

【Grant-in-Aid for Scientific Research(S)】

Biological Sciences (Biology)



Title of Project : Identification of natural ligands for olfactory receptors and elucidation of biological function

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Research Area : Biological sciences

Keyword : olfaction, odorant, receptor, ligand, biological active substance

【Purpose and Background of the Research】

In mammals, detection of numerous volatile signals in the external world is mediated by several hundred odorant receptors (ORs) expressed in olfactory sensory neurons. In the past several years, ~10% of ORs have been paired with cognate odorants by screening compounds that are commercially available or can be obtained from fragrance companies. However, the ligands for ORs in a natural environment are distinct from odorants available in a laboratory, but are odorants derived from food or enemy, or from urine, feces, or various secretions of other individuals or species. In addition, ORs are also expressed in non-olfactory tissues such as testis, muscle, developing heart, brain, and spleen, and presumably these ORs are sensing small metabolic compounds for specific biological functions. Thus, natural ligands received by ORs expressed in a nose or in non-olfactory tissues are largely unknown. In this study, we will develop an OR assay with no background that could be utilized to purify endogenous natural ligands for ORs. We will identify natural ligands for mouse ORs that are secreted from various exocrine gland extracts. We will also identify endogenous natural ligands for ORs expressed in various non-olfactory tissues.

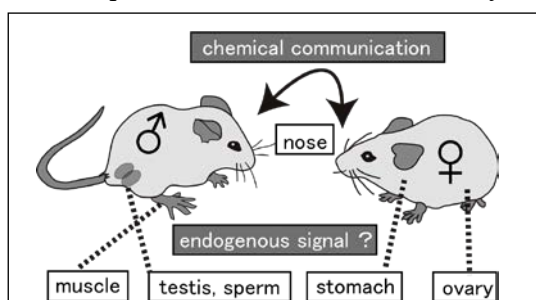


Fig. 1 Overview

【Research Methods】

We first develop a highly efficient OR assay with no background that could be utilized for crude extract samples. By OR assay-guided fractionation and chemical analysis, we will identify natural ligands for mouse ORs from various exocrine gland

extracts. Using the same assay method, we will also identify endogenous natural ligands for ORs expressed in various non-olfactory tissues.

【Expected Research Achievements and Scientific Significance】

Identification of natural ligands for ORs will lead to understanding of socio-sexual behavior in mice. Biological function of a natural ligand as a chemosignal may be useful upon considering regulation of mouse reproduction. Functional analysis of ORs in non-chemosensory tissues will provide a new target of drug development. This study will give a high impact in the fields of environmental sciences, pharmacology, and behavioral and brain research.

【Publications Relevant to the Project】

- Touhara K. & Vosshall, L.B. Sensing odorants and pheromones with chemosensory receptors. *Annu. Rev. Physiol.* 7, 317-332 (2009)
- Haga S, Hattori T, (7 authors) & Touhara K. The male mouse pheromone ESP1 enhances female sexual receptive behavior through a specific vomeronasal receptor. *Nature* 466, 118-122 (2010)

【Term of Project】 FY2012-2016

【Budget Allocation】 165,100 Thousand Yen

【Homepage Address and Other Contact Information】

<http://park.itc.u-tokyo.ac.jp/biological-chemistry/>