

## **Nutrition and the Eye**

A booklet provided to explain the importance of nutrition in ocular health

Recent media and press coverage will have no doubt brought your attention to the new ideas involving nutrition and its role to maintain ocular health. For many years we have considered the idea of relating the role of Vitamin A to ocular nutrition and good vision. Vitamin A plays a very important role in prevention of eye disease however this is only part of the story. The scientific community is continually finding new evidence of a connection between various vitamin combinations and the mechanisms involved in ocular degeneration.

In this booklet we plan to discuss the different vitamins, mineral and antioxidants required to maintain good ocular health. We will discuss foods which contain these factors and also discuss the quantities recommended per day to achieve the correct absorption. We will also discuss the ageing effects on the eye and how the nutritional elements are thought to reduce these changes.

The main concern to patients today is that of Age Related Macula Degeneration (ARMD). As its name suggests, it is the degeneration of the macula area of the retina. The macula is the very central region of the eye that is used for detailed vision. It is also the most susceptible area to damage.

By-products produced through the chemical reactions which occur at the back of our eyes cause damage to the macula.

The process of vision occurs through the breakdown and regeneration of a chemical called Rhodopsin and like any chemical reaction there are by-products released. When related to the reactions of the eye these by-products are known as 'free radicals'. They are highly reactive molecules that require stabilization. It is the process of stabilization that causes damage to the retinal cells and layers, particularly to those cells found at the macula. Waste products from these reactions also build up in the retinal layers and accumulate in the macula area.

The body does however have defence mechanisms against this damage in the form of antioxidants consumed in our diet. These mechanisms fail through poor diet, smoking, alcohol and other factors.

## **Nutritional Elements**

There are several key components that should be included in your daily diet to provide the body with the antioxidants required to prevent ocular damage. The advantages to the visual system are discussed below.

The reference daily nutrient intake is the UK standard. This differs slightly from the RDA which is an international standard. The FSA upper limit was set by the British Food Standards Agency in 2003.

### **Vitamins**

Vitamin A – (Also known as Retinol) is considered the most important vitamin in maintaining ocular health. It plays a role in the production of the photopigment Rhodopsin which is essential in the cells of the retina associated with night vision. Any deficiency in this vitamin is associated with poor vision in the dark.

Vitamin A is only found in animal products. Common sources in our diet include liver, dairy products fish and fish oils.

The reference nutrient intake for men is 700 $\mu$ g and for women it is 600 $\mu$ g. The FSA upper limit is recorded as 7mg.

Vitamin C – This is believed to play an important antioxidant role in the body and is found in high concentrations in the eyes. It is thought that it protects against light damage to the very sensitive area of the eye known as the macula. It is known to work together with vitamin E. It has been specifically mentioned in the research of cataract development as it appears a long-term consumption of vitamin C substantially reduces the development of cataracts.

Good sources of vitamin C in our diet include fruit (particularly berries), spinach, broccoli and potatoes.

The reference daily nutrient intake for men and women is 40 mg. The FSA upper limit is recorded as 1000mg.

Vitamin E – The primary role of this vitamin is to prevent the breakdown of cell membranes. This is important to maintain the integrity of our cells. Good sources in our diet include egg yolk, nuts, seeds, meat and animal fats.

The reference daily nutrient intake value for men is >4mg and for women it is >3mg. The FSA upper limit is recorded as 540mg.

## Minerals

Selenium – This is involved with activating an enzyme that is essential to prevent cell membrane damage. It is essential in the fluid around the lens. A deficiency of selenium in this fluid is thought to be related to cataract formation.

Good sources in our diet include brazil nuts, meat, cereal, grains, and fish.

There is no recommended daily intake amount for Selenium. The available reference nutrient intake amount is recorded as men 70µg and for women it is 55µg. The FSA upper limit is recorded as 450µg.

Zinc – This has many functions in the body and is found in high concentrations in choroid of the eye. There is also a large concentration found in the retina. Its exact function in the eye has not yet been recorded, however, it is thought to have an important role in the prevention of Age Related Macula Degeneration.

Good sources in our diet include red meat, cereals, green leafy vegetables, nuts and seeds.

The reference daily nutrient intake for men is 9.5mg and for women it is 7.3mg. The FSA upper limit is recorded as 25 mg.

## Antioxidants

Lutein and Zeaxanthin – These are found in the macula pigment. They are thought to protect the macula from the damaging wavelengths of light and help prevent ARMD related damage.

Good sources in our diet include leafy green vegetables, peppers, tomatoes and corn.

At present neither Lutein nor Zeaxanthin have been included in a full ‘safe level’ report. No recommendations have therefore been made.

