

OR342*Regulation of brain dopamine by nutrition in female honeybees***Ken Sasaki**, Syuhei Matsuyama, Takashi Nagao

Dopamine plays an important role in promotion of the reproduction in primitively and highly eusocial hymenopterans. In female honeybees, the brain levels of dopamine and dopamine-related substances are higher in queens and reproductive workers than in normal workers. However, the mechanisms underlying regulation of dopamine in the brain are still largely unknown. We firstly tested the possibility of different enzymatic activities for dopamine synthesis in the brains between castes. The *in vitro* enzymatic activities of DOPA decarboxylase (DDC) in brains were not significantly different between castes. The DDC activity in queens was mainly found in the brain, but with lower levels of activity detected in the mandibular glands, salivary glands and ovaries. Gene expression of DDC (*Amddc*) and tyrosine hydroxylase (*Amth*) in the brains were not different between castes. We then considered the possibility of different supply of tyrosine that is a precursor of dopamine and is contained in food of honeybees, and tested the hypothesis by the oral treatments of tyrosine and royal jelly. Oral application of tyrosine and royal jelly to queenless workers led to significantly higher levels of dopamine and dopamine-related substances in the brains than in control workers. The queenless workers fed tyrosine have more developed ovaries than control workers fed sucrose. These results suggest that the higher levels of brain dopamine in the reproductive individuals compared with normal workers can be explained by the tyrosine supply from royal jelly. Such a nutritional supply could drive not only the dopamine signaling, but also other signaling systems to promote the reproduction in females in honeybees.