Nutrition and the Eye
Nutrition and the Eye

Basic and Clinical Research

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In the last 10 years, there has been growing interest in antioxidants and food supplements. Many diseases of the human body, especially those of the eye, are initiated by oxidative metabolites leading to oxidative tissue damage. One of the most important agents contributing to oxidative damage of eye tissue is the physiological stimulus – light. These effects were studied extensively in the early 1980s. However, successful procedures for lens removal and replacement by intraocular lenses have reduced the enthusiasm for further research. New approaches for the treatment of age-related macular degeneration (AMD) have resulted in an overwhelming increase in the interest to continue with research in the field of AMD and related diseases. This was further enhanced by the finding that the lens can protect the macula by filtering the high-energy portion of the visible spectrum of light. In addition, we have learned that numerous diseases of the retina are mediated by oxidative tissue damage. This damage can be initiated and propagated by light- and/or inflammatory-mediated mechanisms as in AMD or by the result of oxidative metabolites of another origin. The generation of advanced glycation end products and the consecutive propagation of oxidative processes play an important role in the pathogenesis of proliferative diabetic retinopathy. Interestingly, there is an association between the generation of oxidative metabolites and inflammatory reaction and expression of growth factors such as VEGF, with cause and effect being taken into consideration.

In the aging organism, several antioxidative protective mechanisms are reduced in both their function and concentration. Consequentially, the pharmaceutical industry has put an overwhelming amount of food supplements on the market, which is confusing for physician and consumer alike. In addition,
we know that the application of antioxidative agents can lead to a prooxidative or counter-reaction of those substances and disturb the balance of the antioxidative network. Fortunately, basic research findings have enhanced our knowledge of free radical mediated processes. These findings are an important contribution when making recommendations for which of antioxidative substances should be given.

This textbook is divided into two major sections: (1) basic research focusing on the major compounds of nutrition and food supplements, and (2) clinical research providing the latest information on the results of important clinical studies. The first section gives further insight into the mechanisms of action of major substances relevant to antioxidants and food supplements in relation to eye diseases. Recommendations for maximum consumption of the respective substances are given. The consequence and relevance of one of the most important trace elements – selenium – is discussed in a separate section. This is also true for vitamins E and C as well as for lutein and zeaxanthin, the physiological macular pigment. The second section focuses on both anterior and posterior segment diseases which might be influenced by food supplementation and/or antioxidants. The latest relevant studies for daily clinical work are discussed. In addition, the oxidative pathomechanisms of the most important disease processes are explained.

It is therefore hoped that this textbook, intended for clinicians and basic vision scientists, will enhance the interest in oxidative processes in eye diseases and increase research activity, especially in eye diseases leading to blindness such as diabetic retinopathy and AMD.

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