Kappa opioid receptors integrate neuronal signaling involved in social behavior

Beneficial social interactions are an essential part of life. Many forms of social contact are rewarding, and are part of normal adaptive behavior. While multiple neuronal mechanisms are involved in social behaviors, the rewarding aspects converge, probably unsurprisingly, on the reward system of the brain. Three neuronal pathways have been particularly implicated in signaling rewarding social contact: the oxytocin producing neurons of the hypothalamus, dopamine neuros of the ventral midbrain, and serotonin neurons of the raphe. Interestingly, recent evidence shows that all these signals may converge in one area – the nucleus accumbens of the basal ganglia in the brain. Based on our data and analysis of the available literature, we hypothesize that three types of signals are integrated and jointly controlled by kappa opioid receptors, and their ligand – dynorphin – released from nucleus accumbens neurons.

To test this hypothesis we plan to observe social behaviors in mice with selective inactivation of kappa opioid receptors in oxytocin, serotonin or dopamine neurons. We expect, that in one or more cases the mutation should enhance social behavior. Moreover, we will also test the effects of inactivating kappa opioid receptors in neurons projecting into the nucleus accumbens, to prove that it is indeed the relevant area for the control social behaviors. In parallel, we will also test behavior in animals, which do not synthesize dynorphins (that activate kappa opioid receptors). In dynorphin-deficient animals rewarding effects of social contact should also be enhanced.

If our hypothesis is proven correct, it will reveal a novel mechanism integrating all the signals important for social reward. It is important to note, that drugs acting on kappa opioid receptors are used clinically, and thus in the future it could be considered, whether they could be of benefit in treating pathologies associated with social impairments.