

Histopathological Analysis of UV-B Irradiated Retina by *Cavia Coba*'ya and with Protection of Transmission Light λ 550–600 nm

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ABSTRACT

In 14 experimental *Cavia Coba*'ya eyes were irradiated with UV-B light, lambda 312 nm, 25 J/cm² in 15 minute exposure. Including the transmission of light through optical media: cornea, lens, humor aqueous and vitreous body, and pupil surface of 7 mm², we can calculate that in these conditions retina can be really irradiated with 10 J/cm². The half number of *Cavia Coba*'ya was simultaneously irradiated with visible light, lambda of 550–600 nm (1000 Lx). Control group was 5 *Cavia Coba*'ya. Two months after irradiation, eyes were enucleated and fixed in 4% formaldehyde. Histopathological findings showed alterations of all retinal layers: loss of ganglion cells, axons, reduction of photoreceptors, vacuolar degeneration and hyperplasia of retinal pigment epithelium. In the second group of irradiance, the eyes with visible light lambda 550–600 nm, all retinal alterations were in 50% decreased.

Key words: UV-B light, irradiated retina, histopathological findings

Introduction

Today, the understanding of the influence of visible light^{1–6} on metabolic retinal processes and phototoxicity^{7,8} is quite well. UV light, short and long wave, espe-

cially in chronic exposure, has a drastic effect on the retinal tissue^{9,10}. The aphakic and pseudophakic eyes are at chronic exposure of UV light^{11,12} consequently with the

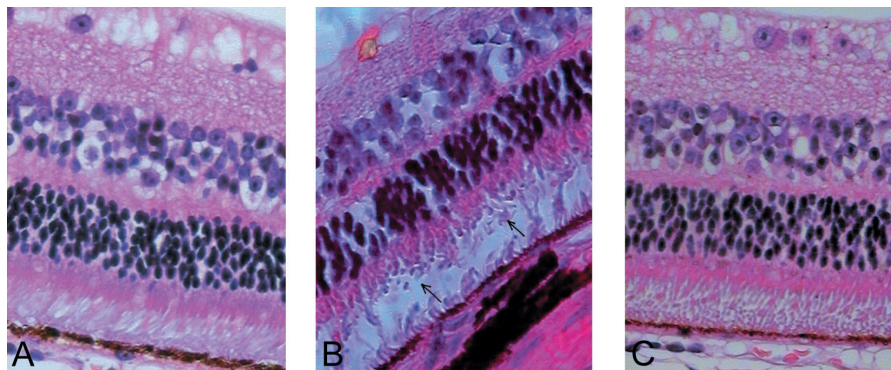


Fig. 1. Histopathological analysis of UV-B irradiated retina by *Cavia Coba*'ya, and with protection of light lambda 550–600 nm transmission (HE, 200x). A – normal finding, B – irradiated UV-B retina, C – irradiated retina with UV-B and protection of visible light lambda 550–600 nm

damage of retinal tissue. Photochemical processes in retina are very complex, especially because of specific effects of one another influenced on the wavelengths and doses of the sunlight. In this reason it is sometimes difficult to explain exactly the nature of light and appearance of the histopathological effect on retinal tissue. The aim of this paper is to explain how the sunlight irradiation is damaging the population on Adriatic islands, because of chronic exposure over harmful limit.

Subjects and Methods

In this study 14 *Cavia Cobia*'ya were treated with UV-B light of lambda 312 nm, energy of 25 J/cm², irradiating the eyes during period of 15 minutes. In calculation of light transmission through optical media of *Cavia Cobia*'ya (pupile surface of 7 mm²), retinal surface of 7 mm², it can be concluded that the retina of *Cavia Cobia*'ya in this experiment was irradiated with 10 J/cm². This represents approximately the irradiated retina of chronically exposed population on the island of Rab (agriculturists and fishermen) during long time of 20 years.

Results and Discussion

The half of number in this experiment, 7 *Cavia Cobia*'ya, was simultaneously irradiated with visible light, lambda of 550–600 nm (1000 Lx). Control group were 5 *Cavia Cobia*'ya. Two months after irradiation, eyes were enucleated and fixed in 4% formaldehyde.

On figure 1 we present the histopathological findings: A represents the normal histology of retina, B shows the

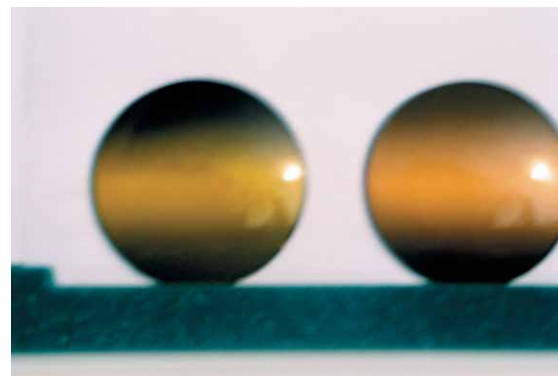


Fig. 2. Filter light protection lenses with lambda 550–600 nm in the middle and mesopic transmission in periphery (patent P20020077A).

atrophy of complete retinal tissue, harm and degeneration of photoreceptors, ganglion cells and destruction of retinal pigment epithelium. As opposed to this, on picture C the histopathological findings were much less harmful.

