

# Macular Disease Society

Promoting independence, confidence and quality of life for people with macular disease



## Nutrition and the eye

This leaflet looks at the role of nutrition and nutritional supplements, and their effect on vision, particularly on age-related macular degeneration (AMD).

### What links eye disease to nutrition?

Good nutrition is very important for both general health and eye health. It helps the body to grow, repair wear and tear, protect against infection and function properly.

The causes of macular disease are not fully understood, however scientists believe that a combination of factors are responsible including genetics, age, diet, smoking and sunlight.

Often there is no known cause for the development of an eye condition.

Studies have shown that a good diet, full of fresh fruit, vegetables and oily fish, may help protect against AMD in later life.

## **Free radicals**

Oxygen is essential for the human body, but it can also be harmful, producing 'free radicals' which damage cells or prevent them from regenerating as they used to. Your eyes can be damaged by free radicals, which can accelerate ageing and affect the body's ability to absorb or extract necessary vitamins and minerals from food.

These free radicals damage the retina, the light sensitive layer at the back of the eye. They also affect the lens, a clear tissue found behind the coloured part of the eye called the iris. The lens helps to focus light onto the retina, which then sends an image of what we are looking at to our brain. This is how we see.

Cigarette smoking increases free radicals, and it can also affect appetite which may lead to a poor diet. Exposure to cigarette smoke has been proved without doubt to be a major risk factor in AMD.

Most vitamins and minerals – called antioxidants – can help prevent free radicals from harming healthy tissue.

## **Antioxidants**

The main focus of research into the link between antioxidants and eye health so far has been on vitamins A, C and E. These vitamins help to maintain healthy cells and tissues in the eye and can be found in many different fruits and vegetables such as oranges, kiwis, green leafy vegetables, and tomatoes. They can also be found in nuts, seeds, dairy products and eggs and many other food types.

## **Lutein and eye health**

More recently, interest has grown into the effect of the antioxidant lutein (pronounced loo-teen), a carotenoid (pigment) found in high quantities in green leafy vegetables. Lutein, with zeaxanthin (pronounced zay-a-zan-thin), forms the macular pigment, absorbing potentially damaging blue light and free radicals. This in turn relieves oxidative stress – a state in which free radical generation compromises the ability of the antioxidant defence system to neutralise their reaction before they cause damage to cells.

Meso-zeaxanthin (MZ) is another carotenoid that scientists think is formed from lutein within the retina. There is little evidence at the moment to suggest that supplementing with MZ is any better than supplementing with lutein.

Some studies have shown that lutein can also increase the density of the macular pigment – an important yardstick for the health of the macula – while other research indicates that early damage to the macula may be slowed by supplementing the diet with lutein.

The human body is unable to manufacture lutein so it has to be obtained from food or supplements. Taking 10mg of lutein every day was found by a randomised controlled trial to have a positive effect, so this is generally considered to be the minimum amount needed. However the European average daily intake is just 2.2mg a day.

While research into the potential benefits of lutein is continuing, experts agree that you should eat a healthy balanced diet which includes plenty of green leafy vegetables and make sensible lifestyle changes, such as stopping smoking, which will boost general health and help reduce your risk of developing AMD.

Lutein and zeaxanthin can be found naturally in vegetables and fruit. For example, lutein can be found in yellow and orange peppers, Brussels sprouts, sweetcorn, green peas, mango, bilberries and green leafy vegetables such as kale, all cabbage, winter greens, spinach, chard and broccoli. The vegetables should be cooked as this increases 'bioavailability' (how easy it is for the digestive system to extract the lutein). Kale however, which is by far the best source of lutein, has good bioavailability even without cooking.

Zeaxanthin can be found in orange and yellow fruits, sweet peppers, broccoli, sweetcorn, Romaine lettuce, spinach, tangerines, oranges and eggs. Many of these overlap with food types in which vitamins A, C and E are present.



# A guide to healthy fruit and vegetables



## Lutein-zeaxanthin content of vegetables milligrams/100g

Kale	21.9	Leaf lettuce	1.8
Collard greens	16.3	Green peas	1.7
Spinach	12.6	Pumpkin	1.5
Parsley		Brussels sprouts	1.3
(not dried)	10.2	Summer squash	1.2
Mustard greens	9.9	Sweetcorn	0.79
Dill (not dried)	6.7	Yellow pepper (raw)	0.77
Celery	3.6	Green beans	0.74
Onions (raw)	2.1	Green pepper	0.70
Leeks (raw)	1.9	Cucumber	
Broccoli (raw)	1.9	pickle/gherkin	0.51
Broccoli (cooked)	1.8	Green olives	0.51

Antioxidants are measured in units called Oxygen Radical Absorbance Capacity (ORAC). This helps identify foods with good antioxidant action. The following foods contain some of the highest amounts of ORAC:

