

IMPROVING THE UPTAKE OF LUTEIN USING TRANSGENIC MICE MODELS

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Lutein and Zeaxanthin are macular pigment carotenoids that reduce the risk of age related macular degeneration in humans. They are not synthesized *in vivo* and must be consumed through the diet. The main focus of this project was to study the uptake of lutein by the mice through their diet, and adopt a better delivery method to the mouse retina, which is comparable to the human eye. In wild type mice (WT), there is minimal, or no ocular detectability of the two carotenoids in the retina. Recent studies from our laboratory suggest that this is due to the active carotenoid cleavage enzymes (BCO1 and BCO2) present in these WT mice. The suggested hypothesis is that the limited ocular bioavailability in mice can be eliminated through the process of gene knockout.

WT mice, BCO₁^{-/-} knockout mice, BCO₂^{-/-} knockout mice, and BCO₁^{-/-}/BCO₂^{-/-} double knockout mice are used. The mice were fed on vitamin A deficient diet for two weeks followed by the experimental diet consisting of lutein DSM ActiLease Beadlet chow (1g/kg) (n=25) for four weeks. The mice were anesthetized and the tissues samples were harvested, and the samples were extracted and analyzed using an analytical chemistry technique known as High Performance Liquid Chromatography (HPLC).

Results show that the lutein levels in the serum, liver, and retinal pigment epithelium (RPE) were higher in BCO₁^{-/-}/BCO₂^{-/-} double knockout, followed by BCO₂^{-/-}, BCO₁^{-/-}, and WT mice. WT mice did not have any lutein in the retina while BCO₁^{-/-} (0.15 ng/pair), BCO₂^{-/-} (0.61±0.08ng/pair), and BCO₁^{-/-}/BCO₂^{-/-} mice (0.85±0.3ng/pair) had detectable levels. These results emphasize the importance of using these transgenic mice models. These results emphasize the importance of using transgenic mice when studying the ocular effects of lutein in mouse models. Their lack of carotenoid cleavage enzymes enables successful delivery of macular pigments to the retina.

