

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

Integrated Disciplines (Complex Systems)



Title of Project : Neuroendocrinology of Social Behavior

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Research Project Number : 15H05724 Researcher Number : 50396610

Research Area : Neuroscience, Behavioral Neuroendocrinology

Keyword : Social Behavior, Steroid Hormone Receptors, Optogenetics, Sexual Differentiation, Individual Differences, Neural Network

【Purpose and Background of the Research】

It is essential for human beings to establish and maintain emotional bonding with other people. However, it has become more and more difficult to form and maintain stable social relationships in a highly industrialized/computerized world. This has brought about a number of negative traits, such as neglect, child abuse, impulsive violence, etc. The main goal of our research is to understand the neurobiological basis of social and affective behaviors. Since gonadal steroids play a central role in the regulation of sex-typical social behaviors throughout life, we will study brain mechanisms of their time-, sex-, and brain site-specific action. We aim to understand: (1) how hormones act on the development of neural network for social behavior; (2) how they regulate adaptive expression of behavior; and (3) how they determine sex and individual differences.

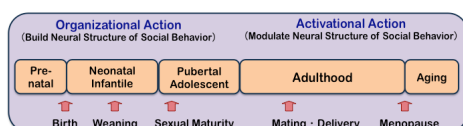


Fig. 1 Life-Long Action of Steroid Hormones on the Regulation of Social Behavior

【Research Methods】

We will focus on organizational and activational action of gonadal steroid hormones to determine the role of the two types of estrogen receptors, ER α and ER β , and their mechanisms of action. Using several different approaches, we will determine critical site, time and mechanisms of steroid action for the sex-typical (both male and female) regulation of sexual, aggressive, and parental behavior as well as social recognition, preference, and anxiety, in mice. Particularly, we will use siRNA-mediated knockdown of ERs, optogenetic manipulation on neural network of social behavior, and neuroanatomical and physiological assays. We will also analyze

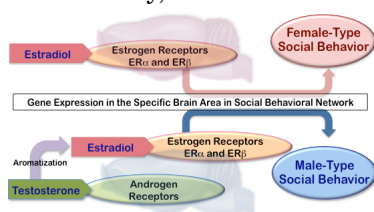


Fig. 2 Neuroendocrine Basis of Sex-Typical Social Behavior

ER-related genetic polymorphisms to identify determinants of individual differences in social behaviors.

【Expected Research Achievements and Scientific Significance】

Our goal will be to establish “a comprehensive brain map of hormonal action for the regulation of social behaviors” by collaborative interactions with neuroscientists with various expertise. These studies will advance our knowledge of how social-behavioral networks are regulated by gonadal steroids via ER α and ER β for sex-typical behavioral expression. The outcome of the studies is expected to provide scientific insights of the nature and causes of disruption of human social and affective behaviors, and determine a possible neuroendocrine basis of sex- and individual-differences. Ultimately the findings should contribute greatly to human well-being.

【Publications Relevant to the Project】

- Tsuda MC, ...Ogawa S. Modification of female and male social behaviors in estrogen receptor β knockout mice by neonatal maternal separation. *Front Neurosci*, **8**, 274, 2014.
- Sano K, ...Ogawa S. Differential effects of site-specific knockdown of estrogen receptor α in the medial amygdala, medial preoptic area, and ventromedial nucleus of the hypothalamus on the sexual and aggressive behavior of male mice. *E J Neurosci*, **37**, 1308-1319, 2013.
- Musatov S, ...Ogawa S. Knockdown of estrogen receptor α using viral-mediated RNA interference abolishes female sexual behavior. *PNAS, U.S.A.*, **103**, 10456-10460, 2006.

【Term of Project】 FY2015-2019

【Budget Allocation】 151,300 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.kansei.tsukuba.ac.jp/~ogawalab/?lang=en>