Development of new fluorescent probes for imaging of prosocial signaling in the brain

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Most species in animal kingdom live in the social groups. To form social groups, one has to recognize and learn the characters of the colleagues. Furthermore, to make the bond within the social groups stronger, one has to make good communications with the others. Accumulating evidences suggested that "prosocial" signaling in brain is likely to be involved in such social activities. Oxytocin and vasopressin, neuropeptides mainly generated in hypothalamus, have emerged as key molecules in prosocial signaling. However, how oxytocin and vasopressin work in the brain during the prosocial activities remains elusive, due to the lack of the method that allows the real-time monitoring of oxytocin and vasopressin in behaving animals. Because defects in prosocial activity is likely to underlie the social isolation in human, understanding how prosocial activities are processed in the brain may lead to the development of the therapeutics for the patients. In this context, there is a pressing need for the technologies that allow the measurement of the dynamics of oxytocin and vasopressin in brain. Therefore, I aimed to develop fluorescent sensors for oxytocin and vasopressin. I engineered and screened more than a hundred of mutant fluorescent sensors, and obtained a potential oxytocin sensor and a potential vasopressin sensor, which shows a large response in the fluorescence intensity upon stimulation with the ligands. In this poster, I will present the characterizations of these new probes and discuss their potential applications.