

OR261*Collective nutritional wisdom: from slime moulds to ant colonies***Audrey Dussutour**

A fundamental question in nutritional biology is how distributed systems maintain an optimal supply of multiple nutrients essential for life and reproduction. We address this question using two systems: highly organised societies of ants and a syncytial slime mould (*Physarum polycephalum*). In the case of animals, the nutritional requirements of the cells within the body are coordinated by the brain in neural and chemical dialogue with sensory systems and peripheral organs. Being a social insect adds a first level of complexity to nutritional regulatory strategies. Contrary to other animals, the food entering a social insect colony is assessed and collected by only a small number of workers. These foragers need to adjust their harvesting strategy to the internal demands for nutrients within the nest, where larvae and workers have different needs. So how do foragers reactions to food encountered outside the nest relate to the nutritional demands of the nest as a whole and themselves as individuals? Here, we show that foraging ants can solve nutritional challenges for the colony by making intricate adjustments to their feeding behaviour and nutrient processing, acting both as a collective mouth and gut. Being a slime mould adds a second level of complexity to nutritional strategies. In social insect and other animals, nutritional regulatory strategies involve components specialised to deal with nutrient supply and demand (brains and peripheral organs, foragers and brood). However, slime moulds are acellular organism thus without specialised centres: how do these organisms coordinate the search for multiple nutrients? Here we show how this extraordinary organism demonstrates the capacity to make complex nutritional decisions, despite lacking a coordination centre and comprising only a single vast multinucleate cell.