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DNA methylation reprogramming during development in the self-fertilizing mangrove rivulus, Kryptolebias marmoratus, and its environmental sensitivity.

Kryptolebias marmoratus is native from the mangrove of the Gulf of Mexico. It presents great adaptive capacities and is characterized by a high level of phenotypic plasticity. In natural populations, hermaphrodites coexist with a low proportion of males (androdioecy) and it displays the unique ability for a vertebrate of self-fertilization. As a new biological model, mechanisms controlling the key transitions during its life history remain largely unknown. Among them, DNA methylation has important regulatory functions controlling gene expression, and thus the phenotype. Here, we explored the dynamic of global DNA methylation by LUMA assays. Significant differences between hermaphrodite ovotestes and male testes were observed (87.2% and 79.6%, respectively). After fertilization, a decrease in DNA methylation occurred from 27.8% in fertilized eggs to 15.8% in gastrula, immediately followed by an increase and re-establishment of the adult pattern by the stage 26 (liver formation) (70.0%). In addition, characterization of genes coding for DNA-methyltransferase enzymes (DNMT1, DNMT3A and DNMT3B) suggests evolutionary conservation of this family. Together these results provide evidence of an original reprogramming pattern of DNA methylation which, was investigated by temperature exposures. Altogether, we hypothesize that DNA methylation may have a crucial role in adaptive evolution of the rivulus.

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Cold "colon"-ization: seasonal changes in the gut microbiome of the spring field cricket, Gryllus veletis

During overwintering, ectotherms experience and respond to a range of environmental pressures; however, we know little of how biotic interactions influence overwintering success. Notably, the impact of the microbiome on host physiology is likely influenced by how overwintering stressors, such as low temperatures, change its composition and function. To understand the role of the microbiome in determining the success of overwintering insects, we began by exploring how overwintering affects the composition of the gut microbiome of the spring field cricket, *Gryllus veletis*. We exposed *G. veletis* to a simulated change in seasons that mimicked temperatures and photoperiods in London, Ontario, Canada, and identified the composition of the community of gut bacteria at time points corresponding to summer, autumn, early winter, mid-winter, late winter, and spring. We found that the composition of the gut microbiome is similar in summer and autumn and is dominated by the classes Bacteroidia and Clostridia. In winter, the composition shifts to favour Bacteroidia, suggesting that bacteria in the class Clostridia do not perform as well at low temperatures. In spring, the composition shifts once again as Gammaproteobacteria flourish. These changes in composition across season suggest that overwintering can markedly shift the microbiome into the growing season. These changes may influence how hosts respond to the multiple stressors associated with winter - from the response to cold stress to immune challenges - and it will next be important to determine how these shifts influence host success.

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Conspecific call playback leads to an exaggerated adrenocortical response to handling stress in Florida scrub-jay (Aphelocoma coerulescens) nestlings

Though altricial young are typically isolated in nests or burrows during development, they may be influenced by their surrounding environment. For instance, acoustic signals between conspecifics, including parents, may be received by developing young, and nestlings may respond behaviorally to calls from predators, conspecifics, and parents; however, little is known about physiological responses to such signals. We hypothesized that Florida scrub-jay (*Aphelocoma coerulescens*) nestlings would alter steroid levels in response to conspecific call playback and parental defense. We conducted conspecific, heterospecific, or no call playback at nests, recorded parental and nestling behavioral responses, and measured corticosterone (CORT) and testosterone (T) in nestlings. Adults responded aggressively to conspecific call playback, but nestling behavior did not differ from controls (begs, begging time, and feedings, $p > 0.3$). Nestling T ($p > 0.3$) and CORT ($p > 0.3$) did not differ from controls immediately following playback, but following the stress of a 10 min restraint, nestlings exposed to conspecific call playback had higher stress-induced CORT levels than nestlings exposed to no playback ($p = 0.001$). These results suggest that, while not directly influencing baseline CORT in nestlings, conspecific vocal cues may nevertheless prime the HPA axis for a heightened response to subsequent stress. As developmental CORT exposure can affect growth rates and body size of nestlings, as well as have long-term effects on HPA axis responsiveness and behavioral phenotype, these results may have implications for high-density populations in which aggressive encounters are common or species for which vocal communication is prominent.

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The Effects of Food Availabilty on the Maternal and Sociosexual Behaviors of Meadow Voles

Many female small mammals, such as meadow voles, *Microtus pennsylvanicus* , may face limited food availability during behavioral estrus, pregnancy, postpartum estrus and lactation. The amount of food that is available to these females may influence their behavior and reproductive success. We examined the effects of nutritional stress on aspects of the behavior of female meadow voles in different reproductive states, including behavioral estrus, pregnancy, postpartum estrus and lactation. In doing so, we also examined if nutritional stress faced by dams affected the phenotype of their offspring. We found that 6 hours of food deprivation (FD) was sufficient to decrease the sexual behaviors of female voles in behavioral estrus relative to female voles that did not face FD. Next, we discovered female voles that were food deprived (FD) or food restricted (FR) during late pregnancy became sexually less receptive and produced scent marks that were no longer as attractive to male voles on the first day of lactation (the onset of postpartum estrus) compared to that of pregnant female voles that were not FD or FR during late gestation. FD and FR pregnant female voles did not enter postpartum estrus (PPE), whereas, control females did enter PPE. We also found that FR during lactation caused dams to spend less time engaged in maternal behavior compared to control dams. Dams that were FR during days 8-14 of lactation displayed the most pronounced decline in maternal behavior relative to dams that were FR during days 1-7 or days 15-21 of lactation. In addition, FR 8-14 dams reared offspring that had lower body mass at weaning and at sexual maturity and had deficits in sexual behavior as adults. Thus, FD and FR can affect the phenotype of adult female voles and induce similar deficits in their offspring. These persistent effects may affect the fitness of individuals within a population and the demography of that population.