

【Grant-in-Aid for Transformative Research Areas (B)】

Section III



Title of Project : Neural representation of "Death"

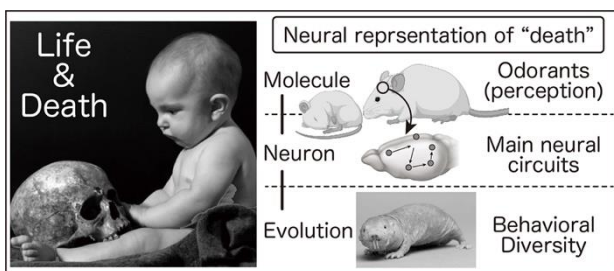
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Number of Research Area : 21B305 Researcher Number : 80625955

【Purpose of the Research Project】

We, humans, recognize the "death of others" and perform rituals such as burial for the dead. Numerous animal studies have shown that animals, from primates such as gorillas and chimpanzees to insects, exhibit a variety of species-specific behaviors toward the death of conspecific individuals. Basically, a dead body symbolizes danger to the animals and elicits strong negative emotions and behaviors such as flight, alarm, and avoidance. Therefore, the perception of death is an extremely essential brain function for wild animals and directly relates to their own survival. Nevertheless, its central neural mechanisms have remained largely unexplored.

How do we represent the death of others in our brains? How do our sensory systems perceive the death of others, and how is the sensory information conveyed to the main neural circuits for recognizing the death of others? For animals, including us humans, is a dead body a form of "others (i.e., another conspecific)" or just "objects"? Are the neural mechanisms underlying death recognition evolutionarily conserved among species? The ultimate goal of our research for the neural recognition of the death of "others" is to tackle the neuroscientific question: "How can we detect other conspecifics in the world?"



【Content of the Research Project】

In order to understand the perception and representation of the death of "others" in our brain from multiple perspectives including molecular neuroscience, structural biology, behavioral neuroscience and neurophysiology, we outline several research areas:

1. Analysis of the central neural mechanisms underlying the recognition of death for "others". (Teruhiro Okuyama Group, University of Tokyo)
2. Elucidating olfactory mechanisms recognizing the smell of death. (Haruki Takeuchi Group, The University of Tokyo)

3. The development of molecular sensors deciphering the signal cross-talk of OXT-AVP system. (Hideaki Kato Group, The University of Tokyo)
4. Exploring the evolutionary origin of social behavior toward "death" in the eusocial rodent, the naked mole-rat. (Kyoko Miura Group, Kumamoto University)

【Expected Research Achievements and Scientific Significance】

Life and death are contradictory concepts, and our research, which clarifies the perception of death, will also reveal the neural function of the perception of life. In recent years, behavioral neuroscience has vigorously elucidated the neural circuits for various social behaviors such as aggression, mating, and social interaction. Importantly, each behavior is accompanied by the recognition of an appropriate target, as in the case of mating behavior, which must be shown toward individuals of the opposite sex of the conspecifics. Is it an organism or an object? Conspecifics or not? Male or female? We expect that the clarification of the recognition of death and life and its representation mechanism in the brain will lead to the understanding of the initial process of recognizing others, essential for any type of social behavior.

Furthermore, the understanding of the above neural mechanisms will also support the knowledge of autism spectrum disorders (ASD). ASD is a developmental disorder that shows impairments in social communication, as well as in the ability to recognize "social object". Generally, we can easily imagine an organism from the appearance of a stick figure walking, while autistic patients have difficulties in the ability. Our research will contribute to the understanding of the neural basis of autism pathology from unique perspectives.

【Key Words】

Animacy perception, Olfactory receptors (ORs), Oxytocin receptor (OxtR), GPCR, Naked mole-rat, Social behavior, Behavioral tracking, Molecular neuroscience, Structural biology, Behavioral neuroscience, Neurophysiology

【Term of Project】 FY2021-2023

【Budget Allocation】 105,000 Thousand Yen

【Homepage Address and Other Contact Information】

Twitter account: @Rep_Death