

# Behind blue eyes -- Ocular nutritional supplements on the Scandinavian market in relation to current evidence

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## Abstract

Nutritional supplements for eye health are very popular, but the size of the market makes it difficult to grasp for the clinician. To guide patients and clinicians in the subject it would therefore be valuable to have a list of available products and their content. The purpose of this study was to investigate the ocular nutritional supplements available on the Scandinavian market and how their doses relate to current evidence.

A list of nutritional supplements for ocular health available on the Scandinavian market was compiled by structured internet searches, and the products and their contents were compared with current evidence and legislated upper tolerable levels.

Out of 104 products on the Scandinavian market, only two products reached the Age-Related Eye Disease Study 2 (AREDS2)-formula at the recommended dose. One additional product reached the same formula if the recommended dose was exceeded.

As only two nutritional supplements for ocular health on the Scandinavian market reached the AREDS2-dose at recommended dose, clinicians offering such substances need to have knowledge not only about the substances but also of the doses. In the future it would be welcome if the health claims for nutritional supplements were based on placebo-controlled intervention studies, to avoid ineffective products.

**Keywords:** Ocular nutritional supplements, AMD, AREDS

## Introduction

Nutritional supplements are popular in the Scandinavian countries. It is estimated that six in ten people in Denmark (DTU Fødevarerinstitutionen, 2016) and Norway (NAFKAM, 2017) take some kind of nutritional supplement. In 2014, nutritional supplements for more than 200 million euro were sold in Sweden (Svensk Egenvärd, 2016). The share of nutritional supplements for eye health is unknown in the Scandinavian countries, but accounts for about 7% in the USA (Yong et al., 2015). As the European Union (EU) classifies nutritional supplements as food, their safety and efficacy are not regulated by the European Medical Agency (EMA) but by The European Food Safety Authority (EFSA). Statements of beneficial medical effects are only permitted according to pre-approved regulations. Food containing at least 15% of the recommended daily dose of vitamin A, B2, zinc or docosahexaenoic acid are allowed to be sold with the health claim, "contributes to the maintenance of normal vision" (The European Commission, 2012) (see Table 1).

EFSA declares nutritional supplements as valid for cataract, dry eyes and impaired night vision. This statement is supported by five books and four articles about cell metabolism, deficiency

diseases in animal models and case reports from humans. References to placebo-controlled intervention studies are lacking (European Food Safety Authority, 2009a; 2009b; 2010). As the Scandinavian populations generally do not have deficiencies of the substances mentioned above, an addition of them would in most cases not lead to improved vision (Livsmedelsverket, 2020a). Even if the health claims are scientifically true, they might therefore mislead the customer.

Table 1: Vitamins and minerals permitted in EU to use the health claim "contributes to the maintenance of normal vision"

	Minimum dose	Upper tolerable limit
Vitamin A (mg)	0.12	3
Vitamin B2 (mg)	0.24	–
Zinc (mg)	2.25	25
DHA	40 mg per 100 g	–

Note: DHA = Docosahexaenoic acid

Even if EFSA does not mention age related macular degeneration (AMD), this is the ophthalmologic field where nutritional supplements have been studied most extensively. At the beginning of the 1990s, the National Eye Institute in USA initiated the placebo controlled Age-Related Eye Disease Study (AREDS). During a period of over 6 years, around 3000 patients with no to advanced AMD were followed. The results showed that a specific formula of vitamin C, E, beta-carotene, zinc and copper could reduce the risk of intermediate AMD progressing to advanced disease to 24%, compared to 30% in the placebo group during the 6.3 year follow-up period (AREDS Research Group, 2001). This means a relative risk reduction of 20% (6%/30%). A more useful way of presenting the result might be absolute risk reduction (ARR), in this case 6% (30%–24%). This means if 100 patients were treated, six would benefit from the treatment. Another way of expressing this is the number needed to treat (NNT) which is the inverse of the ARR. This means that 16 patients had to be treated for one to benefit (1/0.06). In patients with no or early AMD, no reduced risk could be proven. None of the patients showed improvement of their disease (AREDS Research Group, 2001). AREDS2 was initiated in 2006 and followed 4000 patients in four arms: placebo, the Omega-3 acids Docosahexaenoic acid (DHA) and Eicosapentaenoic acid (EPA), lutein and zeaxanthin, and finally all four together. All patients were also given the original AREDS-formula, or a modified formula without beta-carotene and reduced dose of zinc. AREDS2 confirmed the result from AREDS but could not prove any additional effects. As all groups were given the original formula, it is still unknown if lutein/zeaxanthin or DHA/EPA are effective alone. The main result was that the effects remain even if beta-carotene is replaced by lutein/zeaxanthin and the dose of zinc is reduced (AREDS2 Research Group, 2013) (see Table 2). Prolonged use of supplements with zinc has been shown to increase the risk of prostate cancer (Zhang et al., 2009), which is also the case for vitamin E (Klein et al., 2011). Vitamin E could also increase the effect of oral anticoagulant treatment (Bartlett & Eperjesi, 2005) and might even increase total mortality (Bjelakovic et al., 2012; Miller et al., 2005).

