

Expressions of Umami Taste Receptors in the Chicken Taste Buds and Behavioral Responses to Umami Taste in Chickens

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<https://hdl.handle.net/2324/4060218>

出版情報：九州大学, 2019, 博士（農学）, 課程博士
バージョン：
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論文題名 : Expressions of Umami Taste Receptors in the Chicken Taste Buds and Behavioral Responses to Umami Taste in Chickens
(ニワトリの味蕾におけるうま味受容体の発現とうま味に対する行動応答)

区 分 : 「甲」

論 文 内 容 の 要 旨

Elucidation of taste sensing systems of chickens will be an important step to improve feeding strategy and develop new feedstuffs. Among the five basic tastes, umami taste is elicited by l-amino acids and 5'-ribonucleotides in foods, and it is speculated that umami taste is important for the palatability of feeds and nutrient detection in chickens. However, it has not been well understood whether chickens have umami taste perception and expression of umami taste receptors in the taste tissues. Here, molecular biological, histological, and behavioral studies were conducted to clarify the molecular and histological basis for umami taste sensing systems in the taste tissues of chickens, and behavioral preference and sensitivity to umami taste in chickens.

The RT-PCR and qRT-PCR analyses demonstrated the expression of multiple umami taste receptors in the oral and gastrointestinal tissues of chickens, and the abundant expression levels of umami taste receptors (*mGluR1*, *T1R1*, and *T1R3*) and downstream signaling molecules (*TRPM5*, *CALHM1*, and *CALHM3*) in the taste tissues of chickens. The IHC analyses revealed that bitter taste receptor T2R7, umami taste receptor subunits T1R1 and T1R3 were expressed specifically in the taste buds of chickens. These results strongly suggested that molecular basis of bitter and umami sensing systems and downstream signaling systems were present in the taste tissues of chickens.

The two-feed choice test demonstrated that chicken have preference for umami taste in feed. However, it should be noted that the long-term behavioral test can be affected by the post-ingestive effects. To minimize the post-ingestive effects, the brief-access tests were performed, and chickens showed behavioral responses to umami taste stimuli including MSG + IMP and chicken T1R1/T1R3 agonists (L-Ala and L-Ser). These results suggested that chickens could respond to umami taste stimuli without the post-ingestive effects. To further examine whether chickens sense umami taste as taste perception, the CTA test was performed, and chickens conditioned to avoid umami taste solution avoided umami taste solution. This result clearly suggested

that chicken could sense umami taste using orosensory perception.

Taken together, the present study demonstrated expression of multiple umami taste receptors and downstream signaling molecules in the taste tissues of chickens, and behavioral preference, sensitivity, and learning ability to umami taste in chickens. These results suggest that chickens have molecular mechanism to sense and transduce umami taste in their taste buds and the possibility that umami taste is important for the palatability of feeds and their nutrient sensing.