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In vivo muscle protein turnover in double muscled Belgian Blue bulls in relation to compensatory growth after different periods of reduced growth.

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Reducing feed intake impairs animal growth and hence muscle protein (MP) deposition. As the latter is the net result of MP synthesis and MP degradation it could be interesting to study the effect of reduced feed intake on both components of MP turnover.

Four groups of 4 double muscled Belgian Blue bulls (initial weight about 300 kg) were given either a conventional fattening diet (group 1 or control)(Gr1), or, during periods of reduced growth (0.5 kg/day) of different duration e.g. 4 (Gr2), 8 (Gr3) or 14 months (mo) (Gr4), a diet containing a large proportion of straw, followed by the same fattening diet as in group 1. Nitrogen balance and urinary excretion of 3-methylhistidine (3MH), a marker of in vivo myofibrillar MP breakdown in cattle, were measured at mid period of slow growth (period 1), after 1 mo fattening (accelerated growth ;period 2) and 1 mo before slaughter (625 kg; period 3). MP accretion was obtained from N balance, MP breakdown from urinary 3MH excretion and MP synthesis defined as MP accretion + MP breakdown.

During slow growth the three components of MP turnover in groups 2, 3 and 4 were all lower than in the control group: Gr2: 133, 210, 343; Gr3: 114, 280, 394; Gr4: 149, 240, 389; vs 317, 318, 636 g MP/d respectively for MP accretion, degradation and synthesis rates. During compensatory growth liveweight gain increased from 0.5 kg to about 2 kg/d. Daily gain increased most in group 2 but it leveled off more rapidly than in the other 2 groups. MP accretion rose sharply during this period: 419, 426 and 430 g MP/d respectively for Groups 2, 3 and 4. Concommitantly, MP synthesis and degradation increased. These increases were highest in group 2 and declined from group 2 to groups 3 and 4: 1047 and 1467, 668 and 1094, 269 and 699 g MP/d, resp. for degradation and synthesis rates for groups 2, 3 and 4. At the end of the fattening period MP turnover decreased in group 2 (675 and 1086), while in groups 3 and 4 degradation and synthesis rates remained higher (816 and 1207 for Gr3 and 383 and 862 gMP/d for Gr4). As in the 4 groups animal weight was different at the defined periods MP turnover data were expressed per kg live weight (similar to fractional rates) In these terms the response on compensatory growth in Gr2 was distinctly different from the other two. MP accretion, degradation and synthesis were highest in period 2 but decreased in period 3, e.g. period 2: Gr2: .954, 2.383, 3.337; Gr3: .843,1.325, 2.167; Gr4: .767, .480, 1.247; and period 3: Gr2: .657, 1.079, 1.737; Gr3: .640, 1.337, 1.977; Gr4: .771, .623, 1.395, respectively for MP accretion, degradation and synthesis. In the other 2 groups these increases were less pronounced but lasted longer, especially in group 4. In the latter group growth pattern was also different. During the long period of reduced growth the bulls grew in height and even lost their double muscle appearance, which was still not entirely recovered at slaughter.

In conclusion, MP turnover "recovery" during compensatory growth depends on the length of the preceeding reduced growth period. When this period is short, MP increases rapidly to high values but falls off afterwards, while after the longer periods MP turnover response is lower but persists longer.

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