Mark Byrne, an assistant professor at Auburn University, is lead investigator behind research at AU that has developed a technology to enable people to receive medication released through their contact lenses.

Research focuses on delivering antibiotics in contact lenses

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One solution for introducing medication into the body in a more efficient manner may be right in front of our eyes — literally.

Auburn University Assistant Professor Mark Byrne and researchers in AU's Department of Chemical Engineering have developed technology that will enable contact lenses to hold concentrated, renewable doses of medication and release them into the body in a timely and controlled fashion.

The result may be a significant improvement over the use of drops and ointments, which make up 90 percent of eye infection treatments, Byrne said.

"Typically, less than 7 percent of the applied drug is absorbed by the eye tissue," Byrne said about ointments and drops. "Because of that poor absorption rate, the drug has to be applied in very high, multiple dosages to be effective."

Byrne's two-plus years of research, development and testing could potentially come as welcome news for more than 34 million Americans who wear contact lenses, according to the American College of Occupational and Environmental Medicine.

The concept of releasing medications from a soft (hydrophilic) contact lens has been researched since the mid-1960s, but Byrne's research is the first of its kind to apply biometric principles, or mimicking certain kinds of proteins to produce hydro-gels.

The research is so unique, Auburn has filed for patent protection on the technology.

Previously, the largest obstacle has been the limited capacity of soft lenses to hold and release medication in an effective and controlled manner — which has prevented any viable product from showing up in the contact lens market.

"The concept of releasing medications for an extended period of time has not been a reality in the past due to the inability to load a therapeutic amount of medication into a contact lens and release it in a controllable way," Byrne said.

A soft contact lens would be classified as a hydro-gel and is comprised of 40 to 70 percent water.

The end product of Byrne's research is a material in which medication can be loaded into the actual film that comprises the contact lens and is capable of continuously delivering that medication for 24 hours or several days depending on how the contact lens is engineered.

SEE TECHNOLOGY, PAGE 5A
TECHNOLOGY: Researchers work to develop medical contact lenses

FROM PAGE 1A

"With this approach, we have been able to load more significant amounts of medications than any other method," Byrne said. "As a result, we can tailor the amount of drug that goes into the material and its delivery rate."

Right now, Byrne and the members of his research team are working with antihistamines being incorporated into contact lenses, which may be of particular benefit to those who suffer from grass-related allergies.

"Right now, the current treatment for eye allergies are eye drops and oral medications," Byrne said. "With eye drops you lose a large percentage of the drug due to the normal protective mechanisms of the eye."

Eye drops medications usually require several treatments to be effective, and because oral medications have to travel throughout the circulatory system there can be a delay in relief of patients' symptoms.

Byrne and his team — comprised of doctoral candidate Siddarth Venkatesh, graduate student Maryam Ali and senior chemical engineering student Parker Sizemore — also are working to incorporate other medications into contact lenses such as antibiotics and anti-inflammatories.

The idea is an excellent one, said Jimmy Bartlett, chair of the University of Alabama at Birmingham's Department of Optometry.

"If you can correct vision and deliver medication to a patient's system, you're effectively killing two birds with one stone," said Bartlett.

Still with all the research Byrne has conducted to more efficiently introduce medicine to one's system via the contact lens, the lenses still carry out their primary function — correct the vision (refractive correction) of the wearer.

"The clarity and strength of the lens are not changed in our process," Byrne said. "We also see people who don't need vision correction benefiting from this as well because they can get the benefits of a controlled release of medications similar to people who only want to change eye color by wearing cosmetic lenses."

With the laboratory study phase complete, the next step for Byrne and the AU Department of Chemical Engineering will be animal studies and clinical trials.

"The results look encouraging," said Byrne.