

# Dietary Antioxidants and the Long-term Incidence of Age-Related Macular Degeneration

## *The Blue Mountains Eye Study*

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**Purpose:** To assess the relationship between baseline dietary and supplement intakes of antioxidants and the long-term risk of incident age-related macular degeneration (AMD). **Design:** Australian population-based cohort study.

**Participants:** Of 3654 baseline (1992–1994) participants initially 49 years of older, 2454 were reexamined after 5 years, 10 years, or both.

**Methods:** Stereoscopic retinal photographs were graded using the Wisconsin Grading System. Data on potential risk factors were collected. Energy-adjusted intakes of  $\beta$ -carotene;  $\alpha$ -carotene;  $\alpha$ -cryptoxanthin; lutein and zeaxanthin; lycopene; vitamins A, C, and E; and iron and zinc were the study factors. Discrete logistic models assessed AMD risk. Risk ratios (RRs) and 95% confidence intervals (CIs) were calculated after adjusting for age, gender, smoking, and other risk factors.

**Results:** For dietary lutein and zeaxanthin, participants in the top tertile of intake had a reduced risk of incident neovascular AMD (RR, 0.35; 95% CI, 0.13–0.92), and those with above median intakes had a reduced risk of indistinct soft or reticular drusen (RR, 0.66; 95% CI, 0.48–0.92). For total zinc intake the RR comparing the top decile intake with the remaining population was 0.56 (95% CI, 0.32–0.97) for any AMD and 0.54 (95% CI, 0.30–0.97) for early AMD. The highest compared with the lowest tertile of total  $\beta$ -carotene intake predicted incident neovascular AMD (RR, 2.68; 95% CI, 1.03–6.96;  $P = 0.029$ , for trend). Similarly,  $\alpha$ -carotene intake from diet alone predicted neovascular

AMD (RR comparing tertile 3 with tertile 1, 2.40; 95% CI, 0.98–5.91;  $P = 0.027$ , for trend). This association was evident in both ever and never smokers. Higher intakes of total vitamin E predicted late AMD (RR compared with the lowest tertile, 2.83; 95% CI, 1.28–6.23; and RR, 2.55; 95% CI, 1.14–5.70 for the middle and highest tertiles, respectively;  $P = 0.22$ , for trend).

**Conclusions:** In this population-based cohort study, higher dietary lutein and zeaxanthin intake reduced the risk of long-term incident AMD. This study confirmed the Age-Related Eye Disease Study finding of protective influences from zinc against AMD. Higher  $\beta$ -carotene intake was associated with an increased risk of AMD.

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