

A Review on Night Enhancement Eyedrops Using Chlorin e6

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Disclaimer

The authors of this paper are writing this review for research and informative purposes only. Increased light amplification may have adverse effects on the cellular structure of the eye if improperly used and the some of the materials used in this mixture should not be used on humans or animals.

Introduction

Chlorin e6 (Ce6) has been used for many years as a therapy agent in cancer treatment^{1,2}. However, in recent years other uses for ce6 have been found, the most notable in this case being its application into the conjunctival sac of the eye as a means of treating night blindness and improving the dim light vision of those with visual disturbances³. This preliminary study attempts to test the ability of a mixture containing Ce6 to improve the dim light vision of healthy adults.

In 2012 a patent was filed based in some part on the work of Washington et al⁴. The patent claims that a mixture can be made which, when applied to the eye, will absorb to the retina and act to increase vision in low light. The mixture put forth in the patent is a simple combination of Ce6 and insulin in saline. It is mentioned in the same, that dimethylsulfoxide (DMSO) can be used in place of the insulin. We propose a combination of the two could lead to the most noted effects. For testing purposes, the mixture from the patent (Ce6, Saline, Insulin) was used with the addition of DMSO for increased permeability.

Material Background

Ce6 is a tetrapyrrole and a chlorophyll analog. As mentioned, it has historically been used as a photosensitizer in laser assisted cancer remediation. The light amplification properties of the Ce6 are used to use the energy from a low power light source to destroy cancerous cells with literal laser precision. The reaction creates oxygen species which induce apoptosis in tumor cells. This lead to the concerns about the mixture, as it would be possible that bright or even ambient daylight's amplified effect in the eye may harm the cells, potentially causing permanent damage.

The function of the insulin is not expressly mentioned in the patent or the journals papers. It has been shown that insulin downregulates the ABCG2 mediated transport pathway⁵. With ABCG2 downregulated, greater absorption is shown for photosensitizers like Ce6⁶. In the case of this solution, the insulin is used to allow absorption of the Ce6 into the chamber of the eye.

DMSO is used in cell preservation and in medication application. Its primary ability, in this scope, is to cause increased permeability of the cellular membrane, allowing for free passage for any chemicals that come into contact with the dosed area. While anecdotal reports of healing abilities or “tasting” lemon juice through ones skin abound on the internet, the high risk of cellular toxicity from outside contaminants being absorbed through the skin make this chemical something that should only be handled with caution.

Procedure

The Ce6 (Frontier Scientific, CAS: 19660-77-6), was found to be a fine black powder which clung to all surfaces. To make manipulating the chemical easier, a large batch of the total solution was made and then aliquoted into separate containers for storage.

200mg of Ce6 was mixed with 400 units (4ml) of insulin (70/30 Lantus). To this was added 5.38ml of sterile saline solution (0.9% sodium chloride). The mixture was sonicated briefly (30 seconds) to allow for proper dispersal of the powder into saturated solution and then 625µl of DMSO (Amresco) was added. The solution was sealed with parafilm and sonicated for 150 seconds. The resulting liquid was thin and black in color. Solution was kept in glass aliquots wrapped in foil at 20°C.

For the application, the subject rested supine and his eyes were flushed with saline to remove any micro-debris or contaminants that might be present. Eyes were pinned open with a small speculum to remove the potential for blinking, which may force excess liquid out before it had a chance to absorb. Ce6 solution was added to the conjunctival sac via micropipette at 3 doses of 50µl into each eye. After each application, pressure was applied to the canthus to stop liquid from moving from the eye to the nasal region. Each dose was allowed to absorb between reloading the pipette, with the black color disappearing after only a few seconds. After application was complete, the speculum was removed and black sclera lenses were placed into each eye to reduce the potential light entering the eye. Black sunglasses were then worn during all but testing, to ensure increased low light conditions and reduce the potential for bright light exposure.

Testing

The Ce6 solution has been shown to work in as little as one hour, with the effects lasting for “many hours” afterwards³. After 2 hours of adjustment, the subject and 4 controls were taken to a darkened area and subjected to testing. Three forms of subjective testing were performed. These consisted of symbol recognition by distance, symbol recognition on varying background colors at a static distance, and the ability to identify moving subjects in a varied background at varied distances. Symbol recognition consisted of placing a collection of objects with markings on them (numbers, letters, shapes). Subjects were then asked to identify the markings, each viewing the objects from the same location at a distance of 10 meters. The markings were not made prior to the moment of testing.

For subject recognition, individuals went moved in a small grove of trees. They were allowed to chose their own location independently. Distances ranged from 25 to 50 meters from observation point and trees and brush were used for “blending”. Locations were chosen

without being observed by the test subjects. The Ce6 subject and controls were handed a laser pointer and asked to identify the location of the people in the grove. After testing the Ce6 subject replaced the sunglasses which were not removed until sleep. Eyesight in the morning seemed to have returned to normal and as of 20 days, there have been no noticeable effects.

The Ce6 subject consistently recognized symbols that did not seem to be visible to the controls. The Ce6 subject identified the distant figures 100% of the time, with the controls showing a 33% identification rate.

Discussion

It is noted that more testing will need to be done on this particular project. Current testing done was subjective in nature. A Ganzfeld stimulator and electroretinograph will be used to measure the actual amount of electrical stimulation increase from the eye, giving a hard quantifiable number to the degree of amplification. It is also possible to test which ranges of vision are being amplified as well. However, given the current results and the previous body of work on the technique, it seems fair to say that this technique is successful in its claims for low light amplification in the human eye. These findings are subjective experiences. Subject experienced no adverse effects following administration. Preliminary testing seems to indicate this increase in dim light vision to be occurring. Further testing is needed to confirm and measure the degree of improvement in healthy subjects.

Being able to access the information put forth in journals and patents is extremely important for future scientists to be able to work with and build from the knowledge that we have currently. Moreover, it is extremely important for clear methods to be available for any researcher who desires to review a scientific paper. The last year (2014) has shown more scientific journal articles rescinded than any year previously. Citizen scientists and "DIY biologists" are under no pressure to reach or hold a position of tenure and often do not have the need to produce for monetary reasons. It is possible that this will allow for less bias in publishing and a more open release of work due to the lack of external motivators. By making information accessible, one can pre-empt "scooping" and instead focus on collaboration. During this research, we feel we were fortunate to be operating from just such a position. The disadvantage however was a decreased availability of access to many of the tools that would allow us to verify our findings quickly and easily. Ce6 administered as described in this paper in the dosages described have so far been without any adverse effects and show great potential to enhance the vision of healthy adults in dim light situations. Further studies should be performed in order to measure the effects of this ce6 solution objectively.

References

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