## The Effect of Egg Yolk Metabolite Profiles on Hatchability Traits

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Various fatty acids in yolk, as the most important nutrient component during middle and late egg incubation stages, are highly correlated with hatchability of embryos. Therefore, the determination of ingredients in yolk fatty acids and the relationship with the embryonic metabolism appear to be increasingly crucial for finding methods to reduce embryonic mortality. This study tried to detect the association of chicken metabolism with their breed, selection and hatchability breeding value through the analysis of fatty acid metabolism data and hatchability breeding value data with a generalized linear mixed model. The breeding value data with records of more than 7,000 individuals was supplied by the reproduction trait analysis of previous research. To measure the fatty acids content, eggs from 81 unselected Brown layer hens (BL) and 90 White layer hens (WL) in the Friedrich Loeffler Institute (FLI), 350 selected Brown layer hens (BL) and 382 selected White layer hens (WL) at Lohman company were collected. Egg yolks from the same hen were mixed and modified with methylation reagent for fatty acids separation. Totally, there were 39 kinds of fatty acids separated from yolk. Among them, 19 kinds of fatty acids which contain 6 kinds of saturated fatty acids, 7 kinds of unsaturated fatty acids and 6 kinds of steroids were known and the other 20 fatty acids were unknown. The results of association analysis showed Cholest-4-en-3-on was related with hatchability breeding value ($P<0.05$). However, no significant relationship was found in the detected unsaturated fatty acids, such as linolenic acid, DPA etc. In terms of selection effect, 4 kinds of saturated fatty acids, 4 kinds of unsaturated fatty acids and 2 kinds of steroids were remarkably different between commercial lines and experimental lines ($P<0.05$). Meanwhile, a wide range of fatty acids difference, 5 kinds of saturated fatty acids, 6 kinds of unsaturated fatty acids and 2 kinds of steroids, existed among BL and WL ($P<0.05$). This diversity probably could be used to explain hatchability distinction in different chicken lines, and help further gene expression research to find the solution to decrease hatch fail rate.

**Keywords:** metabolism; fatty acid; hatchability; breed; selection

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## In Ovo Injection of Tolbutamide Alters the Post-Hatch Performance and Insulin Sensitivity of Broiler Chickens

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The aim of this study was to investigate if the in ovo injection of tolbutamide during 3 consecutive days, which stimulates the pancreatic secretion of insulin in both mammals and birds, could cause long-term effects in broilers and to obtain more insight in their unusual glucose-insulin regulation. In a pilot study, plasma insulin concentrations were significantly higher 15 min after the tolbutamide injection on ED17, compared to those of the control and sham group, showing the functionality of tolbutamide in chicken embryos. Next, broiler eggs were injected on embryonic day 16, 17 and 18 into blood capillaries of the chorioallantoic membrane, with 200 µl tolbutamide dissolved in a 0.05N NaOH solution (80 µg/g embryo weight) or with 200 µl 0.05N NaOH solution (sham group). A control group did not receive any treatment. Plasma glucose and insulin concentrations, body weights and feed intake were analyzed using a 2-way ANOVA model in SAS 9.2. and a 95% confidence interval threshold ($P < 0.05$) was set. Plasma glucose concentrations of tolbutamide-injected embryos remained low at 8 and 24 hours after each injection, during the three consecutive injection days, reaching ±30% of the levels of the control and sham group (n=10). Plasma insulin concentrations of the tolbutamide group at these sampling times did not differ from the control and sham group. Male chicks were hatched and raised until slaughter age, divided into four pens per treatment (7 chicks/pen). During the entire posthatch period, tolbutamide-treated chicks had a significantly lower body weight than the control group, with the sham group being intermediate. They had a significantly lower feed intake than the control and sham group during the first 2 weeks. On day 42, fasted chickens of the three groups were subjected to an insulin resistance test (n=8). Plasma glucose concentrations reached a minimum level 90 min after the intramuscular injection of insulin, and returned slightly to the basal level 270 min post-injection. Only at 180 min after the injection, plasma glucose concentrations of tolbutamide-treated chickens were significantly higher than those of the control and sham group. In conclusion, these findings suggest that a three-day lasting hypoglycemia in embryos negatively affected their posthatch performance, which might be related to their insulin sensitivity.

**Keywords**: insulin, glucose, tolbutamide, feed intake, body weight

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