Researchers invent nano-drops that improve nearsightedness and farsightedness

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A revolutionary, cutting-edge technology, developed by researchers at Bar-Ilan University's Institute of Nanotechnology and Advanced Materials (BINA), has the potential to provide a new alternative to eyeglasses, contact lenses, and laser correction for refractive errors.

The technology, known as Nano-Drops, was developed by opthamologist Dr. David Smadja from Shaare Zedek Medical Center, Prof. Zeev Zalevsky from Bar-Ilan's Kofkin Faculty of Engineering, and Prof. Jean-Paul Moshe Lellouche, head of the Department of Chemistry at Bar-Ilan.

Nano-Drops achieve their optical effect and correction by locally modifying the corneal refractive index. The magnitude and nature of the optical correction is adjusted by an optical pattern that is stamped onto the superficial layer of the corneal epithelium with a laser source. The shape of the optical pattern can be adjusted for correction of myopia (nearsightedness), hyperopia (farsightedness) or presbyopia (loss of accommodation ability). The laser stamping takes a few milliseconds and enables the nanoparticles to enhance and 'activate' this optical pattern by locally changing the refractive index and ultimately modifying the trajectory of light passing through the cornea.

The laser stamping source does not relate to the standard laser treatment for visual correction, which ablates corneal tissue. It is, rather, a small laser device that can connect to a smartphone and stamp the optical pattern onto the corneal epithelium by placing numerous adjacent pulses in a very speedy and painless fashion. Tiny corneal spots created by the

laser allow synthetic and biocompatible nanoparticles to enter and locally modify the optical power of the eye at the desired correction.

In the future, this technology may enable patients to correct their vision in the comfort of their own home. To accomplish this, they would open an application on their smartphone to measure their vision, connect the laser source device for stamping the optical pattern at the desired correction, and then apply the Nano-Drops to activate the pattern and provide the desired correction.

Upcoming in-vivo experiments in rabbits will allow the researchers to determine how long the effect of the Nano-Drops will last after the initial application. This promising technology has been shown, through ex-vivo experiments, to correct nearly three diopters of both myopia and presbyopia in pig eyes.

Provided by Bar-Ilan University