Evaluation of a dynamic mechanistic growth model simulating the performance of broiler chicken

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From a modelling point of view, the differences between mammals and poultry species are due to the magnitude and efficiency of energy transactions, rather than having special metabolic processes. Therefore, a generic dynamic mechanistic model describing the nutrient partitioning in broiler chicken has been developed with the same approach as the pig model, InraPorc®. The model predicts the chemical body composition and the body weight of an average individual chick at any time point of the growing and finishing phase.
The aim of our present study was to evaluate the broiler model in terms of body weight (BW) response to different dietary treatments by using independent literature data. For this purpose, the model was calibrated firstly. For calibration, the daily feed intake (FI) and BW data of Ross 308 and 708 broilers from hatch to day 70 were taken from the breeder's guidelines. The calibrated model was then tested with literature data published during the last three years. The model was challenged with diets containing graded levels of digestible lysine, methionine or threonine. Furthermore, datasets on broilers fed with low protein diets supplemented with or without amino acids and/or dietary fat were tested. To study the reliability of model evaluation the root mean square prediction error (MSPE) was calculated. Based on statistics the contribution of different source of model error attributed to bias, regression and undefined error was also determined.
Our results showed that the model gave a reasonably precise estimation on BW in each trial, the relative MSPE was between 1-5%, except for one trial where it was close to 10% which still could be considered as a good prediction. The reliability of the prediction might be improved further if more precise daily FI data were included to *in silico* experiment. Modelling the main routes of nutrient transformation from absorbed nutrients to body protein and body fat accretion, the model assists for a better understanding of the metabolism and helps to answer questions related to feed use mechanisms.
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