AREDS and AREDS2 are the largest studies of the effects of antioxidant treatment for AMD, but not the only ones. Several others have been published with fewer participants and shorter follow-up periods. Unfortunately, none of them have

proven that other preparations could prevent or slow down the progress of AMD (Evans & Lawrenson, 2017a; 2017b). Intake of Omega-3 is correlated to less AMD in observational studies, but the connection between intervention and reduced risk has not been proven (Lawrenson & Evans, 2015). Nutritional supplements containing Omega-3 and Omega-6 fatty acids have also been used for treatment of dry eye syndrome (DES). Even if the effects are promising, evidence is not yet strong enough to recommend the use of fatty acids as a stand-alone treatment for DES (Molina-Leyva et al., 2017). The ability of antioxidant vitamin supplements to prevent or slow down the progression of cataract and glaucoma has also been studied, but there is still insufficient evidence to draw a conclusion (Bussel & Aref, 2014; Mathew et al., 2012). However, a smaller study has shown that vitamin B3 in doses of 1500–3000 mg per day improve retinal ganglion cell function in patients with different forms of glaucoma in the short term (Hui et al., 2020). The long-term effects for visual function are, however, still under investigation. Bilberry products are used to treat various diseases of the eye, but no beneficial effects have been proven. In a review of 30 studies of the effect of bilberry on night vision, only five satisfied scientific requirements whereof four showed no correlation (Canter & Ernst, 2004). Another review of the effect of bilberry on cataract, retinopathy and night vision did not show any clear relationship (Ulbricht et al., 2009).

Table 2: Content and dosage of formulas based on AREDS/AREDS2.

	AREDS formula	AREDS2 formula
Vitamin C (mg)	400	400
Vitamin E (IU)	400	400
Beta-carotene (mg)	15	–
Copper (mg)	2	2
Lutein (mg)	–	10
Zeaxanthin (mg)	–	2
Zinc (mg)	80	80 (25 with low dose)

Note: IU = International Units (equals 0.67 mg natural d-Alpha tocopherol or 0.9 mg synthetic dl-Alpha tocopherol.)

The Danish Ophthalmologic Society recommends the AREDS-formula to patients with wet AMD in one eye, to patients with several large drusen and visual impairment, and even to patients with drusen and relatives with visual impairment caused by AMD (Dansk Oftalmologisk Selskab, 2015). The Danish legislation demands that retailers of nutritional supplements report the name and list of contents of their product to the Danish Veterinary and Food Administration (DFVA) (Miljø- og Fødevareministeriet, 2015). Information from all registered products is available on the Internet (Fødevarestyrelsen, 2017). DVFA does not control the content (Miljø- og Fødevareministeriet, 2017a), but products considered hazardous might be removed from the market. For example, a supplement for eye health was forbidden during the spring of 2018 because of a zinc dose of 80 mg per day (Fødevarestyrelsen, 2018). Maximum intake levels for vitamins and minerals were established in 1996 (Miljø- og Fødevareministeriet, 1996). The old legislation did not allow the AREDS2-formula in contrast to the new rules from 2018. The updated 2018 legislation no longer presents maximum levels (ML) but uses upper tolerable levels (UL). Those doses are considered safe in healthy individuals, even after prolonged use. Levels are given for men and women and children divided into five age groups. The limit for vitamin E was increased more than 6-fold in 2018. Vitamin C still has no UL, but a temporary guidance value is presented in the absence of further knowledge (Miljø- og Fødevareministeriet, 2017b). The legislation in Norway also demands that retailers of nutri-

tional supplements should report the names of products to the Norwegian Food Safety Authority. However, this is only done on a regional level and no public register is constructed. In the first established maximum intake levels of vitamins and minerals from 2004, the AREDS-formula was not allowed (Helse- og omsorgsdepartementet, 2004). In the revision from 2017, the maximum levels for all contents of the AREDS-formula were abolished except for vitamin C, where the limit was made equal to the European UL. The remaining maximum levels will be presented as soon as scientific documentation is available (Helse- og omsorgsdepartementet, 2017). Sweden has a similar legislation to Norway with a requirement for regional registration. No maximum levels exist today but the National Food Administration has investigated whether this should be introduced and have written a proposal for consultation (Livsmedelsverket, 2020b). The first limits might be legislated during 2021. The EU has no common ML, but ULs that serve as guiding values (European Food Safety Authority, 2006); (see Table 3).

