



# Position Statement for Healthcare Professionals

## *Eggs and Eye Health*

*Updated June 2017*

Age-related eye disorders have been reported as the leading causes of vision impairment and blindness in Australia<sup>1,2</sup>. These disorders include cataracts, age-related macular degeneration (AMD), diabetic retinopathy and glaucoma<sup>1</sup>, with age-related macular degeneration being the most common cause of blindness<sup>3</sup>.

The major risk factors for age-related eye disorders include smoking, family history and increasing age<sup>4,5</sup>. AMD also appears to be more likely in men than women<sup>6</sup> although this differs between countries<sup>7</sup>. Given Australia's ageing population, eye health will continue to be an important health issue to address. However, eye disorders are not only a problem for older adults - eye disorders are also among the most common long-term health problems experienced by Australian children<sup>8</sup>.

Evidence indicates that several dietary factors such as fruit and vegetable intake<sup>9</sup>, antioxidant intake<sup>10</sup>, fat types<sup>11</sup>, omega-3 intake<sup>12</sup>, glycemic index<sup>13</sup> and adequate intake of key vitamins and minerals<sup>9</sup> play an important role in the development and progression of some of these disorders including AMD and cataracts.

People with diabetes, in particular, have an increased risk of developing eye disease with an Australian study finding evidence of diabetic retinopathy in 16% of study participants<sup>14</sup>. Improved diabetes control, which ideally involves dietary and lifestyle modification, reduces the risk of developing, and the progression of, diabetic retinopathy<sup>15</sup>.

### **Antioxidants and Eye Disease –**

Lutein and zeaxanthin (with their isomer meso-zeaxanthin) are the primary carotenoids found in the macular region of the retina<sup>16,17</sup>. Numerous studies have suggested lutein and zeaxanthin, (along with other nutrients such as omega-3), are essential components for eye health<sup>18-20</sup>. Current evidence from human studies, suggest dietary intake of lutein and zeaxanthin can lead to their accumulation in the retina, and as a result may provide protection against retinal degeneration<sup>21-23</sup>.

The Blue Mountains Eye Study (BMES) showed that older adults with the highest intake of dietary lutein and zeaxanthin, had a reduced risk of developing late AMD (RR 0.35)<sup>10</sup>. Similarly, a 2012 systematic review found that while dietary lutein and zeaxanthin were not significantly associated with a reduced risk of early AMD, these important antioxidants may protect against late AMD<sup>24</sup>. Studies published since then have also suggested that the benefits of these antioxidants may be limited to advanced (late) AMD<sup>25</sup>.

Further support for dietary lutein and zeaxanthin intake as a protective factor in AMD comes from the eye supplement trial, AREDS ((Age-Related Eye Disease Study) <sup>26,27,28</sup> which found the supplement lost its effectiveness if the background diet was sufficient in lutein and zeaxanthin.

Individuals at high risk of AMD (ie, those genetically susceptible to AMD) appear to benefit from a high lutein and zeaxanthin intake<sup>29</sup>. Among participants with high genetic risk, the highest intake of lutein and zeaxanthin was associated with a >20% reduced risk of early AMD. No similar association was evident among participants with low genetic risk.



## **Bioavailability of Carotenoids in Eggs**

Eggs contain both of the antioxidants lutein and zeaxanthin, with one serve\* of eggs containing around 530µg. While this is lower than most plant sources of these carotenoids, a number of studies have demonstrated that the lutein and zeaxanthin in eggs is bioavailable while factors in plants may reduce the bioavailability from these sources<sup>30-32</sup>.

Egg consumption has been shown to be an effective vehicle for increased uptake of lutein and zeaxanthin, with results showing egg consumption effectively raises blood carotenoid levels<sup>33-35</sup> and in some studies macular pigment optical density (MPOD)<sup>36,37</sup>. The level of increase differed in the studies dependent on level of egg consumption (1 to 4 eggs per day), duration of study and type of eggs used (regular verses lutein enriched). Furthermore, LDL cholesterol levels were not found to increase despite the increases in carotenoid levels with egg consumption<sup>33,36,37</sup>.

