

# Age Related Macular Degeneration & Nutrition

## Definition

Due to the significant ageing of the population, prevalence of degenerative diseases such as cancer, heart diseases or neuro-degenerative diseases is increasing.

With an ageing population, it is natural that the prevalence of eye disorders such as senile cataract, glaucoma, diabetic retinopathy or age-related macular degeneration (AMD) will be on the increase.

Here in the West, Age-related macular degeneration (AMD) is the leading cause of sight loss in those over the age of 65 years. It is characterised mainly by degenerative changes in the macular region of the retina that result in a gradual decrease in central vision.

- **The early form (30% of cases)** is characterised by the presence of macular drusen and irregular proliferation or atrophy of the retinal pigment epithelium.
- **The atrophic or “dry form” (50% of cases)** is characterised by damage to the retinal pigment epithelium and thinning of the retinal macula due to drusen confluence; the disease develops slowly over a number of years.
- **The exudative or “wet form” (20% of cases)** is characterised by the development of neovascularization under the macula. This form may develop very rapidly causing sudden loss of central vision.

## Treatment of AMD

Currently, there is no known cure for the early and atrophic forms of AMD. Only preventative measures can be taken such as complementing intake in antioxidant vitamins and minerals. The other severe form of AMD, the neovascular or “wet” form, can be treated by drugs that target and inhibit proteins called VEGFs (vascular endothelial growth factors) responsible for the stimulation of new choroidal vessel formation (angiogenesis).

## Risk Factors

The main risk factor for the development of AMD is increasing age.

Although a number of risk factors have been investigated, cigarette smoking is the only risk factor other than age, ethnicity (AMD is more common amongst caucasians) and genetics that has been consistently identified in numerous studies.

Other factors that may play a role in AMD are:

- Exposure to blue light
- Hypertension and other underlying atherosclerotic disease processes
- Fat diets
- Low levels of antioxidants

## Physiopathology of AMD: the role of oxidative stress

Little is known about the pathogenesis of AMD. However there is a general consensus that **cumulative oxidative damage is responsible for ageing and may play an important role.**

This imbalance is a consequence of either over exposure to pro-oxidative factors (blue light, cigarette smoke), lack of antioxidants, ageing, or a combination of these three elements.

**The retina is particularly susceptible to oxidative stress because of its high consumption of oxygen, its high proportion of long chain PolyUnsaturated Fatty Acids, (PUFA) a target of free radicals, and its exposure to visible light.**

The retina contains intra and extracellular antioxidant defence systems against oxidative stress:

### Antioxidant Enzymes

Minerals: zinc, copper, selenium, manganese

Vitamins: vitamin C, vitamin E, vitamin A and carotenoids including beta-carotene

Macular pigment: Lutein and Zeaxanthin

PUFA: Omega-3, and especially DHA

Glutathione

Most of these compounds cannot be synthesized and must be taken in through dietary sources.

Elderly patients tend to take inadequate diets that are deficient or totally lacking in fruit and vegetables, which means that they are deficient in antioxidants, minerals and protective carotenoid pigments.

Therefore with advancing age, the amount of antioxidant available in tissues reduces. It is thus essential for the elderly to secure the daily intake of such antioxidants with a proper diet or with the intake of dietary supplements.

In 2001, the AREDS Study (Age-related Eye disease Study Research Group) confirmed for the first time the interest of antioxidants and Zinc in advanced AMD patients.

This double-blind, multicenter, randomised, clinical trial (1992-2001) financed by the National Eye Institute, was designed to evaluate the effect of high doses of zinc and selected antioxidant vitamins (C, E and beta-carotene) on the development of advanced AMD in old persons. It included 3640 patients (55-80 years old). The average follow-up of participants was 6.3 years.

### Conclusions of AREDS:

1. People older than 55 years should have dilated eye examination to determine their risk of developing advanced AMD.
2. Those with extensive intermediate size drusen, at least one large drusen, non central geographic atrophy in one or both eyes, or advanced AMD or vision loss due to AMD in one eye, and without contraindications such as smoking, should consider taking a supplement of antioxidants plus zinc such as that used in this study.

### Macular pigment: Lutein and Zeaxanthin. Their role in AMD

Two hundred years ago, a yellow colour was first observed in the macular region (macula is called macula lutea: yellow spot for its characteristic yellow colour). We know that the yellow colour of macula is due to the presence of pigments Lutein and its isomer Zeaxanthin called macular pigment<sup>13</sup>.

