Multiple Regression Equations for the Relationship between Dietary and Yolk Fatty Acid Composition

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The present study was undertaken to study possible interaction effects between different dietary fatty acids (FA) on the yolk FA composition. ISA-brown laying hens were fed a diet with either 3 or 6% added fat, in which fish oil was blended at either 0.25, 0.5, 0.75, or 1.5% with other vegetable oil sources (coconut oil, sunflower oil, soybean oil, and linseed oil) in different proportions to obtain a wide range of dietary FA profiles (32 treatments with 3 replicates of 3 birds each). Lipids were extracted from feeds and fresh yolk (pooled samples of 3 eggs/pen) and analysed for FA composition. A set of 20 dietary FA (mg/100g feed) variables was used in stepwise regression to predict the concentration of the major yolk FA (g/100g FAME): SFA (sum of saturated FA), MUFA (sum of monounsaturated FA), 18:2*n*-6, 18:3*n*-3, (20:5*n*-3+22:6*n*-3), their quadratic terms and their 2 by 2 interaction terms. The determination coefficients of the models describing the relationship between the dietary FA contents and the yolk FA profile varied between 0.79 and 0.98, with the highest determination for the *n*-3 polyunsaturated FA. Both the yolk SFA and MUFA proportions were determined predominantly by the supply of these FA groups in the diet. The main determinant for the yolk 18:2*n*-6 proportion was its direct supply by the diet, however other FA variables also contributed considerably to the accuracy of the final model. The yolk 20:4*n*-6 proportion was also explained by a combination of several linear and other terms, of which the negative coefficient for the dietary content of (20:5*n*-3+22:6*n*-3) explained most. The yolk concentration of 18:3*n*-3 was very well predicted by its dietary content, and other dietary FA did not much contribute. The yolk 20:5*n*-3 and 20:6*n*-3 proportion was mainly determined by the direct dietary supply of (20:5*n*-3+22:6*n*-3), with several linear, quadratic and interaction terms further contributing to the accuracy, however with a slight contribution only of the dietary 18:3*n*-3 supply.