An end to the medicine dropper for eye injuries?

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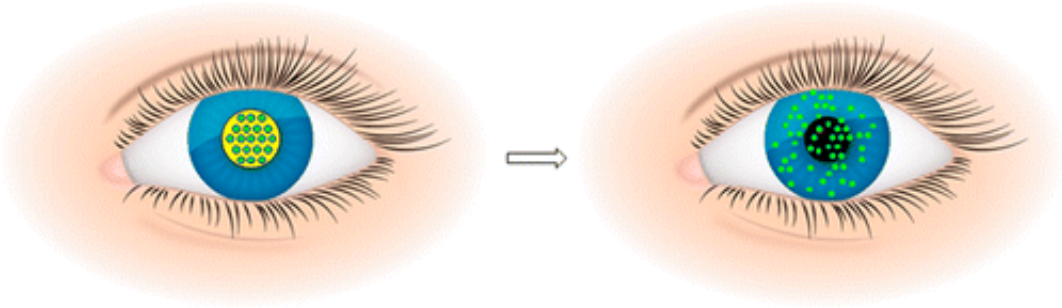

For years, treating scratches and burns to the eyes has usually involved dropping medicine onto the eyes several times a day, sometimes for weeks—a treatment that lends itself to missed doses and other side effects. But scientists are now reporting in the journal *ACS Nano* a novel, drug-releasing wafer that patients can put directly on their affected eyes just once a day. The team says the device works better than drops and could help patients recover faster.

Ghanashyam Acharya, Stephen C. Pflugfelder and colleagues point out that eye injuries are a major cause of blindness worldwide. In the U.S., about 2.5 million people suffer such an injury every year. But typical eye drop therapies are not very efficient. Blinking and tears clear the medicine quickly from the eyes, so patients have to apply drops several times a day. But this frequency boosts the risks for side effects,

including inflammation and blurred vision, and makes it likely that patients will miss doses. Researchers have tried many approaches to address these problems, but none so far have worked well.

In a new approach, Acharya's team developed a clear, round film—which for humans would be about one-tenth the size of a typical contact lens—embedded with tiny pockets that can hold and release medicine slowly over time. The film then dissolves completely. In mice, the wafer was twice as effective as eye drops and didn't cause inflammation that can lead to side effects. The team concludes that the wafer could be used to treat eye injuries and other conditions such as chronic dry eye and glaucoma.

More information: Ocular Drug Delivery Nanowafer with Enhanced Therapeutic Efficacy, *ACS Nano*, Article ASAP, DOI: 10.1021/nn506599f

Abstract
Presently, eye injuries are treated by topical eye drop therapy. Because of the ocular surface barriers, topical eye drops must be applied several times in a day, causing side effects such as glaucoma, cataract, and poor patient compliance. This article presents the development of a nanowafer drug delivery system in which the polymer and the drug work synergistically to elicit an enhanced therapeutic efficacy with negligible adverse immune responses. The nanowafer is a small transparent circular disc that contains arrays of drug-loaded nanoreservoirs. The slow drug release from the nanowafer increases the drug residence time on the ocular surface and its subsequent absorption into the surrounding ocular tissue. At the end of the stipulated period of drug release, the nanowafer will dissolve and fade away. The in vivo efficacy of the axitinib-loaded nanowafer was demonstrated in treating corneal neovascularization (CNV) in a murine ocular burn model. The laser scanning confocal imaging and RT-PCR study revealed that once a day administered

axitinib nanowafer was therapeutically twice as effective, compared to axitinib delivered twice a day by topical eye drop therapy. The axitinib nanowafer is nontoxic and did not affect the wound healing and epithelial recovery of the ocular burn induced corneas. These results confirmed that drug release from the axitinib nanowafer is more effective in inhibiting CNV compared to the topical eye drop treatment even at a lower dosing frequency.

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