Table 3: Recommended national maximum daily dose of vitamins in the AREDS-formula.

	EU	Denmark	Norway	Sweden (proposal)
	2004 UL	1996 ML / 2017 UL	2004 ML / 2017 ML	2020 ML
Vitamin C (mg)	1000	90 / 670	200 / 1000	1000
Vitamin E (IU)	330	45 / 330	33 / –	330
Zinc (mg)	25	22.5 / 25	25 / –	25
Copper (mg)	5	3 / 5	4 / –	2

Note: UL = Upper tolerable limit, ML = Maximum limit, IU = International units.

The market for nutritional supplements is difficult to grasp as it contains countless ever-changing products with several substances in varying doses. This makes it difficult for a clinician to guide patients in the subject. The purpose of this study was to investigate how nutritional supplements available on the Scandinavian market relate to current evidence on treating eye diseases and to the legislation of upper tolerable limits.

## Methods

A list of all nutritional supplements for ocular health available on the Scandinavian market was compiled by structured internet searches June 2018 – January 2019.

The Google main site was used with the phrases +“nutritional supplements” +“maintenance of normal vision” translated into Swedish, Danish and Norwegian. To only include Scandinavian sites the search condition “site:” was used, together with the national domains (\*.dk, \*.no and \*.se). As most companies use the national top-domain, we believe this strategy represents the Scandinavian market. Only supplements with the pre-approved ocular health claim were included (i.e., contributes to the maintenance of normal vision). Products linked to eye health only by their name were excluded, and so were products no longer advertised on the manufacturer’s web page but only by a reseller. Only tablets and capsules were included as they are the most cost-effective form as the manufacturer can pack the most material into a given space and therefore also the most common. Powders, oils, and effervescent tablets etc. were excluded. If the recommended daily dose was relative (e.g., 1–2 tablets), the calculation was based on the higher value. If no dose was specified one tablet a day was assumed. The cheapest price without shipping was used and converted to euro in January 2019. The content was thereafter compared with the evidence-based AREDS2-formula with low zinc (see Table 2). Because of a potential effect for DES and glaucoma, the content

of Omega-3 and vitamin B3 was also compared. Even in the absence of evidence, the supplements included in the study were also compared by their content of bilberry, because of its popularity and tradition of use. The content of interest in the included supplements was compared in mg or % of the AREDS2 formula with low dose zinc.

## Results

In total 104 nutritional supplements produced by 61 companies were sold with a health claim to maintain normal vision. Zinc was the most common substance and was included in 54% of the supplements, followed by vitamin E (45%) and vitamin A (40%). The doses showed great variation. The products containing vitamin E ranged from 3 to 268 international units (average 32). Seven in ten products contained at least one of the supplements in the AREDS2 formula, but only two reached the AREDS2 formula with low dose zinc in content and dosage in recommended dose (Optivital and Macushield Gold). One additional supplement fulfilled the original AREDS formula with high dose zinc if the recommended dose was exceeded (Cezin pluz), which of course also meant a higher price. A further three products matched the AREDS2-formula by content but not in dosage and to fulfill the dose of vitamins, the amount of zinc had to overstep the upper tolerable limit within the EU (Synvital Pluss, Retisan, Klarin Perfekt). Omega-3 was included in 28% of the products with doses varying from 129 to 3740 mg per day with an average of 974. Vitamin B3 was included in three products with doses ranging from 16 to 50 mg per day. Bilberry (*vaccinium myrtillus*) was included in 22% of the products with doses varying from 5 to 2000 mg per day with an average of 412. The annual cost varied from 20 to 880 euro per year, with an average of 200 euro (see Table 4 and Appendix).

Table 4: Summarized content of certain interest in 104 ocular nutritional supplements on the Scandinavian market.

	Number (proportion)	Average (min-max)
Vitamin C	40 (38%)	128 (4–500) mg
Vitamin E	47 (45%)	32 (3–268) IU
Zinc	56 (54%)	14 (1.5–50) mg
Copper	25 (24%)	1 (0.1–2) mg
Lutein	29 (28%)	12 (1–40) mg
Zeaxanthin	18 (17%)	1 (0.2–2.5) mg
Omega 3	29 (28%)	974 (129–3740) mg
Vitamin B3	3 (3%)	32 (16–50) mg
Bilberry	22 (21%)	412 (5–2000) mg

Note: IU = International units.

## Discussion

Among some one hundred ocular nutritional supplements on the Scandinavian market, only two reached the AREDS2-formula in the recommended dose. One additional product met the same formula if the dose was increased. It is therefore difficult for patients to use ocular nutritional supplements in an evidence-based manner without guidance from a clinical expert.

Even if the evidence is not strong enough to recommend Omega-3 fatty acids as a sole treatment for DES, they have shown promising effects in doses between 150–2400 mg/day. Many of the products included in our study reached these levels and could therefore be considered as an option as supplementary treatment.

