

Thirsty mothers pay extra costs to reproduce

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Reproduction exposes females to many obstacles to their health and survival. For instance, female vertebrates usually face major morphological rearrangements and severe physiological stressors during pregnancy. These costs of reproduction shape the reproductive tactics of all species. A universal cost of reproduction involves the alteration of the balance between attack by free radicals and antioxidant defences, which is defined as oxidative stress. In this study, we determined if and how pregnancy, thirst and thermal stress affected oxidative stress in female lizards. Oxidative stress was quantified in the blood (plasma) of lizards from 12 natural populations exposed to different temperature and water conditions. Using a robust experimental design, we then examined how controlled thirst jointly influenced both female oxidative balance and offspring performance. In both studies, despite boosted defensive capacity, females exhibited similar levels of oxidative attack compared to males, suggesting that they protected themselves against this oxidative cost of reproduction. Furthermore, the concentrations of oxidative markers in pregnant females depended on the number of their developing embryos and were increased under water-restricted conditions. Interestingly, these



Pregnant female common lizard (Zootoca vivipara) in a volcano crater (Puy Mary) exposed to warm temperature.

immediate changes in mothers impacted their offspring, hence illustrating new insights into mother-offspring relationships. Specifically, mothers with a greater capacity to defend themselves against oxidative attacks had a higher proportion of viable offspring, and offspring that faced stronger oxidative attacks during their foetal development had lower survival the following year. These results confirm that thirsty females with higher fecundity have to pay an extra cost of reproduction and suggest inter-generational consequences of maternal oxidative stress on offspring performance. In this regard, costs of reproduction in wild lizards are predicted to increase as summer droughts increase in frequency.