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## **Professor Inchan Kwon's research team develops a contact lens for the treatment of eye inflammation**

- GIST (President Seung Hyeon Moon) – Professor Inchan Kwon of School of Materials Science and Engineering has succeeded in developing contact lenses for treating conjunctivitis and keratitis.
  - The research team has succeeded in adding functional monomers to soft contact lenses and effectively infused anti-inflammatory drugs into existing contact lenses, opening a new way for the treatment of eye infections such as conjunctivitis and keratitis.
- Drug delivery using contact lenses is safer than direct injection of eye drops and has the advantage of high-efficacy. Therapeutic contact lenses can be made by immersing the lens in a drug solution, but not all drugs are loaded on to the contact lens, and there is a limit for loading a sufficient amount of drugs necessary for treatment on to the contact lens.
  - In addition, drugs applied on to therapeutic contact lenses are very limited because effective loading depends on the type or nature of the drug molecule. Typically, Ofloxacin and Neomycin \* are rarely loaded as antibiotics on common contact lenses, which are

frequently used in the treatment of keratitis and conjunctivitis, and have not been used to study drug delivery through contact lenses. The research team added functional monomers to contact lenses to increase interaction with drugs, and they succeeded in loading 20 times more Ofloxacin and 50 times more Neomycin than possible on conventional contact lenses.

\* Ofloxacin and Neomycin are hydrophilic and have positive charge.

- This is due to the increase of the water content of the contact lens (hydrophilicity) and the electrostatic interaction between the positive charge of the drug and the negative charge of the added functional monomers.
- The research team has developed a new approach to the commercial use of contact lenses by expanding the range of drugs available and increasing the amount of drugs loaded. By adding functional monomers to the contact lens, the researchers succeeded in raising the load to the same level as one dose from an eye drop.
- Soft contact lenses based on poly (2-hydroxyethyl methacrylate) (pHEMA) were used in the study. Methacrylic acid, AA (acrylic acid), and MPA (4-methyl-4-pentenoic acid) were used as the functional co-monomer. A small amount of monomer was added to the contact lens synthesis solution and then heat treatment was performed to synthesize highly efficient therapeutic contact lenses. The size and the transparency of the contact lens to which the functional monomers were added are the same as those of the conventional lens.
- Professor Inchan Kwon said, "The study showed the wide range of potential uses for therapeutic contact lenses by successfully loading drugs that could not be loaded on to conventional contact lenses. In particular, this is expected to be widely applicable to drugs with a positive electric charge to treat a wide range of eye diseases in the future."

- This research, led by Professor Inchan Kwon (corresponding author) of the School of Materials Science and Engineering, was conducted by researchers Da-som Lee (first author) and No-ook Lee (first author), was supported by GIST GRI and published on August 13, 2018, in *Biomaterials Science*, which is the top academic journals in the field of materials.

