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Evaluation of the disinfecting properties of solutions for the care of soft contact lenses

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Contact vision correction is an effective method of correction of refractive error, therefore more than 130 million people in the world use contact lenses. However, there is a complication problem in contact correction (toxic-allergic, infectious), which is caused by insufficient daily cleaning of surface deposits on lenses and their disinfection with the help of disinfectants used for lens washing. Bioluminescent analysis, which is based on quenching the bioluminescent glow of the bacterial enzymatic test system in response to the addition of the solution under analysis, can be used to identify the disinfecting properties of the solutions used for contact lenses care. The purpose of the study is to identify the possibility of using bioluminescence analysis of determining the disinfectant properties of universal solutions used for contact lenses care. Universal solutions for washing contact lenses of Russian and foreign production, including Spain, Great Britain, were studied. The solutions were tested both before use (just after opening the vial) and after use by soaking contact lenses (produced in the UK), which were in use for 14 days, 1 month and 3 months. The bacterial bio enzymatic system NADH:FMN-oxidoreductase + luciferase (Krasnoyarsk, Russia) was used as a test system. The biotest reaction was determined by the amount of inhibiting the bioluminescent test system. It is established that just after opening the vial; the universal solutions for washing contact lenses of Russian production inhibited the bioluminescence glow less than the solutions of foreign production. A high percentage of inhibition of bioluminescence glow indicated the destruction of protein enzymes that were in the test system, which in its turn indicated good disinfecting properties of the solutions. The analysis of the solutions after soaking contact lenses revealed that bioluminescent glow was intensified from the solutions of Russian production, so the contact lenses immersed in them were not cleaned enough. Bioluminescent glow of the solutions of foreign production did not change, i.e. their disinfecting properties preserved. In addition, there is an increase in inhibiting bioluminescence glow with growing wear time. We explain it by accumulation of deposits on contact lenses. Thus, the enzymatic test system applied for testing luminous bacteria can be used as a diagnostic integral indicator of disinfecting properties of universal solutions for contact lenses care and can be a promising direction in clinical ophthalmology for studying the causes of complications in contact correction of vision.

Recent Publications

1. Global Industry Analysts, Contact lenses and solutions: A Global Strategic Business Report, June 2014.
2. Alipour F, Khaheshi S, Soleimanzadeh M, et al. (2017) Contact lens-related complications: a review. *Journal of Ophthalmic and Vision Research* 12(2):193–204.
3. Narayana B L, Rao P, Bhat S, et al. (2018) Comparison of the antimicrobial efficacy of various contact lens solutions to inhibit the growth of *Pseudomonas aeruginosa* and *Staphylococcus aureus*. *International Journal of Microbiology* DOI: 10.1155/2018/5916712.
4. Kratasyuk V and Esimbekova E (2015) Applications of luminous bacteria enzymes in toxicology. *Combinatorial Chemistry & High Throughput Screening* 18(10):952-959.

Biography

Yuliya S. Levchenko, has completed her PhD at the age of 28 years from Krasnoyarsk Medical University. She is an ophthalmologist doctor at Krasnoyarsk clinical ophthalmological hospital named after P.G. Makarov. Selects all kinds of contact lenses, including toric, multifocal and orthokeratological lenses. Author of 20 scientific works on contact correction of vision. Currently she studies safety for the eyes when using contact lenses and solutions for them.