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Professor Euiheon Chung's research team suggests the possibility of phototherapy for dry eye syndrome caused by corneal nerve damage

- GIST (Gwangju Institute of Science and Technology, President Kiseon Kim) Department of Biomedical Science and Engineering Professor Euiheon Chung's research team presented the possibility of a non-invasive photobiomodulation* effect-based phototherapy method for the growth promotion of damaged trigeminal ganglion cells** and regeneration of the peripheral nervous system using a near-infrared laser.

* photobiomodulation: a non-invasive, non-thermal therapy which stimulates cells to generate more energy and undergo self-repair through the use of near infrared light

** trigeminal ganglion cells: relay sensory information from peripheral tissues in the face, oral cavity, nasal cavity and dura mater to the central nervous system via trigeminal nerves

- As the number of patients undergoing LASIK and LASEK surgery increases, the incidence of dry eye syndrome caused by the side effect of keratotomy is also increasing rapidly. LASIK surgery is a surgery in which the cornea is cut to correct vision. In the recovery process, nerve cells in the cornea may not be regenerate sufficiently, and the probability of developing dry eye syndrome increases due to damage to the peripheral nerves that respond to the external environment.

- The research team induces regeneration of trigeminal ganglion cells, one of the direct causes of dry eye syndrome, through near-infrared laser. The therapeutic effect was studied through an assay for measuring cell activity. To this end, trigeminal ganglion cells were collected from genetically modified mice and cultured for primary cell cultures*. The cultured neurons were irradiated with various continuous and pulsed laser beams.

* primary cell culture: the disassociation of cells from a parental animal or plant tissue through enzymatic or mechanical measures and maintaining the growth of cells in a suitable substrate in glass or plastic containers under controlled environmental conditions

- As a result, the optimal light irradiation conditions were found to regenerate damaged peripheral nerve cells. In this process, morphological information analysis was selected and applied for quantitative analysis regarding nerve cell regeneration.

- Professor Euiheon Chung said, "This research showed the possibility of promoting the growth of the damaged peripheral nervous system using light, and it is expected to be applied in the future to treat of dry eye syndrome caused by corneal resection and chronic pain caused by peripheral nervous system damage."

- This research was led by GIST Professor Euiheon Chung (corresponding author) and conducted Department of Biomedical Science and Engineering master's student Heejoo Cho (first author) with support from the National Research Foundation of Korea and the GIST Research Institute and was published online on July 15, 2020, in the *Journal of Photochemistry and Photobiology B: Biology*.

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