早稲田大学 人間科学学術院 人間科学会 諸費用補助成果報告書（Web 公開用）

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所属・資格（※学生は課程・学年を記載。卒業生・修了生は卒業・修了年月も記載）	人間科学研究科 健康・生命医科学領域 修士 2 年
発表年月 または事業開催年月	2025 年　　12 月
発表学会・大会 または事業名・開催場所	JAACT2025
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発表題目（※学会発表の場合のみ記載）	Intracellular Sensing Mechanisms of a phytochemical in Lysosomes

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。）

Lysosomes are increasingly acknowledged as dynamic "sensing hubs" that coordinate cellular adaptation to environmental changes, extending beyond their traditional role in degradation. This paradigm shift presents unprecedented opportunities to understand how diet-derived bioactive compounds influence cellular homeostasis and lifespan. The lysosomal quality control (LQC) mechanism, despite its dysfunction being a critical homeostasis process that suppresses cellular senescence and age-related diseases, remains largely unexplored in terms of dietary factor sensing. This represents a significant advancement in food science and preventive medicine. This study uncovered a previously unrecognized signaling pathway through which lysosomes sense phytochemicals and initiate adaptive cellular responses. Focusing on 6-(methylsulfinyl) hexyl isothiocyanate (6-MSITC), a bioactive isothiocyanate derived from wasabi, we found that lysosomes serve as the primary sensing site for this food component, initiating lysosome-derived intracellular signaling pathways. Furthermore, the transcriptional regulatory mechanisms activated by lysosome-derived signals were elucidated. These findings are expected to provide crucial insights into the molecular mechanisms by which food factor signals detected in lysosomes induce transcriptional programs, thereby enhancing cellular resilience and quality control.