingredients lutein and zinc and a range of other important vitamins, minerals and antioxidants such as those discussed.**

## References

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