The few products that contained vitamin B3 had only a few per cent of the amount used in a recent study of glaucoma (Hui et al., 2020) and were well within the current European upper

tolerable level of 900 mg per day (European Food Safety Authority, 2006). Concerning bilberry supplements, these products are still very common. The reason for this might be a strong cultural belief and global legends like that British pilots ate bilberry jam to improve their night vision during World War II. However, there is today no conclusive evidence that bilberry improves any aspect of eye function. There is therefore no difference in evidence of effect between the product with the lowest concentration compared to the product with the highest, even if the concentration of bilberry is 400 times larger in the latter.

This study has several limitations. As the market is ever-changing the supplements may have changed since the compilation of the list. Only products available on the Internet were counted, supplements sold in stores or in other ways were not included. However, this is the first published list of nutritional supplements on the Scandinavian market. The results may be compared with those of Yong et al., who found that among 11 top-selling supplements for ocular health in the USA, only one third contain the AREDS-formula (Yong et al., 2015).

Regulation of the vitamin and nutritional supplements industry is needed both to prevent wasteful spending and to reduce unnecessary risks. However, the studies that motivate the European health claims are not based on good science. In the next revision of the regulations, the inclusion of placebo-controlled interventional studies would be welcome. At the same time, there are several problems in conducting studies on nutritional supplements. The levels of antioxidants are affected by both diet and activities, and compliance might be difficult to supervise over long-term periods. Even if supplements are sold for billions of euros, the industry is small compared with the licensed drugs industry and there is little interest in conducting rigorous experiments with the lack of exclusive rights to the formulas.

The Danish web-register of supplements is probably of great value, both for the state to monitor the market and for the consumer to evaluate different products. As a considerable part of the market has moved to the Internet, local registries would probably be outdated very quickly. None of the Scandinavian countries control the content of nutritional supplements whereupon it is totally up to the producer to ensure the content.

Danish ophthalmologists have the most positive attitude in Scandinavia to nutritional supplements. They recommend AREDS treatment even to patients with mild drusen who have close relatives with vision loss caused by AMD. Due to the previous regulations, only reduced AREDS-formulas are available in Denmark and Norway. Therefore, ophthalmologists need to give instructions to exceed the recommended dose, in Norway as much as six times. The updated regulations will probably make the AREDS-formula available also in Denmark and Norway.

## Conclusion

In summary, ocular nutritional supplements constitute a large and complex market with expensive products. Only a few supplements available in Scandinavia meet the evidence-based AREDS2-formula. Knowledge of the market is of value for both clinicians and for decision makers to construct new policies.

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## Conflicts of Interest

The authors declare no conflict of interest.

