THE DIGESTIBILITY OF BLOOD MEAL PROTEIN BY CHINOOK SALMON (*Oncorhynchus tshawytscha*)

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ABSTRACT

The objective of the present study was to establish whether commercial sources of dried blood meals available in New Zealand offer useful sources of digestible protein for chinook salmon.

Three blood meals were evaluated to assess their suitability as ingredients in salmon feed. *In vitro* digestibility was determined using the pepsin and pronase digestibility assays. *In vivo* digestibility was determined by feeding diets to chinook salmon formulated to contain 20% dried blood meal (batch dried, ring dried or spray dried), and 80% of a basal diet and by correcting for the digestible protein supplied by the basal diet. Chromic oxide was included in the diets as an indigestible marker. The apparent digestibilities of crude protein and amino acids were determined based on samples of faeces collected after 7 days of feeding the respective test diet to chinook salmon. Feces were collected by a manual stripping of the hindgut

Crude protein contents were uniformly high, at 92.0%, 93.1% and 89.6% for the batch, ring and spray dried blood meals respectively. Amino acid contents were also generally high, with the exception of the essential amino acid methionine. All crude protein digestibility determinations ranked the blood meals as: spray dried > ring dried > batch dried. *In vitro* N digestibility values determined by pronase assay were 60.5%, 25.5% and 9.0% for spray, ring and batch dried bloods, respectively. The pronase assay yielded significantly ($P<0.001$) higher digestibility values than did the pepsin assay in the case of ring and spray dried blood meals, corresponding values for crude protein digestibility with the pepsin assay were 27.8%, 18.9% and 8.4% for spray, ring and batch dried bloods, respectively. The *in vivo* apparent faecal digestibility of protein in the dried blood meals determined in the chinook salmon were highest for the spray dried blood meal (68.4%), lower in ring dried blood meal (46.3%), and very low in the batch dried blood meal. The amino acid digestibilities were similarly ranked, with the difference between ring and spray dried blood meal being statistically significant for 9 of 17 assayed amino acids ($P<0.05$).

A secondary aim of the study was an evaluation of the laboratory rat as a model animal for determining protein digestibility in the chinook salmon. Batch dried blood meal was fed to rats in an experimental design closely following that set for the chinook salmon, and the apparent digestibility of nitrogen and amino acids were determined based on sampling of ileal digesta. Ileal crude protein digestibility for this batch dried blood meal in the rat was also very low (3.9%), suggesting that the rat may be a suitable model animal for prediction of protein digestibility in chinook salmon.

Differences in the protein digestibility of the blood meals appeared to be inversely related to the time spent in processing and drying. It appears that spray and ring dried blood meals may be suitable for inclusion in chinook salmon diets in partial replacement of fishmeal proteins.

Keywords: Salmon, rat, protein, amino acid, digestibility, blood meal

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