ACTIVATION OF THE IMMUNE SYSTEMS INCURS ENERGETIC COSTS BUT NO THERMOGENIC TRADEOFFS IN HOUSE SPARROWS (PASSER DOMESTICUS) UNDERGOING COLD STRESS

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ABSTRACT

Trade-offs between the immune system and other condition dependent life-history traits (reproduction, predator avoidance, and somatic growth) have been well documented in both avian and mammalian studies. However, to best of our knowledge, no work has been done examining trade-offs between immune activation and thermoregulation during cold exposure. Because of their high surface area-to-volume ratios, small birds incur high energetic costs associated with thermoregulation during cold exposure. Consequently, we predicted that the immune system and the thermoregulatory system would compete for energetic resources. To test this, we immunologically challenged adult House Sparrows (Passer domesticus) with 5 mg/kg of lipopolysaccharide (LPS) to induce an acute phase response (APR) and measured both the basal metabolic rate (BMR = Minimum metabolic rate required for maintenance; measured as the metabolic rate at thermoneutrality in resting, postabsorptive, nongrowing birds in the resting phase of the daily cycle) and summit metabolic rate (M_{SUM} = maximal metabolic rate achieved during cold exposure). We found that birds injected with LPS had significantly higher BMR and M_{SUM} rates than birds injected with phosphate buffered saline (PBS), indicating that LPS treated birds were able to support both the cost of immune activation and that of thermoregulation. These results suggest that, in the absence of a pathogen, birds that experience short-term activation of the immune system have higher energetic costs during cold exposure, but they do not experience trade-offs between immune activation and cold tolerance performance.