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**References**

- AREDS Research Group. (2001). A randomized, placebo-controlled, clinical trial of high-dose supplementation with vitamins C and E, beta carotene, and zinc for age-related macular degeneration and vision loss: AREDS report no. 8. *Archives of Ophthalmology*, 119(10), 1417–36. <https://doi.org/10.1001/archophth.119.10.1417>
- AREDS2 Research Group. (2013). Lutein + zeaxanthin and omega-3 fatty acids for age-related macular degeneration: The Age-Related Eye Disease Study 2 (AREDS2) randomized clinical trial. *JAMA*, 309(19), 2005–15. <https://doi.org/10.1001/jama.2013.4997>
- Bartlett, H., & Eperjesi, F. (2005). Possible contraindications and adverse reactions associated with the use of ocular nutritional supplements. *Ophthalmic and Physiological Optics*, 25(3), 179–94. <https://doi.org/10.1111/j.1475-1313.2005.00294.x>
- Bjelakovic, G., Nikolova, D., Gluud, L. L., Simonetti, R. G., & Gluud, C. (2012). Antioxidant supplements for prevention of mortality in healthy participants and patients with various diseases. *Cochrane Database of Systematic Reviews*, (3), CD007176. <https://doi.org/10.1002/14651858.CD007176.pub2>
- Bussel, I., & Aref, A. A. (2014). Dietary factors and the risk of glaucoma: A review. *Therapeutic Advances in Chronic Disease*, 5(4), 188–94. <https://doi.org/10.1177/2040622314530181>
- Canter, P. H., & Ernst, E. (2004). Anthocyanosides of *vaccinium myrtillus* (bilberry) for night vision—a systematic review of placebo-controlled trials. *Survey of Ophthalmology*, 49(1), 38–50. <https://doi.org/10.1016/j.survophthal.2003.10.006>
- Dansk Oftalmologisk Selskab. (2015). AMD og kosttilskud. <http://www.dansk-oftalmologisk-selskab.dk/arkiver/23>
- DTU Fødevarerinstitutionen. (2016). De fleste får nok vitaminer og mineraler fra kosten alene. <http://www.food.dtu.dk/-/media/Institutter/Foedevareinstituttet/Publikationer/Pub-2016/E-artikel-De-fleste-faar-nok-vitaminer-og-mineraler-fra-kosten-alene.ashx?la=da>
- European Food Safety Authority. (2006). *Tolerable upper intake levels for vitamin and minerals*.
- European Food Safety Authority. (2009a). *EFSA Journal*, 7(9), Article 1221.
- European Food Safety Authority. (2009b). *EFSA Journal*, 7(9), Article 1229.
- European Food Safety Authority. (2010). *EFSA Journal*, 8(10), Article 1814.
- Evans, J. R., & Lawrenson, J. G. (2017a). Antioxidant vitamin and mineral supplements for preventing age-related macular degeneration. *Cochrane Database of Systematic Reviews*, 7, CD000253. <https://doi.org/10.1002/14651858.CD000253.pub4>
- Evans, J. R., & Lawrenson, J. G. (2017b). Antioxidant vitamin and mineral supplements for slowing the progression of age-related macular degeneration. *Cochrane Database of Systematic Reviews*, 7, CD000254. <https://doi.org/10.1002/14651858.CD000254.pub4>
- Fødevarerstyrelsen. (2017). Søg i kosttilskud. <https://www.foedevarestyrelsen.dk/Foedevare/Kosttilskud/Sider/S%C3%B8gI%20Kosttilskud.aspx#k=cezin%20pluz>
- Fødevarerstyrelsen. (2018). For meget zink i kosttilskud. [https://www.foedevarestyrelsen.dk/Nyheder/Aktuelt/Sider/Tilbagekaldte%20af%20C3%B8devarer%202018/For\\_meget\\_zink\\_i\\_kosttilskud.aspx](https://www.foedevarestyrelsen.dk/Nyheder/Aktuelt/Sider/Tilbagekaldte%20af%20C3%B8devarer%202018/For_meget_zink_i_kosttilskud.aspx)
- Helse- og omsorgsdepartementet. (2004). FOR-2004-05-20-755. <https://lovdata.no/dokument/SF/forskrift/2004-05-20-755>
- Helse- og omsorgsdepartementet. (2017). FOR-2017-05-30-671. <https://lovdata.no/dokument/LTI/forskrift/2017-05-30-671>
- Hui, F., Tang, J., Williams, P. A., McGuinness, M. B., Hadoux, X., Casson, R. J., Coote, M., Trounce, I. A., Martin, K. R., van Wijngaarden, P., & Crowston, J. G. (2020). Improvement in inner retinal function in glaucoma with nicotinamide (vitamin B3) supplementation: A crossover randomized clinical trial. *Clinical and Experimental Ophthalmology*. <https://doi.org/10.1111/ceo.13818>
