RIKEN BDR

Women and Future in Science Seminar

Evolution of the T1R receptors in vertebrates

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Unraveling Stem Cell Heterogeneity in Skin Inflammation and Aging

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13:00-14:00 JST

← via Zoom Register here

https://riken-jp.zoom.us/meeting/register/tJwrduygrz0vEt2npkzYlEg3_k93h8MfjvtR

Evolution of the T1R receptors in vertebrates

Taste is a vital sense used to discriminate between nutrient-rich and toxic food items. In vertebrates, umami and sweet tastes are sensed by G protein-coupled receptors termed T1Rs. Umami taste is sensed by a heteromeric complex of T1R1 and T1R3, while sweet taste is sensed by the T1R2/T1R3 heterodimer. Retention of T1R receptors over timescales is shaped by feeding ecology. Birds, which evolved from presumably carnivorous theropod dinosaurs, have lost T1R2. However, nectarivorous birds, such as hummingbirds, have subsequently acquired the ability to detect sugars by changing the function of their T1R1/T1R3. Insectivorous mammalian ancestors likely had a nucleotide-sensitive umami taste receptor, while the multiple lineages of primates, including ancestors of humans, have evolved T1R1/T1R3 for detecting glutamate of their leafy diets. Recently, we identified additional members of T1Rs by analyzing the genome and transcriptome data of a broad range of jawed vertebrates. Our data suggest that T1R genes can be classified into eleven members. The diversity of the palatable taste sensations might have enabled vertebrates to adapt to diverse diets on Earth.

Unraveling Stem Cell Heterogeneity in Skin Inflammation and Aging

Tissue stem cells divide infrequently to minimize the risk of replication stress and DNA damage; however, it remains unclear whether the "slow cycling" nature of stem cells protects them and delays aging. Using a model with slow- and fast-cycling stem cell populations identified in mouse skin, we have shown that during aging, the number of fast-cycling clones gradually decreases, and the unique lineage identities of distinct stem cell populations are impaired. We found that the extracellular matrix (ECM), fibulin-7, is a microenvironment that maintains epidermal stem cell heterogeneity, thereby protecting the skin from the detrimental effects of aging and preserving tissue resilience over time. Fibulin-7 interacts with structural ECM and matricellular proteins, and induction of fibulin-7 results in slower proliferation in the absence or presence of inflammatory cytokines. These results provide new insights into age- and inflammation-induced impairment in the epidermal stem cell identity and suggest that signal crosstalk maintains the balance of heterogeneous stem cell populations. Our work opens a new avenue for understanding stem cell dynamics through all life stages, from development to aging, with implications for applications in regenerative therapy and future treatments of age-related disorders, including cancer.

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