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Professor Inchan Kwon's team has developed a long-lasting diabetes treatment by combining albumin

- Diabetes mellitus, one of the most common diseases in Koreans, is a disease in which glucose levels in blood remain high. If blood sugar levels in the body are high, blood sugar management is very important for diabetics as various complications such as retinal disease, kidney disease, and cardiovascular disease can occur.
 - In the body, a hormone called glucagon like peptide-1 (hereinafter referred to as GLP-1) is secreted to regulate blood sugar levels. GLP-1 lowers blood sugar through several mechanisms, such as the brain, liver, stomach, and pancreas, and has a short half-life * of less than 3 minutes, and studies have been conducted to increase the half-life in the body. However, there is a need for improvement in current research because of insufficient increase in the half-life, drug efficacy is significantly reduced, or the yield of the drug production process is low.

* half-life: the time it takes for proteins, drugs, etc. to be reduced by half in the body

- GIST (Gwangju Institute of Science and Technology, President Kiseon Kim) School of Materials Science and Engineering Professor Inchan Kwon's research team combined the albumin, a protein that has a long half-life in the body and is abundant in the blood with GLP-1 in a new way using E. coli, to increase the half-life of GLP-1 (160 times in mice). This is expected to make the most of the half-life

increase effect of albumin compared to existing methods that directly or indirectly use albumin.

- In addition, in order to compensate for the problem of low production yield when making long peptide drugs such as GLP-1 by chemical means, this study confirmed that long peptide drugs can be easily produced with recombinant protein technology using *E. coli*. In particular, conventional recombinant protein * technology makes it difficult to combine albumin in a specific location of peptide medicine, so non-natural amino acid ** with click chemical reactors *** using specially designed *E. coli* can be manufactured in peptide medicine introduced at a specific location of peptide.

* recombinant protein: protein produced from living cells using gene recombinant technology

** non-natural amino acids: amino acids that do not exist in nature

*** click chemical reactor: a reactor that selectively reacts and binds only specific substances

- The researchers confirmed that the effect of GLP-1 and albumin conjugates can be varied by adjusting the binding position of GLP-1 and albumin through cell experiments and glucose tolerance tests in mice.
- Therefore, it is expected that the binding position of albumin will affect the effectiveness of the therapeutic peptide drug, and it is expected to dramatically reduce the time, cost and pain of patients when applied to the manufacture of various therapeutic peptide drugs in the future as it increases the half-life of peptide drugs and enables easier production.

- GIST Professor Inchan Kwon said, "The significance of this study was that it confirmed the possibility of optimizing the drug efficacy by changing the albumin binding position while obtaining a half-life increase effect through the combination of GLP-1 and albumin. In the future, recombinant protein technology using *E. coli* is expected to be widely applied not only in medical research, but also in biocatalyst research to respond to climate change and to solve energy problems."

- This research was led by GIST School of Materials Science and Engineering Professor Inchan Kwon, performed by School of Materials Science masters student Mijeong Bak and Department of Biomedical Science and Engineering Ph.D. student Junyoung Park, supported by the National Research Foundation of Korea (Research Officer Professor Ki-yong Tae) and by the GIST Research Institute, and was published on April 16, 2020, in *Pharmaceutics*, an international journal of pharmacology.