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Blood metabolite, hormone and $\delta^{13}\text{C}$ turnover kinetic during compensatory growth of crossbred heifers

S. Lerch¹, P. Silacci¹, G. Cantalapiedra-Hijar², R. Siegenthaler¹, S. Dubois¹, A. Delavaud², M. Bonnet² and I. Morel¹
¹Ruminant Nutrition and Emissions, Animal Biology, Research Contracts Animals, Feed Chemistry, Agroscope, 1725 Posieux, Switzerland, ²INRAE, Université Clermont Auvergne, Vetagro Sup, UMRH, 63122 Saint-Genès-Champanelle, France; sylvain.lerch@agroscope.admin.ch

Compensatory growth occurs when cattle are refed after feed restriction and is characterized by changes in metabolic and hormonal profiles. Aim was to explore relationships between feed efficiency or compensation intensity, and blood metabolites, hormones and ^{13}C natural abundance ($\delta^{13}\text{C}$). Sixty-six beef-on-dairy heifers (♀ Swiss Brown × ♂ Angus, Limousin or Simmental) were used from 270 to 527 kg body weight (BW). Thirty-three grew discontinuously (DI), 111 d on mountain pasture, followed by 80 d refeeding at barn (65:20:8:7 grass silage/hay/maize silage and concentrates, DM basis). The remaining 33 were fed continuously the barn-diet (CO). Blood serum non-esterified fatty acids (NEFA), glucose, creatinine, τ -methyl-hystidine (τMH , CAS:332-80-9), and plasma insulin, IGF-1 and $\delta^{13}\text{C}$ were determined at d 0, 2, 4, 8, 16, 35 and 70 of refeeding. Relationships (Proc CORR, SAS 9.4.) were explored with feed conversion efficiency [FCE=average daily gain (ADG)/DM intake] and compensatory index (CI; reduction of BW differences between DI and CO treatments over 80 d refeeding). When compared to CO, ADG of DI heifers was lower at pasture (0.45 vs 1.06 kg/d), but higher during compensation (1.46 vs 1.02 kg/d), as for FCE (0.17 vs 0.13; $P<0.001$). CI was 43% whatever the crossbreed ($P=0.52$). Plasma $\delta^{13}\text{C}$ at d 0 was negatively correlated with ADG at pasture ($r=-0.77$), but positively over compensation ($r=+0.76$), as for FCE ($r=+0.63$); the reverse being observed for d 0 IGF1 ($r=+0.46$, -0.76 , -0.51) and d 70 τMH ($r=+0.34$, -0.65 , -0.59 ; $P\leq 0.10$). The FCE was positively correlated with increases (by difference) in glucose from d 0 to 70 and creatinine from d 0 to 4 ($r=+0.59$, 0.56 , respectively; $P\leq 0.06$), but negatively with d 2 to 16 τMH and d 16 to 70 insulin increases ($r=-0.62$, -0.58 ; $P\leq 0.05$). The CI was positively correlated with d 0 to 4 creatinine increase ($r=+0.60$) and $\delta^{13}\text{C}$ turnover ($r=+0.57$; $P\leq 0.06$). Feed efficiency and CI were associated with blood metabolites, hormones and $\delta^{13}\text{C}$ kinetic following a refeeding in beef-on-dairy heifers.