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## **Professor Youngsoo Jun's joint research team investigates the accuracy of intracellular material transport**

□ GIST (President Kiseon Kim) School of Life Science Professor and Cell Logistics Research Center Director Youngsoo Jun and a joint research team at the University of Dartmouth in the U.S. have identified that "the accuracy of intracellular material transport is determined by a unique combination of three types of proteins."

- This research contradicts the existing theory that "the accuracy of intracellular transport is largely determined by a protein called SNARE \*" and is expected to suggest a new paradigm for future intracellular transport.

\* SNARE: A protein that mediates membrane fusion between vesicles and organelles in cells. It mediates membrane fusion between biological membranes.

□ Intracellular material transport refers to the process of transporting proteins or lipids inside cells for the production and growth of cells or the secretion of hormones and growth factors. Because proteins and lipids are used everywhere in the cell, intracellular transport of proteins and lipids is essential for cell survival. If the intracellular transport of substances does not occur correctly, it may threaten the survival of the cells themselves and may cause various diseases.

- Intracellular material transport is mainly enclosed by vesicles \*. The vesicles generated at one intracellular location are precisely moved to a specific

intracellular location via the cytoplasm and membrane-fused biofilm at that location, thereby transporting the substances contained in the vesicles to their final destination.

\* vesicles: membrane structures in cells surrounded by phospholipids that around 50 nanometers in diameter present and transport proteins and lipids from one organelle to another

- However, the mechanism of how vesicles can move precisely to their final destination and even membrane fusion is unknown. However, James Rothman, who won the 2013 Nobel Prize in Physiology, suggested that the SNARE hypothesis would serve as an address for the vesicle's final destination.
- In addition to the snare protein, there are several proteins such as SM protein, NSF, and a-SNAP in the protein mediating membrane fusion between the vesicle and the biofilm. According to existing theories, the main function of these proteins is known to promote membrane fusion by SNARE proteins.
- This study shows that membrane fusion between vesicles and organelles is highest only when unique combinations of SNARE proteins present in vesicles, SNARE proteins present in organelles, and SM proteins that bind to each snare protein work in a unique combination. Thus, even if a cell has a limited kind of SNARE protein and SM protein, various combinations of these proteins can simultaneously ensure the diversity and accuracy of material transport in cells.
- GIST Professor Youngsoo Jun said, "The biggest achievement of this study is to present a new theory on how intracellular material transport can occur accurately. We expect to present a new paradigm for research to find cures for various diseases caused by defective intracellular material transport."
- This research was conducted by Professor Youngsoo Jun with support from a Cell Logistics Research Center grant funded by the National Research Foundation of Korea and published in the *Proceedings of the National Academy of Sciences* (PNAS, IF= 9.6) on November 4, 2019.

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