*Please note: It can be dangerous and harmful to your body to exceed the reference daily intake amount.*

## **Changes in the Human Eye**

The ageing changes to the human eye are unfortunately inevitable to a certain degree. However, there are several factors that can further influence the changes and cause premature ageing effects. These factors are discussed in detail below.

**Smoking** – the detrimental effects of smoking on human health is well publicized and documented. The effects of smoking on ocular health have also been well researched and findings indicate a link between smoking and the development of chronic ocular disease. The risk of development of cataracts, tear film abnormalities and age related macula degeneration (ARMD) are all thought to be increased in smokers. Smoking has also been related to higher ocular pressures in glaucoma patients.

Smoking causes a reduction in nutrient levels in the body particularly involving vitamin C and antioxidants. This decrease in nutrients is more noticeable in the structures of the eye.

Smoking generates ‘free radicals’ which are extremely damaging molecules that cause irreparable damage to human body cells in all human organs. These molecules are usually eradicated by the antioxidants in our bodies.

Therefore, a higher demand is placed on the body for antioxidants but this demand is not usually met in smokers due to the fact that the smoking itself reduces the antioxidants in the body. Damage to the body’s cells is inevitable.

To compound the issue, research shows that smokers generally have a poorer diet than non-smokers which again reduces the vitamin and nutrient levels entering the body.

This huge imbalance in nutrition and free radical formation leaves smokers very susceptible to organ damage and in particular to ocular damage.

**Alcohol** – the continued increase in alcohol consumption amongst the population, in particular in the younger generation, has led to much media coverage over the past few years.

Moderate consumption of alcohol is actually thought to have beneficial effects on the body which includes a decreased risk of developing ARMD. This is due to the body’s ability to metabolise a small amount of alcohol immediately. Heavier drinking affects this and impairs the digestive system’s ability to absorb nutrients efficiently. High intake of alcohol is associated with deficiencies in zinc and vitamin B. It is also thought to lead to a decrease in the antioxidant levels in the body.

**Poor Diet** - the diet of the general population as a whole is decreasing in nutritional levels. This is due to the increase of fast foods and ready made meals. This processing of food vastly reduces the nutritional content of the foods.

With the fast lifestyle many of us are now leading, the preparation and consumption of fresh foods has dramatically decreased and therefore recommended daily nutrient intake levels are not being met.

Malnutrition and other associated factors are thought to be leading to ocular changes occurring at an earlier age.

### **Other Factors – Environmental**

Certain aspects of our environment are also thought to contribute to ageing changes of the eye.

**Sunlight** – It has long been known that sunlight is detrimental to ocular health. Sunlight is thought to cause substantial changes to the conjunctiva and lens of the eye.

Conjunctival changes occur at the nasal and temporal side of the iris, as this is the most exposed area.

The most common change seen is the development of a pinguecula, which is a benign degenerative condition of the conjunctiva that appears as a thick yellowish raised area. It is more common with advancing age and is due to deposits caused by light damage.

The development of cataracts is also thought to have some connection with exposure to sunlight. Here we are more concerned with the light rays that enter the eye at oblique angles. These rays pass through the lens of the eye at the central polar points where the new cells of the lens are produced. The new cells are more susceptible to damage from sunlight. Hence damage and cell changes occur causing lens opacities – cataracts.

Ensuring a good quality sun lens is worn in bright sunlight can prevent the above changes. Ideally a wrap around type of frame is best to ensure the whole eye area is covered and prevent oblique light rays entering the eye.

**Industry** – there is some thought that people living in heavy industrial lenses are more susceptible to damage to the eyes. This has not been supported by any scientific research, and hence no further information or comment is available.

### **Nutrition and Dry Eyes**

Recent studies have discovered that a high dietary intake of omega 3 decreases the risk of dry eye.

Omega-3's are essential fatty acids – essential because they cannot be produced by the body, hence our only source of these is through intake in the diet.

Omega-3's are commonly found in dark, oily cold water fish and flaxseed.

Their intake in the diet helps to prevent inflammation, in particular in the areas of the eyelids. This can help with patients who suffer from meibomitis and blepharitis.

They also help reduce programmed cell death. Programmed cell death causes apoptosis, which results in decreased tear production.

Another benefit discovered is that these fatty acids actually stimulate tear production and the synthesis of tear oils.

Ensuring a good supply of omega-3's in your diet should improve tear stability and reduce the symptoms of dry eyes.

***We now have recommended dietary supplements available for sale in the practice. If you require any further information on this topic, or have any questions you would like to discuss, please feel free to contact us.***