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How does dehydration affect thermoregulation in ectotherms? A case study on lacertid lizards

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Climate change is negatively affecting many species. The increase in mean air temperature is often associated with distribution shifts, changes in phenology, and local extinctions. Other factors, like water and food shortage, only partially correlating with air temperature, may also contribute to the negative consequences of climate change. Lizards are receiving much attention in recent years since they are considered particularly vulnerable to climate change. However, the possible consequences of dehydration on lizard ecology, physiology, survival and conservation tend to be neglected. In a context of limited water availability, we predicted that lizards exposed to acute dehydration would thermoregulate less precisely than hydrated lizards. Furthermore, dehydrated lizards will be less active, change the daily pattern of thermoregulation and trade-off water balance against thermoregulation. We exposed four temperate lacertid species to thermal gradients with or without a source of water. We measured preferred body temperatures, daily pattern of thermoregulation, and the use of space. Dehydration negatively affected thermoregulation in all investigated species. Dehydrated lizards reduced their mean preferred temperature (but not the mode) and showed a species-specific pattern of hourly change in thermal preference. Furthermore, they more frequently used the colder parts of the gradients, as well as spent more time hidden. Lizards experiencing acute dehydration may suffer a reduction in survival and fitness because of poor thermoregulation. Similarly, dehydrated lizards may spend more time hidden, waiting for more favourable weather conditions. Such inactivity may have ecological consequences especially in those regions that undergo prolonged periods of droughts. Finally, lizards seem to trade-off thermoregulation and water balance, as these factors are physiologically intertwined, and should be approached simultaneously in the context studies focusing on the effects of climate change.