## ORAC per 100g

Goji Berry	25,300	Cherries	670
Prunes	5,770	Kiwi fruit	610
Pomegranates	3,307	Pink grapefruit	483
Raisins /		White grapes	460
dark grapes	2,830	Banana	210
Blueberries	2,400	Apple	207
Blackberries	2,036	Apricot	175
Cranberries	1,750	Peach	170
Strawberries	1,540	Pear	110
Raspberries	1,220	Watermelon	100
Plums	949	Honeydew melon	97
Oranges	750		
Red grapes	739		



However, foods with a high ORAC score do not often contain much lutein. It is recommended that you include both foods that are high in lutein and also those with a high ORAC score – aim for 10mg of lutein a day and a minimum of 3,000 ORAC units a day.

## Saffron

Research is currently underway by the University of Sydney in Australia into the potential beneficial effects of the antioxidant saffron on the eye.

A previous Italian study of around 30 people showed encouraging results.

## **Omega 3**

Omega 3 is an essential unsaturated fatty acid that is beneficial to general health. Some studies have shown that eating foods rich in omega 3 can make developing MD less likely. Further research is currently being carried out into any potential benefit.

The body cannot make omega 3 so it has to be obtained from food, such as oily fish – including salmon, herring, sardines and anchovies – and eggs, meat, milk and cheese.

Omega 3 can also be taken in the form of a fish oil supplement. Remember to check with your GP before taking any supplements or making major changes to your diet, especially if you take other medications such as Warfarin, as omega 3 may thin the blood.

## **Vitamin supplements**

As a result of various research projects into lutein and zeaxanthin, there are now many different vitamin supplements for eye health on the market.



These tend to take the form of daily capsules and usually contain the daily recommended amount of the vitamins and minerals found to be of benefit for eye health. Your pharmacist, optician or health food shop can advise you about the products available.

In many cases it is possible to obtain further information on research from the supplement's manufacturers – their details are usually on the box or instructions leaflet in the product box – to explain how their combination of vitamins and minerals could be of benefit. Lutein and zeaxanthin supplements are fat soluble and their passage through the intestinal wall is enhanced when they are consumed with fat such as olive oil.

## **Research into supplements**

AREDS 1, completed in 2001, was a trial to investigate the effect of nutritional supplements on AMD. It recommended the following formulation for healthy eyes:

Vitamin A (as beta-carotene) 15mg

Vitamin C 500mg

Vitamin E 400iu

Zinc 80mg

Copper 2mg

Bausch & Lomb produced Ocuvite Preservision to a similar formulation and this is recommended by some ophthalmologists. However, this high-dose formulation may not be suitable for all:

- Beta-carotene has been linked to an increased risk of lung cancer in smokers and ex-smokers.
- Vitamin E may interact with medications such as Warfarin and Aspirin.

Vitamin K can change the way Warfarin affects the blood, decreasing its effect. This causes a dilemma for people on Warfarin, as many of the leafy green vegetables, which are so good for eye health, have high levels of vitamin K such as spinach, parsley, collard greens, kale and Swiss chard.

**We recommend you consult your GP before taking any supplements.**



### **Evidence of the benefits of nutritional supplements**

Studies into the benefits of nutritional supplements for eye disease are conflicting and

there is no real agreement among researchers. However, it has been agreed that if you eat a good healthy diet which includes sufficient fresh fruits and vegetables (at least five portions every day) there should be no need to use supplements.

In reality most people fail to eat the recommended amounts and, while supplements should not be seen as a substitute for a healthy diet, they may be used when the diet does not include enough fresh fruit and vegetables or if the vitamins they contain are not adequately absorbed by your body.

A second trial, AREDS 2, is currently underway and will evaluate the effect of antioxidants (lutein and zeaxanthin) and fish oil (omega 3) on the progression of AMD. More information is available at [www.nei.nih.gov/amd/](http://www.nei.nih.gov/amd/).

## **Products**

While the Macular Disease Society believes that taking supplements containing lutein may be beneficial to eye health, we do not endorse any brand.

## Further information

- Visit the Macular Disease Society website: [www.maculardisease.org](http://www.maculardisease.org).
- Read the Society's "Anti-Glare Spectacles" information leaflet for advice about protecting your eyes in the sun.
- The British Nutrition Foundation provides information about healthy eating and nutrition on its website: [www.nutrition.org.uk](http://www.nutrition.org.uk).
- Two cookbooks, 'Vegetables for Vision' and 'Fruit for Vision', by prominent ophthalmologist Professor Ian Grierson from Liverpool University, can be purchased from the Macular Disease Society. Telephone 01264 350 551.

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We receive no government funding and are funded by grants and donations. If you have found this leaflet useful, please consider making a donation to the Society – phone 01264 350 551 or visit our website [www.maculardisease.org](http://www.maculardisease.org).

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