EFFECTS OF EARLY FEED RESTRICTION ON GROWTH PERFORMANCE AND DIGESTIVE ENZYME ACTIVITIES IN BROILER CHICKENS

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Feed restriction for a short period within the first two weeks after hatching leads to compensatory growth (e.g. Plavnik and Hurwitz 1985). In order to gain insight into mechanisms operating during compensatory growth, the effects of feed restriction on intestine growth and digestive enzyme activity were studied.

The experiment was carried out in two parts. In one part, 80 day-old broiler chicks were placed in floor pens (10 birds/pen; four pens per treatment) and raised until day 40 for measurements of body composition and feed conversion ratio. In part 2, chickens were placed in cages from day 0 to day 25 for the measurement of digestive enzyme activities. The two treatments were ad libitum feed intake (Control) and feed intake restricted to 40% of the intake of the Control group (FI 40) from day five to day 11. Commercial starter broiler feed was given from day 0 to day 25 and broiler finisher from day 26 to day 40. After starving for 16-18 hours, the birds were killed on days 12, 19, and 26 for in vitro determination of peptidase activities. Glycyl L-leucine was used as a substrate for dipeptidase and L-leucine ß-naphthylamide as a substrate for aminopeptidase activities (Tarvid 1992) on the surface and in homogenates of three equal segments of the small intestine. The segment activities were then expressed as an average for the total ileum and jejunum.

Immediately following the period of feed restriction (i.e. day 12), Group FI 40 birds kept in floor pens had a significantly lower ($P<0.01$) mean body weight (212.4 g ± 2.7) than that of the Control birds (362.1 g ± 3.4). However on day 40, there was no difference in body weight between the Control group (2268 g ± 37) and Group FI 40 (2168 g ± 40). The mean body weights, weights of small intestine and peptidase activities of birds in cages are shown below:

Age	day 12		day 19		day 26	
Treatments	Control	FI 40	Control	FI 40	Control	FI 40
No. of birds	6	6	5	5	6	6
Body weight (BW), g	273.2±6.0	168.1±4.6**	663.7±8.7	458.8±35.0**	1062.8±38.5	900.9±16.6**
Intestine, g/kg BW	30.2±1.4	35.3±2.6	22.4±1.3	22.3±1.7	18.5±0.8	18.1±0.7
Surface activity						
aminopeptidase	0.25±0.01	0.35±0.02**	0.19±0.02	0.25±0.01*	0.18±0.01	0.20±0.01
dipeptidase	7.67±0.49	11.87±1.20*	6.28±0.48	7.88±0.63	5.69±0.53	4.92±0.35
Homogenate activity						
aminopeptidase	3.57±0.21	4.31±0.40	2.47±0.07	3.47±0.14**	2.27±0.15	2.60±0.13
dipeptidase	460.1±44.8	449.7±62.8	376.2±10.9	459.9±10.7	338.6±24.7	360.3±22.3

activity expressed as mmoles leucine/g intestinal tissue per min; *$P\leq0.05$; **$P\leq0.01$

The feed restricted birds exhibited compensatory growth and were able to maintain the growth of the small intestine during the period of feed restriction. The maintenance of growth of the small intestine and the increase in its digestive enzyme activity may be a functional adaptation to the effects of feed restriction which enables support for the added demands during compensatory growth.

PLAVNIK, I. and HURWITZ, S. (1985). Poult.Sci. 64: 348.
TARVID, I. (1992). Comp.Biochem.Physiol. 101A: 161.

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