

Screening of Olfactory Receptor-Derived Peptides for Detecting Odors

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The development of ultra-sensitive volatile organic compounds sensing technology is expected to have a wide range of applications, including environmental monitoring, hazardous materials detection and quarantine, manufacturing flow and quality control, and health and disease monitoring. While existing large-scale analytical instruments such as gas chromatography offer high detection accuracy, but they have some issues in operational complexity, and the ability to perform real-time and on-site detection. Consequently, the development of compact sensors has been pursued extensively and vigorously. Focusing on the odorant-recognition capabilities of olfactory receptors, we conducted a systematic screening to determine whether amino acid sequences of olfactory receptor could serve as a source for short synthetic peptides (1,2). In this study, the design of short peptides capable of binding to trans-2-hexenyl acetate, a compound with green apple-like aroma, was investigated. Specifically, we utilized a spot synthesis method to create a library of short peptides covering the amino acid sequence of the *Drosophila* OR67b receptor; the peptides were designed with a length of 12 residues, with sequences overlapping by 6 residues. The candidate peptides were identified in the binding assay with trans-2-hexenyl acetate using the gas chromatography-mass spectrometry measurement. After introducing the cysteine with thiol with the GGG-linker, the peptide was immobilized on a gold QCM sensor, and sensing was performed by measuring frequency changes. Further improvement is necessary for investigation of peptide immobilization techniques and measurement conditions.

References

1. T. Rungreunthanapol, C. Homma, K. Akagi, M. Tanaka, J. Kikuchi, H. Tomizawa, Y. Sugizaki, A. Isobayashi, Y. Hayamizu, M. Okochi. (2023) Volatile organic compound detection by graphene field-effect transistors functionalized with fly olfactory receptor mimetic peptides. *Anal. Chem.* 95, 4556-4563.
2. K. Saruwatari, T. Rungreunthanapol, S. Saito, M. Tanaka, Y. Hayamizu, M. Okochi. (2026) Detection of skatole using a phage display-derived peptide-modified graphene FET. *Talanta*, 306, 129734.