On figure 2 the special protect lenses with filtration of light lambda 550–600 nm in the middle, and mesopic transmission in periphery are demonstrated. This protection lenses are patented on the basis of this experiment.

Figure 3 shows that during UV irradiation of retina there is also a damage of ganglion cells, and consequently the axons of optical nerve.

In conclusion, we can suggest that chronic exposure to sunlight without protection of eyes can cause very serious harm of retina, leading to vision loss.

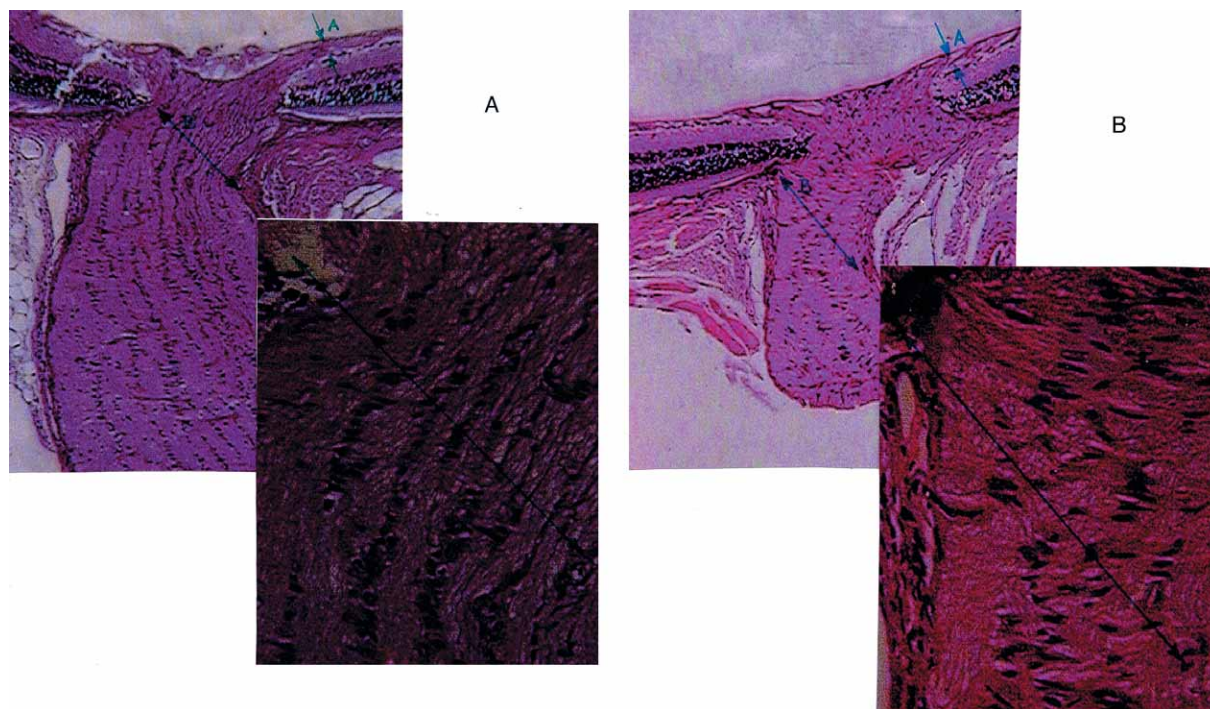


Fig. 3. Histology of the normal (A) and irradiated retina (B) of male Wistar albino rat. (Irradiated energy 30 J/cm²) (HE 200/400x).

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HISTOPATOLOŠKA ANALIZA OZRAČENE RETINE ZAMORČADI SA UV-B, UZ PROTEKCIJU SA SPEKTROM LAMBDA 550–600 nm

SAŽETAK

U 14 zamorčadi ozračene su retine sa 25 J/cm² UV-B, u vremenu od 15 minuta. U polovičnoj skupini istovremeno je retina ozračena s vidljivim dijelom spektra, lambda 550–600 nm, jačine 1000 luxa. Uz kontrolnu skupinu od 5 zamorčadi, životinje su žrtvovane nakon mjesec dana. Patohistološka analiza ozračenih retina pokazuje da je došlo do promjena u svim slojevima retine, tipa vakuolarne degeneracije, smanjenog broja receptora i aksona s ganglijskim stanicama, kao i hiperplazije i destrukcije pigmentnog epitela. U zamorčadi s istovremenim ozračenjem vidljivom svjetlošću od lambda 550–600 nm, došlo je do bitnog smanjenja intenziteta ovih promjena u histološkoj strukturi retine, sl. 1 A, B, C i D. Zaključno, na osnovu ovog eksperimenta, autori su patentirali filter leću s centralnom transmisijom vidljivog spektra lambda 550–600 nm, dok je periferija protektivne leće u mezopskim uvjetima transmisije viših valnih duljina.