- Klein, E. A., Thompson, J., I. M., Tangen, C. M., Crowley, J. J., Lucia, M. S., Goodman, P. J., Minasian, L. M., Ford, L. G., Parnes, H. L., Gaziano, J. M., Karp, D. D., Lieber, M. M., Walthers, P. J., Klotz, L., Parsons, J. K., Chin, J. L., Darke, A. K., Lippman, S. M., Goodman, G. E., ... Baker, L. H. (2011). Vitamin E and the risk of prostate cancer: the Selenium and Vitamin E Cancer Prevention Trial (SELECT). *JAMA*, 306(14), 1549–56. <https://doi.org/10.1001/jama.2011.1437>
- Lawrenson, J. G., & Evans, J. R. (2015). Omega 3 fatty acids for preventing or slowing the progression of age-related macular degeneration. *Cochrane Database of Systematic Reviews*, (4), CD010015. <https://doi.org/10.1002/14651858.CD010015.pub3>
- Livsmiddelverket. (2020a). *Risikvurdering av vitaminer og mineraler i kosttilskott. bilaga 1* (Report).
- Livsmiddelverket. (2020b). Vem behöver extra vitaminer och mineraler? <https://www.livsmiddelverket.se/livsmiddel-och-innehall/kosttilskott/vem-behover-extra-vitaminer>
- Mathew, M. C., Ervin, A. M., Tao, J., & Davis, R. M. (2012). Antioxidant vitamin supplementation for preventing and slowing the progression of age-related cataract. *Cochrane Database of Systematic Reviews*, (6), CD004567. <https://doi.org/10.1002/14651858.CD004567.pub2>
- Miljø- og Fødevarerministeriet. (1996). Bekendtgørelse om kosttilskud, BEK nr 860 af 25/09/1996. <https://www.retsinformation.dk/Forms/R0710.aspx?id=84169>
- Miljø- og Fødevarerministeriet. (2015). BEK nr 1465 af 07/12/2015. <https://www.retsinformation.dk/Forms/R0710.aspx?id=176054>
- Miljø- og Fødevarerministeriet. (2017a). BEK nr 1239 af 27/11/2017. <https://www.retsinformation.dk/forms/R0710.aspx?id=194906>
- Miljø- og Fødevarerministeriet. (2017b). Vejledning om kosttilskud VEJ nr. 10213 af 13/12/2017.
- Miller, S. E., Pastor-Barriuso, R., Dalal, D., Riemersma, R. A., Appel, L. J., & Guallar, E. (2005). Meta-analysis: High-dosage vitamin E supplementation may increase all-cause mortality. *Annals of Internal Medicine*, 142(1), 37–46. <https://doi.org/10.7326/0003-4819-142-1-200501040-00110>
- Molina-Leyva, I., Molina-Leyva, A., & Bueno-Cavanillas, A. (2017). Efficacy of nutritional supplementation with omega-3 and omega-6 fatty acids in dry eye syndrome: A systematic review of randomized clinical trials. *Acta Ophthalmologica*, 95(8), 677–685. <https://doi.org/10.1111/aos.13428>
- NAFKAM. (2017). Rapport: Bruk av alternativ behandling i Norge 2016. <http://www.nifab.no/content/download/101011/632568/file/NAFKAM-2016%20rapport%20finale.pdf>
- Svensk Egenvård. (2016). Egenvårdsmarknaden 2015. <http://svenskegenvard.se/content/uploads/2016/03/statistik-2015.pdf>
- The European Commission. (2012). Commission regulation no 432/2012. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0432>
- Ulbricht, C., Basch, E., Basch, S., Bent, S., Boon, H., Burke, D., Costa, D., Falkson, C., Giese, N., Goble, M., Hashmi, S., Mukarjee, S., Papaliadis, G., Seamon, E., Tanguay-Colucci, S., Weissner, W., & Woods, J. (2009). An evidence-based systematic review of bilberry (*vaccinium myrtillus*) by the natural standard research collaboration. *Journal of Dietary Supplements*, 6(2), 162–200. <https://doi.org/10.1080/19390210902861858>
- Yong, J. J., Scott, I. U., & Greenberg, P. B. (2015). Ocular nutritional supplements: Are their ingredients and manufacturers' claims evidence-based? *Ophthalmology*, 122(3), 595–9. <https://doi.org/10.1016/j.ophtha.2014.09.039>
- Zhang, Y., Coogan, P., Palmer, J. R., Strom, B. L., & Rosenberg, L. (2009). Vitamin and mineral use and risk of prostate cancer: The case-control surveillance study. *Cancer Causes Control*, 20(5), 691–8. <https://doi.org/10.1007/s10552-008-9282-y>

