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Postprandial nutrient metabolism in lipopolysaccharide-challenged growing pigs reared at thermoneutrality or acclimated to high ambient temperature

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The effect of exposure to high temperatures on the health status of pigs has not been investigated thoroughly. It is not clear how the ambient temperature (T_a) could influence the responses to an inflammatory challenge in pigs, inflammation being known to induce a high metabolic and physiologic cost. We recently showed that acclimation to high T_a might limit the physiological disturbances, and the associated impact on growth rate and feed intake, caused by repeated administration of *Escherichia coli* lipopolysaccharide (LPS). The aim of the present study was to evaluate the effects of high T_a on postprandial metabolism of growing pigs subjected to repeated administration of LPS.

Thirty-seven pigs fitted with a jugular catheter were assigned to thermo-neutral (TN, 24 °C) or high (HT, 30 °C) T_a conditions. After a 21-day adaptation period, pigs were administered 5 injections of LPS, each at 2-day intervals. Pigs were submitted to a meal test procedure before the first LPS injection (T1), then 24h after the second (T2) and the fourth injections (T3): after being fasted overnight, pigs were fed a meal standardized for size (300 g) and composition, and serial blood samples were taken before the meal then over 4 hours to measure plasma insulin and metabolite concentrations.

Before the LPS injection, HT has negligible direct effects on the postprandial profiles of insulin, energy and nitrogen related metabolites. Each LPS injection induced a hyperthermia and increased plasma concentrations of haptoglobin, an acute phase protein. Compared to T1, postprandial plasma concentrations of glucose and insulin were greater and those of lactate, NEFA, α -amino nitrogen and urea were lower after the LPS injections. The lactate profiles were more affected by LPS in TN than in HT pigs whereas those of nitrogen related metabolites were more affected by LPS in HT than in TN pigs. Conversely, T_a did not modify the effect of LPS on NEFA

profiles. Postprandial plasma glucose and insulin were increased by LPS at T2 and T3 in HT pigs whereas those changes were noticed only at T2 for TN pigs. This revealed that LPS induced a state of insulin resistance that persisted longer in pigs acclimated to HT. This metabolic status may contribute to limit glucose utilisation by muscle and adipose tissue and could be a potential mechanism modulating pig capacity to overcome an inflammatory challenge.