**Lutein is believed to function in two important ways: primarily as a filter of high energy blue light (toxic for the eye), and secondly as an antioxidant that quenches and scavenges photo-induced reactive oxygen species<sup>14</sup>.**

Lutein and Zeaxanthin are members of the carotenoid family. They are the only carotenoid found in high concentration in the macula.

Lutein is the second most prevalent carotenoid in human serum and is abundantly present in dark, leafy green vegetables, such as spinach and kale.

The concentration of Lutein and Zeaxanthin in the macula decreases with age and should be taken through dietary sources.

### Role in AMD incidence

Several scientific studies have demonstrated a reduction in the occurrence of the most severe forms of AMD in persons with high dietary intakes of fruits and vegetables containing Lutein and Zeaxanthin.

Specifically, people who consume large quantities of fruits and vegetables rich in Lutein and Zeaxanthin (6mg/day) had a 43% reduced risk of developing the most severe form of macular degeneration.

Another observational study conducted in 2002 showed that average levels of Lutein and Zeaxanthin were 32% lower in AMD eyes versus normal elderly control eyes as long as the subjects were not consuming high doses of Lutein supplements.

**This study demonstrated that patients who had begun to consume supplements containing high doses of Lutein ( $\geq 4$  mg/day) regularly after their initial diagnosis of AMD, had average macular pigments levels that were in the normal range and that were significantly higher than in AMD patients not consuming these supplements.**

**All these findings are consistent with the hypothesis that low levels of Lutein and Zeaxanthin in the human macula may represent a pathogenic risk factor for the development of AMD. It also suggests that supplementation can contribute to maintaining eye health.**

### Omega-3 and AMD

Omega-3 is considered an essential fatty acid, which means that they are essential to human health.

Omega-3 fatty acids cannot be synthesized by the body, and must be obtained from food, especially from fish and sea food.

Omega-3 is highly concentrated in the brain and appears to be particularly important for cognitive and behavioral function. In fact, infants who do not get enough omega-3 from their mothers during pregnancy are at risk for developing vision and nerve problems.

Extensive research indicates that omega-3 has a protective effect against diabetes and hypertension, reduced inflammation and helps prevent certain chronic diseases such as heart disease and arthritis thanks to their antithrombotic and hypolipidemic properties.

Omega-3 plays a key role in the structure and function of the sensor retina.

### Conclusion

Although AMD is a leading cause of blindness in the elderly, its pathogenesis is not clearly understood. In recent years there has been increasing interest in the potential role of antioxidants, macular pigment and more recently omega-3 in the AMD pathogenesis.

Several studies suggest that antioxidants, macular pigment and omega-3 may act as modifiable factors capable of modulating processes implicated in AMD pathogenesis and progression.

**The AREDS study was the first clinical trial that established the key role of oxidative stress in AMD pathogenesis.**

Furthermore the results showed that people at high risk of developing advanced stages of AMD, lowered their risk by about 25% when treated with a high-dose combination of vitamin C, Vitamin E, beta-carotene and zinc.

In the same high risk group – which includes people with intermediate AMD, or advanced AMD in one eye but not the other eye – the nutrients reduced the risk of vision loss caused by the advanced AMD by about 19%.

**Since the AREDS study, several epidemiological studies have reported an inverse relationship of dietary omega-3 or lutein intake with advanced AMD that are statistically significant.**

**All these studies and clinical trials support the different formulations commercialized, including antioxidants (vitamins and minerals), lutein and omega-3 (DHA).**

A new large-scale phase III randomized clinical trial sponsored by the National Eye Institute (NEI, USA), AREDS II<sup>25</sup> or “The Lutein/Zeaxanthin and Omega-3 Supplement Trial” has been initiated.

Scientific data has proven that to promote healthy eyes, it is mandatory to ensure a sufficient daily intake of antioxidants (vitamins, minerals, glutathione, polyphenols), lutein, as well as omega-3 through an appropriate diet, eventually enhanced with a dietary supplement.

### Ordering your Nutritional Supplements

The Home Health Clinic supplies a range of nutritional supplements for eyes. If you would like to discuss your individual needs and the options available, speak to our Optometrist today on 020 8428 4068.