DIETARY PROTEIN LIMITS RESPONSIVENESS TO GROWTH HORMONE

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Most disease states that restrict mammalian growth are associated with relatively high concentrations of growth hormone (somatotropin) and low levels of insulin-like growth factor-I (somatomedin) in blood. Oversecretion of growth hormone (GH) combined with undersecretion of insulin-like growth factor-I (IGF-I) suggests a state of GH resistance. Dietary energy deficiency has been shown to reduce responsiveness to GH. To determine the importance of availability of amino-acids to GH sensitivity, we measured the effect of GH treatment on growth and blood plasma levels of IGF-I of pigs that were fed rations containing variable amounts of protein.

Six groups of ten sows each were fed isocaloric diets containing between 10.6% and 23.6% protein commencing at 60 kg liveweight. Each animal was injected daily with either 0 or 3 mg porcine GH until they reached 100 kg liveweight. Blood was then collected and plasma pGH and IGF-I were measured by radioimmunoassays. Co-efficients of variation were 3% for pGH and 4% for IGF-I.

Plasma concentrations of pGH were undetectable (<2.4 ng/ml) in 20% of the 100 kg animals that had received daily injections of vehicle and the highest level of endogenous pGH observed was 18.0 ng/ml. Plasma IGF-I varied between 56 and 220 ng/ml in pigs receiving vehicle. Restriction of dietary protein reduced their IGF-I levels ($P<0.05$) by about 30%. In sows injected daily with GH, plasma levels of pGH ranged from 15.1 to 132.6 ng/ml 3 h after the final injection at 100 kg liveweight. Plasma IGF-I was increased by over 200% with GH treatment but the response to GH was reduced as the protein content of the diet was reduced. GH improved growth performance except in sows fed the lowest protein rations.

This study shows that reducing dietary protein can blunt the responsiveness to growth hormone, and indicates that availability of amino-acids can partly regulate the ability of GH to stimulate IGF-I production.

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