**Appendix -- Ocular nutritional supplements available on the Scandinavian market**

Content of certain interest in 104 ocular nutritional supplements available on the Scandinavian market in absolute weight or in relation to AREDS2. Total yearly cost is given for recommended daily consumption.

Product, Brand	AREDS2-content with low dose zinc (%)						Omega-3 (mg)	Vit. B3 (mg)	Bilberry (mg)	Price (€/year)
	Vit. C	Vit. E	Zink	Cu	Lutein	Zeaxanthin				
A-vitamin, Naturdrogeriet										50
AD levertran, Naturdrogeriet							129			70
Aktiv Vital, Nutracare	10%						504			250
Alpha plus öga plus, Alpha plus			80%		200%	38%			700	880
Amdexyn Vision 120 tablett, Pharma Nord	50%	50%	80%	50%	40%				16	120
Argus Blåbærstrakt, Vesterålens Naturprodukter (VNP)			2%	60%		60%				330
Asta Omega+, Novo Vita							2400			550
B Vitamin complex tablets, Bulkpowders								50		40
Basica compact, BioVita			20%	50%						420
Bellavista, Mezina	12%	4%	20%	25%					2000	250
Bilberry with Lutein, Amway						100%				105
Bio Zink, Pharma Nord			60%							50
Bio-Selen+Sink, Pharma Nord	18%		60%							80
Biopharma Blåbær, Biopharma	8%								250	330
Blue, EFI									280	320
Blue berry original, New Nordic									400	230
Blue Berry Plus Øjenvitamin, New Nordic			40%	50%					400	380
Blue Berry™ Øjenvitamin Omega, New Nordic			40%	50%			500		400	390
Blue Eye, Elexir Pharma		4%	50%			250%			150	180
Blueberry vision, Life	8%	2%	20%			250%			200	180
BlåbærKrekling, Bioform									400	210
Blåbærpillen, New Nordic			16%						400	120
Body science omega-3, Body science							3150			380
Bodylab ZMA, Bodylab			80%							80
Cezilu, Amwo farma	10%	10%	32%		10%	10%				30
Cezin pluz, AMWO Farma <sup>2</sup>		25%	28%	80%	25%	25%	25%			50
Chewable Calamari Omega-3, HappyMe		2%					361			150
Complete Multi 50+ tablett 60stk, Weifa	15%	4%	28%	45%						50
Daily Vita min, Scitec nutrition	24%		60%	100%						70
DFI A-Vitamin 1500, DFI										40
DFI B2, DFI										70
EPA-GLA+, Biosym							968			330
Evelle, Pharma Nord	12%	4%	30%							490
Eye D, Zentabox	2%		6%		100%	100%				100
Eye health tablet, Myprotein			6%		100%				60	130
Eye Q Kapslar, New Nordic										140
Eye total, Anjo		3%			120%	100%	260			570
Eyewise, Lamberts					206%	40%			400	460
Fitness Pharma blåbær, Enseyes			40%		100%				50	90
Food Grown – Antioxidant boost, Wild nutrition	1%	9%	10%							440
Food Grown – Daily Multi Nutrient for kvinner, Wild nutrition	6%	2%	20%	25%						350
Food Grown – Daily Multi Nutrient spesielt utviklet for tenåringsgutter – 60 kapsler, Wild Nutrition	6%	2%	28%	13%						280
Food Grown – Immune support, Wild nutrition	8%		40%	10%						310
Forever daily, Orkla care	16%	4%	20%	45%						240
Hair and beauty vitamins, Lykli	12%	13%	20%							420
Eye Q, IQ Medical (New Nordic)			1%							110
Klarin Perfekt, Aktivsyn <sup>3</sup>	16%	4%	40%	50%	80%	80%		16	50	290
Komplet 50+, Vitacare	15%	4%	36%				3740			170
Life Extension – Zinc Kapsler, Life extension *			200%							50
Lifeline care Barn kosttilkudd, Lifeline care							503			150
Livol multi total, Livol	15%	4%	36%	45%						80
Longovital 50 +, Solaray	16%	4%	40%							110

Product, Brand	AREDS2–content with low dose zinc (%)						Omega-3 (mg)	Vit. B3 (mg)	Bilberry (mg)	Price (€/year)
	Vit. C	Vit. E	Zink	Cu	Lutein	Zeaxanthin				
Longovital Kvinde, Biosym	32%	4%	40%							150
Lutein Eyes, Solaray	1%				180%					230
Luteinblå 60 kapslar, Helhethshälsa	32%	7%	56%		300%	55%		200		160
Luzea, Amwo farma					100%	100%				150
Macushield, Alliance Pharma					100%	100%				220
Macushield gold, Alliance Pharma <sup>1</sup>	100%	100%	100%	100%	100%	100%				340
MarinOlive Extra, NaturaMed Pharma		4%					504			220
Maximum Extra, Naturdrogeriet	18%	4%	60%							120
Medox, Medox										540
Mega B2–vitamin, Biosym										130
Mervital Öga, Alpha Plus	20%	13%	40%	25%	200%			5		170
Multi tabs complete, Pfizer	16%	4%								180
Naturens apotek Blåbär, Naturens apotek		4%	128%		40%	50%		200		80
NDS Zn+ Zinc tablet, 90 tab, NDS		1%	60%	50%						90
New Nordic Blåbærpillen, New Nordic			16%					400		120
New Omega, Efi		7%					970			190
Norvital Red Omega, Norvital							552			350
Norvital Smart Omega, Norvital		3%					666			170
Nycoplus B–kompleks, Nycomed										30
Nycoplus geleputer, Nycomed		4%					660			220
Nycoplus høy omega-3 Kaps 1000 mg fiskeolje 120 kapsler, Nycomed							1252			180
Nycoplus Omega 3 basic, Nycomed	18%	11%					866			160
Nycoplus selolje Kaps 162 mg / 200 mg / 20 mg, Nycomed							600			120
Nycoplus Zink, Nycomed			100%							40
Ocuvite complete, Bausch + Lomb	36%	11%	60%		100%	100%	600			350
Omni Zink3, Biosym			80%							20
Omni-B active, Biosym										210
Omnikrill, Biosym							300			110
Omnimin Pure, Biosym	80%	37%	80%	100%						40
OmniVegan, Omnisym / Biosym	80%	19%	80%	25%						130
OmniX, Biosym	80%	19%	72%	20%						110
Ophtamin 20 Lutein + Zink, Deep sea pharma***	16%	4%	60%	50%	100%	100%	318			180
Optimega D, Soflin Pharma							300			310
Optivital, Soflin Pharma <sup>1</sup>	100%	100%	100%	100%	100%	100%				330
Oxyvision, IQ Medical (New nordic)	40%	3%	80%	5%	60%					230
Pharma eskimo 3, Berthelsen							1300			240
Puori (PurePharma) Omega-3 O3, Medivit							2000			220
Pureviva Omega 3, Medivit										50
Retisan, Pharmex <sup>3</sup>	17%	16%	53%	17%	17%	17%				60
Silica extra, Biosym										110
Strix Forte 120 tableter, Ferrosan		4%	60%		60%					200
Synvital, Wellvita							1000			40
Synvital Pluss, Synvital <sup>3</sup>	17%	16%	52%	25%	17%	17%				30
TheraTears nutrition, Amwo Farma							1200			230
Total B–complex, Berthelsen								30		70
Ultimate Omega, Nordic naturals							1280			140
Veg–omega3, Solaray							750			180
Vistavital, Wellvita	16%	4%	40%						2000	110
Vita helse omega 3, Vita helse		3%					600			40
Zink, Naturdrogeriet			80%							20
Zink Citrat, Naturdrogeriet			80%							70
Ögonboost forte, Vidasal		4%	50%		400%	125%				160

