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発表題目（※学会発表の場合のみ記載）	Optimizing autophagic activation through functional food pairing: Insights into mTORC1-dependent and independent pathways

発表の概要と成果（抄録を公開している URL がある場合、「概要・成果」を記載した上で、URL を末尾に記してください。また、抄録 PDF は別途ご提出ください。なお、抄録 PDF は Web 上には公開されません。）

Objective: The concept of "functional food pairing," which involves the synergistic enhancement of bio-regulatory effects through the combination of food ingredients, is garnering attention as a novel approach in the field of food functionality research. Nevertheless, it is exceedingly challenging to identify functional combinations among the multitude of functional ingredients that are currently available. The present study focuses on the functionality of autophagy in food. Autophagy is a recycling mechanism for intracellular components that plays an important role in maintaining cellular and organismal health. Furthermore, evidence suggests that the activation of autophagy can extend lifespan while maintaining motor function and higher brain function. If it is possible to effectively activate autophagy through food ingredients, it is expected to have applications in preventive medicine and health promotion. The aim of this study was to identify food combinations that enhance autophagy activity through a functional interaction.

Materials & Methods: The human colon cell line (Caco-2 cells) was cultured in DMEM containing 10% fetal serum and 1% penicillin/streptomycin in an environment inside a 37°C CO_2 incubator. The food samples were combined with the culture medium and introduced to the cells. A toxicity test was conducted using WST-8, which measures the activity of dehydrogenase in the cytoplasm. The number of cells was also determined by using a hemocytometer. The autophagic flux activity was evaluated quantitatively by acquiring the fluorescence signals of GFP and RFP using FACS in Caco-2 cells that had been stably transfected with the GFP-LC3-RFP probe.

Results & Discussion: The results of the toxicity tests showed that the activity of dehydrogenase increased in six samples. Furthermore, as cell proliferation was not observed in these samples, it was shown that they had the ability to enhance cell metabolism. Subsequently, an autophagy flux assay was conducted on the samples that showed enhanced metabolic activity. As a result, an increase in autophagy flux was observed in three samples. Furthermore, when the mechanism of action of these substances on autophagy was investigated, one substance was identified as inducing autophagy via the mTORC1 kinase-dependent pathway, and two substances were identified as inducing autophagy via the non-dependent pathway. Subsequently, the effects of combinations of functional ingredients were examined from the perspective of

the mechanism of action on autophagy. It was found that combining ingredients that activate different pathways effectively enhances autophagy activity. These results show that functional food pairing based on the molecular mechanisms of action is a useful approach for effectively improving functionality.