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SÉMINAIRE

The role of the host microbiome in Daphnia-food stress interactions

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In aquatic ecosystems, food stress (more in particular cyanoHABS, cyanobacterial harmful blooms) has a strong negative impact on zooplankton grazers, and through the food web, disrupt the whole freshwater community. Deciphering the mechanisms underlying resistance to cyanoHABS in these grazers is thus essential to predict how cyanoHABs can be prevented or controlled. In the freshwater crustacean Daphnia, resistance is influenced by prior exposure to cyanobacteria and genotype, but the underlying mechanisms remain unclear. Through gut microbiota transplants, we here show that the gut microbiota plays a crucial role, and might mediate both genetic adaptation and acclimatization to cyanoHABs. Microbiota from resistant genotypes conferred a higher resistance to recipient Daphnia than microbiota from susceptible genotypes. Resistance to cyanobacteria in recipient Daphnia was not affected by the recipient genotype, but was strongly impacted by the donor genotype. This suggests that the Daphnia genotype acts indirectly on resistance to cyanobacteria, by shaping the gut microbiota. In addition, resistance was higher when donors were previously fed cyanobacteria, suggesting that gut microbiota responded to become more efficient in dealing with cyanobacteria after prior exposure. Next generation sequencing of 16S rDNA shows that resistance is associated with changes in microbiota structure. Our results provide evidence that resistance to toxic cyanobacteria in Daphnia is driven by the gut microbiota, which might thus be an important mediator of the genetic mosaic of coevolution between toxic cyanobacteria and their grazers, and a key determinant of how freshwater ecosystems respond to climate warming.