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Nutritional regulation of resistance to *Nippostrongylus brasiliensis* re-infection in lactating rats

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Previous studies in small ruminants and rodents have shown that breakdown of immunity to gastrointestinal nematode (GIN) infection occurs during parturition[(1)], and this breakdown is believed to have a nutritional basis[(2,3)]. Local and systemic immune responses are essential for the initiation of a Type 2 (Th2) immune response, which results in parasite expulsion[(4)]. Here we investigated the impact of dietary protein supply on systemic responses in a *Nippostrongylus brasiliensis* re-infection lactating rat model.

Multiparous female Sprague-Dawley rats were given a primary infection of 1600 *N. brasiliensis* 3rd stage infective larvae (L3) subcutaneously 14 days prior to mating. Ten days post mating confirmation, rats were offered either a High Protein (H) or a Low Protein (L) diet through the latter half of gestation and during lactation. Half of these animals were administered with a secondary 1600 L3 on day 2 post parturition (pp), whereas the other half were sham-infected controls. Expression of genes related to Th1, such as interferon (IFN)-γ, Th2, such as interleukin (IL)-13 and arginase 1, and anti-inflammatory agents, such as peroxisome proliferator activated receptor (PPAR)-γ and 12/15 lipoxygenase, was measured in the spleen on day 5 pp.

There was a significant feeding treatment by time interaction on dam weight (Fig. 1; $P < 0{\cdot}05$) over the latter half of the gestation period, and pup weight during lactation, with H diet resulting in heavier dams and pups. Gene expression in the spleen, including IL-13 (Fig. 2), arginase 1 (Fig. 2), 12/15 lipoxygenase, PPAR-γ and IFN-γ, was significantly up-regulated in H compared to L animals ($P < 0{\cdot}05$). Infection status did not have significant effect on dam or pup weight and gene expression.

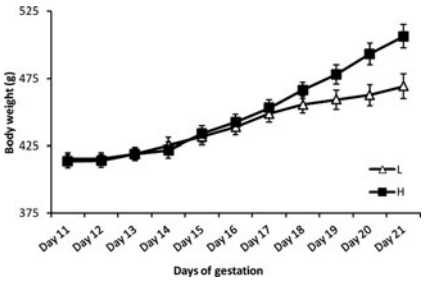

Fig. 1. Dam weight during gestation.

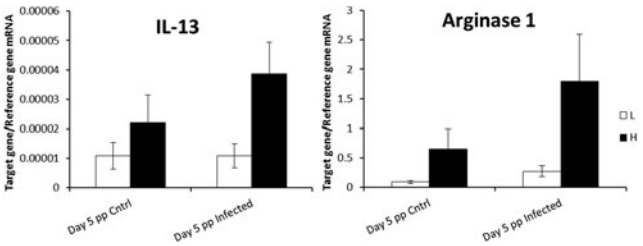

Fig. 2. Gene expression for IL-13 and arginase 1 in spleen.

The spleen has shown to be an important source of Th2 cells in GIN infection[(4)]. Up-regulation of Th2 genes in both challenged and non-infected H groups suggests that high protein diet intake during gestation and lactation can improve both maternal performance and immune responses. It is still largely unknown how these effects are mediated, and further understanding of these mechanisms is important for developing practical and sustainable nutritional parasite control strategies in mammals.

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