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Professor Jiwon Seo's joint research team suggests the possibility of developing oral drugs through the chameleonic properties of cyclic peptides

- GIST (Gwangju Institute of Science and Technology, President Kiseon Kim) Professor Jiwon Seo's joint research team identified the principle of cell membrane permeability and oral administration of cyclic peptides.

  - The results of this research are expected to solve the problems of low cell membrane permeability and low oral dosing rate, which are disadvantages of peptides, and suggest the possibility of developing new drugs based on cyclic peptides that can be administered orally.

- Peptide drugs have been neglected in the pharmaceutical market due to many shortcomings, but as technologies that can overcome the shortcomings of peptides such as mass production, sequencing, and drug formulation technology have developed, they currently account for about 5% of the global market and are approved as drugs every year. The number of drug approvals is increasing every year.

  - In particular, peptide drugs mimic the active site involved in protein-protein interaction* and have good inhibitory effects as drugs, but there are several

research strategies to overcome the shortcomings of low cell membrane permeability/oral penetration and rapid degradation by peptide-degrading enzymes. Cyclic peptides in which the C-terminus and N-terminus of a heavy peptide are receiving much attention.

* protein-protein interaction: a physical contact between proteins that occurs selectively for signal transmission within a cell

- Cell membrane permeability and oral administration are characteristics that should be improved first in order to use cyclic peptides as drugs, and research is being conducted based on natural cyclic peptides that can penetrate cell membranes. In particular, cyclosporin A*, which is currently used as an immunosuppressant, is a representative cyclic peptide drug for oral administration and is receiving a lot of attention in the field of cell membrane permeation/oral administration.

* cyclosporin A: a natural cyclic peptide with immunosuppressive effect and is a drug used for immune-related diseases such as rheumatoid arthritis and organ transplantation that can be taken orally

- The cyclic peptide discovered by the research team is cyclosporine O, which is a structural analog of cyclosporine A, and the structural conditions for developing a cyclic peptide with a molecular weight of 1000 Daltons (Da) or more as an orally administered drug were identified through a comparative study of the two substances.

- The research team used two-dimensional nuclear magnetic resonance spectroscopy* to confirm that cyclosporine A and cyclosporine O have similar structures under lipophilic conditions similar to the cell membrane environment, but they have different structures under hydrophilic conditions. It was found that the effect on the cell membrane permeability and oral administration of the peptide type peptide.

- This property of changing the structure according to the conditions is similar to the property of chameleons to change color in the surrounding environment, so it is called 'chameleonic.' It is expected to contribute to vitalization of new drug development research.

* two-dimensional nuclear magnetic resonance spectroscopy: This is a spectroscopy equipment used to investigate the structure of biomolecules such as proteins, peptides, and nucleic acids.

□ GIST Department of Chemistry Professor Jiwon Seo said, "An important design principle was presented for the development of new drugs using cyclic peptides, which are important molecular platforms in the development of new polymer drugs. Using this cyclic peptide structure, we plan to continuously conduct research on the development of new drugs for infectious diseases such as antivirals."

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