Due to both their high bioavailability and not being subject to seasonal variation, the consumption of eggs is a favourable source of lutein and zeaxanthin in the diet.

## **Recommended Level of Intake**

Currently there is insufficient research to indicate an exact optimal level of intake of lutein and zeaxanthin for protecting against eye disease, although some researchers have recommended levels as high as 6mg per day<sup>38,39</sup>. Although more recent research suggests possible protective effects at levels considerably below the suggest 6mg per day<sup>10,40</sup>.

Overall, the research to date suggests that eggs are a highly bioavailable source of the dietary carotenoids, lutein and zeaxanthin, and that they are an effective vehicle for increased and site-specific antioxidant uptake. This in turn may have benefits for long term eye health given the data supporting the role of lutein and zeaxanthin.

## **Omega-3 Fats and Eye Health**

The essential long chain omega-3 fatty acid docosahexaenoic acid (DHA) is a major structural lipid found in the photoreceptors of the retina and DHA deficiency is associated with alterations in the functioning of the retina and visual processing. Adequate intake of long-chain omega-3 can protect the eye from retinal damage caused by ischemia, oxidation, light, inflammation and age-associated diseases<sup>41</sup>. Some research has shown that lower intakes of saturated fat and higher intakes of omega-3 fatty acids are protective against the development of certain eye diseases<sup>12,42,43</sup>.

While individual studies have found associations between the consumption of omega-3 and/or omega-3 status and a reduced risk of AMD<sup>44-47</sup>, a 2015 Cochrane review found that omega 3 supplementation in people with AMD (who have had the disease for up to five years), does not reduce the risk of progression to advanced AMD or the development of moderate to severe visual loss. The review concluded that current available evidence does not support increasing dietary intake of long chain omega 3 fatty acids for the explicit purpose of preventing or slowing the progression of AMD<sup>48</sup>.

Of note, in 2010, the European Food Safety Authority (EFSA) asserted that consuming 250mg of DHA per day (in one or more servings), can make an important contribution towards maintaining vision in the general population<sup>49</sup>.



## Other Nutrients in Eggs

In addition to omega-3, lutein and zeaxanthin, adequate intakes of vitamin A, other antioxidants and zinc are thought to reduce the amount of visual degeneration in older adults<sup>10,39,50</sup>.

For people aged 51 years and over, one serve of eggs\* provides bioavailable vitamin A (34% RDI for women, 27% RDI for men), vitamin E (34% AI for women, 24% AI for men), selenium (68% RDI for women, 59% RDI for men), and zinc (6% RDI for women, 4% RDI for men).

## Dietary and lifestyle effects on eye health

Studies have linked diet quality, glycemic index (GI) and body mass index (BMI) with eye health. Studies using data from the BMES have shown older adults with higher diet quality (better compliance with dietary guidelines) also had healthier retinal vessels<sup>51</sup> and a decreased long term risk of visual impairment<sup>52</sup>.

Given the nutritional composition of eggs, they can make a valuable contribution to improved diet quality, help lower the GI of a meal/overall diet and may have a role to play in assisting weight management through appetite control.

## Conclusion

Eggs contain a range of nutrients and antioxidants that have been shown to contribute to long-term eye health. Eggs can therefore be enjoyed regularly as part of a healthy lifestyle that also includes the following:

- Smoking avoidance
- Enjoying 1-2 fish meals per week
- Eating other foods rich in carotenoids such as dark green and orange/yellow fruit and vegetables daily
- Reducing dietary sources of saturated fat
- Exercising regularly to control body weight and blood pressure
- Reducing the glycaemic index of the diet
- If overweight, aiming for weight loss to assist with controlling blood glucose levels and fat loss
- For people with type 2 diabetes, achieving and maintaining optimal blood glucose and plasma lipid levels.

This statement is for healthcare professionals only.

*\*One serve = 2x60g eggs (104g edible portion)*

*RDI: Recommended Dietary Intake*

*AI: Adequate Intake*

## Useful links:

<http://www.mdfoundation.com.au/>

<https://www.visionaustralia.org/learn-more/eye-conditions/age-related-macular-degeneration>

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