

Effects of The Different Dietary Arginine Levels on Plasma Free Amino Acid Concentrations in rainbow trout

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Introduction

Studies in the chick (Hill and Olsen 1963, Richardson et al. 1953), rat (Swendseid et al. 1963, Young and Zamora 1968), pig (Puchal et al. 1962), man (Longnecker and Hause 1961, Snyderman et al. 1964, Swendseid et al. 1966), and fish (Thebault 1985) have clearly established that a reduced concentration of an EAA in plasma reflects a deficient level of that amino acid in the diet.

Because of the large individual variation of plasma free EAA concentrations with species, nutrition and environment factors, no attempts has been made successfully to study the effects of the different dietary amino acid levels on PFAA concentrations in fish. Nevertheless, plasma free EAA concentrations data from Sea-Bass (Thebault 1985) and rainbow trout (Schuhmacher et al. 1997, Vermeirssen et al. 1997) clearly showed the possibility to design the experiment to study the effects of dietary EAA on the plasma EAA concentrations in dorsal aorta cannulated growing rainbow trout.

Therefore, the purpose of the present study was to determine the effects of the different dietary arginine levels on PFAA concentrations in rainbow trout, *Oncorhynchus mykiss*.

Materials and Methods

Dorsal aorta cannulated rainbow trout averaging $528 \pm 11.3\text{g}$ (Mean \pm SD) were

divided into 6 groups of 4 fish to study the effects of the different dietary arginine levels on PFAA specially on plasma free arginine (PFArg) concentrations. Fish were fed a commercial diet for 3 days until fish were recovered from the dorsal aorta cannulation stress. After 24 hrs starvation, each group of fish were fed one of six L-amino acid diets containing graded levels of arginine (0.48, 1.08, 1.38, 1.68, 1.98 or 2.58%) by the stomach intubation method at 1 % body weight. Blood samples were taken at 0, 5 and 24hr after feeding the experimental diets.

Results and Discussion

The fasting (24hr post feeding) PFArg concentrations increased linearly from fish fed diets containing arginine between 0.48% and 1.38%, and the concentrations remained constant from fish fed diets containing arginine at a above 1.38%. The broken line analysis (Robbins et al., 1979) for the postprandial and the fasting PFArg indicated that the dietary arginine requirement could be 0.9% and 1.36% in rainbow trout. These findings showed that the fasting PFArg concentrations could be one of the sensitive indices for the adequacy of the dietary arginine level.

Table 1. 5hr and 24hr post feeding plasma free arginine concentrations (nmol/ml) from fish fed graded levels of dietary arginine¹

Level of arginine (%)					
0.48	1.08	1.38	1.68	1.98	2.58
5hr post feeding values					
157 ± 22 ^c	168 ± 25 ^c	211 ± 20 ^b	236 ± 23 ^b	245 ± 47 ^b	292 ± 17 ^a
24hr post feeding values					
66 ± 5 ^d	93 ± 7 ^c	117 ± 8 ^{ab}	113 ± 11 ^b	121 ± 16 ^{ab}	132 ± 15 ^a

¹Values are means ± SD from four fish where the means in each row with a different superscript are significantly different (P<0.05)

Reference

- Kim, Kyu-Il., Kayes, T. B. & Amundson, C. H. (1992) Requirements for lysine and arginine by rainbow trout (*Oncorhynchus mykiss*). *Aquaculture*, 106: 333-344
- Robbins, K.R., Norto, H.R., Baker, D.H. (1979) Estimation of nutrient requirements from growth data. *T. Nutr.* 109:1710-1714.