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RADIATION EFFECTS ON EYE COMPONENTS

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The radiation damage (X-ray, UV light) of the most important components of the vertebrate eye (crystallins and other proteins, hyaluronic acid, vitreous, aqueous humor, ascorbic acid) has been investigated by various methods of physical chemistry [1]. UV absorption and fluorescence spectroscopy as well as circular dichroism unveiled changes of the chromophores/fluorophores of the constituent biopolymers and low-molecular components, together with alterations of helix content and the occurrence of aggrega-tion. Size-exclusion chromatography, analytical ultracentrifugation, densimetry, viscom-etry and light scattering experiments monitored changes of the global structure of pro-teins and polysaccharides involved. Electrophoreses allowed conclusions on fragmenta-tion, unfolding and crosslinking. Analytical methods provided information regarding the integrity of groups of special concern (SH, SS) and revealed the existence of stable nox-ious species (H_2O_2). By means of various measures and additives, manifold modifica-tions of the impact of both ionizing and nonionizing radiation may be achieved [1-3]. Caused by differences in the primary reactions, eye polymers are protected efficaciously by typical $^{\cdot}OH$ radical scavengers against X-irradiation, whereas compounds which ex-hibit absorption behavior in the UV range turn out to act as potent protectives ("chemi-cal filters") against UV light. A few substances, such as ascorbate, are able to provide protection against both sorts of radiation and are even able to exhibit a slight chemical repair of already damaged particles. The results obtained are of importance for under-standing pathological alterations of the eye (loss of transparency, cataractogenesis) and for developing new strategies for protection and repair of eye components. If compared to other proteins [2], crystallins show an extraordinary stability against different types of noxious effects (presence of chaotropic agents, impact of radiation). Since eye-lens pro-teins exhibit no significant turnover, their high stability as well as their capability to act as chaperones and to suppress aggregation (α-crystallins) are necessary prerequisites to withstand all detrimental structural changes and denaturation during the whole lifespan.

[1] Durchschlag, H., Fochler, C., Abraham, K., Kulawik, B.: *in:* Radiation Research 1895-1995, Vol. 1 (Hagen, U., Jung, H., Streffer, C., Eds.) 10th ICRR Soc., Würzburg (1995) p. 201.
[2] Durchschlag, H., Fochler, C., Feser, B., Hausmann, S., Seroneit, T., Swientek, M., Swoboda, E., Winklmair, A., Wlcek, C., Zipper, P.: Radiat. Phys. Chem. 47 (1996) 501-505.
[3] Fochler, C., Durchschlag, H.: Progr. Colloid Polym. Sci. 107 (1997) 94-101.