Development of a far-red luminescence imaging technology

Imaging technology of a cancer cell based on chemical reactions in *Cypridina* bioluminescence

We have developed a far-red luminescence imaging technology for visualization of disease specific antigens on cell surfaces in a living body. First, we conjugated a far-red fluorescent dye to biotinylated *Cypridina* (sea-firefly *Umihotaru*) luciferase. This conjugate produced a bimodal spectrum that has long-wavelength bioluminescence emission in the far-red region as a result of bioluminescence resonance energy transfer. To generate a far-red luminescent probe with targeting and imaging capabilities of tumors, we then linked this conjugate to an anti-human Dlk-1 monoclonal antibody. This far-red luminescent probe enabled us to obtain high-resolution microscopic images of live, Dlk-1-expressing Huh-7 cells without an external light source, and to monitor the accumulation of this probe in tumor-bearing mice. Thus this far-red luminescent probe is a convenient analytical tool for the evaluations of monoclonal antibody localization in a living body.

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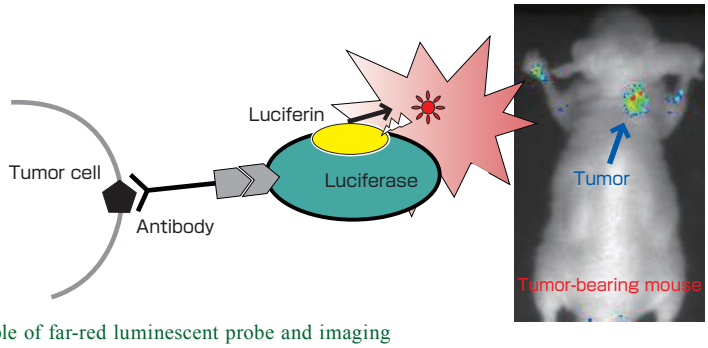

Principle of far-red luminescent probe and imaging of the location of tumor tissues in living mice

Development of an objective examination for olfactory malfunction

Possibility of early identification of Parkinson's disease and Alzheimer's disease

Currently, clinical examination of olfaction is not so familiar as vision, audition or tactile sensation, because of its difficulties in stimulus presentation. Objective diagnoses for diseases are also well developed in vision, audition and touch sensation. For olfaction, however, the situation is still poor. On the other hand, recent studies reveal that hyposmia is frequently observed in early stages of Alzheimer's disease or Parkinson's disease.

AIST has developed objective and subjective diagnostic methods for olfaction. We utilized olfactory event related magnetic fields of the brain for objective olfactory diagnosis. Five healthy participants and four anosmia patients were diagnosed using T & T olfactometry and intravenous olfactometry. We presented β-phenylethylalcohol in forty trials, with 400 milli seconds stimulus period, and inter-stimulus interval was thirty seconds. And we discovered clear change in the magnetic field of the healthy participants but not with the patients. This diagnosis method will be useful for the clarification of the mechanism for olfactory loss and degenerative neurologic disease.

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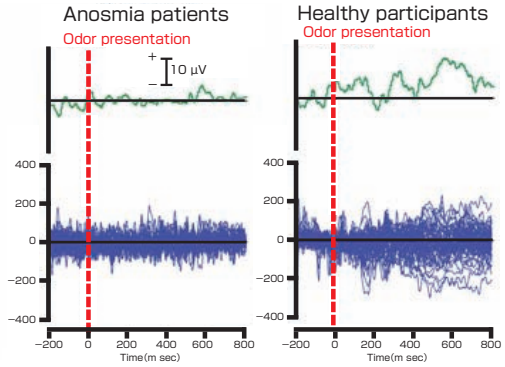

Measurement results
Electroencephalogram (EEG) (upper left) and magnetoencephalogram (MEG) (lower left) signals of anosmia, EEG (upper right) and MEG (lower right) signals of healthy participants