Note: 1 – AREDS content and dosage in recommender dose. 2 – AREDS content and dosage in exceeded dose. 3 – AREDS content but not dosage even in exceeded dose.

## Bakenfor blå øyne – Kosttilskudd for øyehelse tilgjengelig på det skandinaviske marked relatert til dagens kunnskap

### Sammendrag

Kosttilskudd rettet mot øyehelse er svært populære, men antall tilgjengelige produkter på markedet gjør det uoversiktlig for klinikere. Som en veiledning for pasienter og klinikere ville det være verdifullt å ha en liste over tilgjengelige produkter og deres innhold. Målet med denne studien var å undersøke kosttilskudd rettet mot øyehelse som er tilgjengelige på det skandinaviske marked og hvordan anbefalt dosering samsvarer med dagens kunnskap.

Ved hjelp av strukturerte internettsøk ble det utarbeidet en liste over kosttilskudd rettet mot øyehelse som er tilgjengelige i Skandinavia, og produktene og deres innhold ble sammenliknet med oppdatert kunnskap og maksimal tillatt dose.

Av 104 produkter tilgjengelige i Skandinavia var det kun to som nådde anbefalingen fra Age-Related Eye Disease Study 2 (AREDS2) ved anbefalt døgndose. I tillegg nådde ett produkt anbefalingen fra AREDS2-studien dersom døgndosen ble økt.

Siden kun to kosttilskudd tilgjengelig på det skandinaviske markedet oppfyller anbefalingen fra AREDS2-studien ved anbefalt døgndose, er det nødvendig at klinikere som tilbyr disse kosttilskuddene har kunnskap ikke bare om innholdet, men også om doseringen. For å unngå ineffektive produkter vil det være nyttig om fremtidige helsepåstander for kosttilskudd er basert på randomiserte, kontrollerte studier.

*Nøkkelord: Kosttilskudd rettet mot øyehelse, AMD, AREDS*

## Dietro gli occhi blu -- Supplementi nutrizionali per gli occhi nel mercato Scandinavo in relazione alle correnti evidenze scientifiche

### Riassunto

I supplementi nutrizionali per la salute oculare sono molto popolari oggi giorno, ma la loro dimensione nel mercato li rende difficili da comprendere per il clinico. Per guidare i pazienti e i clinici nell'argomento potrebbe essere utile avere una lista dei prodotti disponibili e del loro contenuto. Lo scopo di questo studio è quello di ricercare quali siano tutti i supplementi nutrizionali per gli occhi disponibili nel mercato Scandinavo e come il loro utilizzo è relativo alle correnti evidenze scientifiche.

Una lista di tutti i supplementi nutrizionali per la salute oculare disponibile nel mercato Scandinavo è stato compilata attraverso una ricerca strutturata su internet, i prodotti e i loro contenuti sono stati comparati con le correnti evidenze scientifiche e i loro livelli massimi di tollerabilità secondo la legislazione.

Su 104 prodotti presenti nel mercato Scandinavo, solo due prodotti raggiungono la dose raccomandata del "Age-Related Eye Disease 2 (AREDS2)-formula". Un altro prodotto ha raggiunto la stessa formula ma solo nel caso di un sovradosaggio.

Essendo che solo due supplementi nutrizionali per la salute oculare disponibili nel mercato Scandinavo hanno raggiunto la dose raccomandata dallo studio AREDS2, i clinici che offrono tali sostanze devono conoscere non solo la sostanza stessa ma anche le dosi utili. Nel futuro, sarebbe utile avere informazioni su tali prodotti basandosi su studi d'intervento placebo-controllo per evitare l'utilizzo di prodotti ineffettivi.

*Parole chiave: Supplementi nutrizionali per gli occhi, AMD, AREDS*