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肉种鸡产蛋中期饲料不同能量水平对胚胎期蛋黄及血清脂类代谢相关指标的影响

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Effects of Maternal Dietary Energy Level on Lipid Metabolism Related Indexes in Embryonic Yolk and Serum during the Middle Laying Period in Broiler Breeders

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摘要 本试验旨在研究爱拔益加(AA)肉种鸡产蛋中期饲料不同能量水平对胚胎期蛋黄及血清脂类代谢相关指标的影响。试验采用单因子试验设计,选取20周龄体重相近AA肉种母鸡300羽,随机分为3组,每组5个重复,每个重复20羽。当产蛋率达到5%时开始正式试验,对照组饲喂玉米-豆粕型基础饲料,试验组饲喂饲料能量水平分别为对照组的120%、80%的试验饲料,各组均限饲且饲喂量相同。于产蛋中期(37~39周龄)进行人工授精并按肉种鸡分组收集种蛋(每组150枚)进行孵化,分别于12、13、15、17、19、21胚龄采集蛋黄、血清样品。试验结果表明:1)高能组蛋黄中,12、13、17、19胚龄的粗脂肪含量均显著高于对照组($P<0.05$)。与对照组相比,12、17、21胚龄高能组及13、17胚龄低能组的蛋黄胆固醇含量均显著升高($P<0.05$)。2)高能组胚胎血清中,17、19胚龄的低密度脂蛋白含量,17胚龄的三碘甲腺原氨酸含量,13、19胚龄的甲状腺素含量,15、17胚龄的生长激素含量分别显著低于对照组($P<0.05$),而15、21胚龄的胆固醇含量,12、19胚龄的葡萄糖含量,21胚龄的低密度脂蛋白含量,13、17、19胚龄的胰岛素样生长因子- I 含量均显著高于对照组($P<0.05$)。3)低能组胚胎血清中,12、13、15、19胚龄的葡萄糖含量,17胚龄的低密度脂蛋白含量,12、17、19、21胚龄的生长激素含量显著低于对照组($P<0.05$),而除13胚龄外各胚龄的胆固醇含量,15、17胚龄的三碘甲腺原氨酸含量,15胚龄的甲状腺素含量均显著高于对照组($P<0.05$)。4)各胚龄血清瘦素含量及12、13、17胚龄的胰岛素含量整体随肉种鸡饲料能量水平的降低而降低,除15、21胚龄外的各胚龄血清甘油三酯含量整体随肉种鸡饲料能量水平的降低而呈现出先降后升的变化过程。综上所述,肉种鸡采食不同能量水平饲料将会对12胚龄后的胚蛋蛋黄、胚胎血脂代谢产生母体效应,并显著提高了蛋黄粗脂肪、胆固醇含量及血清胆固醇、甘油三酯含量。

关键词: 能量水平 肉种鸡 蛋黄 胚胎 血清 脂类代谢

Abstract: The objective of this study was to investigate the effects of maternal dietary energy level on indexes related in lipid metabolism of yolk and embryo serum during the middle laying period in broiler breeders. A single factorial design was adopted, and 300 AA broiler breeders (20 weeks of age) with similar body weight were randomly allocated into 3 groups with 5 replicates per group and 20 birds per replicate. The experiment was conducted when laying rate reached 5%. The birds in the control group were fed a corn-soybean meal based diet, and the others in trial groups were fed the diets with 120% and 80% energy levels of the basal diet, respectively. During the experiment period, feed intake in each group was restricted and set the same. After artificial insemination ranged from 37 to 39 weeks of age, 150 hatching eggs in each group were collected and hatched in accord with the group of the breeders during middle laying period. Yolk and serum samples were allocated at embryonic days 12, 13, 15, 17, 19 and 21. The results showed as follows: 1) in high energy group, the yolk crude fat content at embryonic days 12, 13, 17 and 19 was significantly higher than that in control group ($P<0.05$). The cholesterol content in high energy group at embryonic days 12, 17 and 21 and low energy group at embryonic days 13 and 17 was significantly improved compared with the control group ($P<0.05$). 2) The contents of low density lipoprotein at embryonic days 17 and 19, triiodothyronine at embryonic day 17, thyroxine at embryonic days 13 and 19 and growth hormone at embryonic days 15 and 17 of embryonic serum in high energy group were significantly lower than those in control group ($P<0.05$). However, The contents of cholesterol at embryonic days 15 and 21, glucose at embryonic days 12 and 19, low density lipoprotein at embryonic day 21, insulin like growth factor- I at embryonic days 13, 17 and 19 in high energy group were significantly higher than those in control group ($P<0.05$). 3) The contents of glucose at embryonic days 12, 13, 15 and 19, low density lipoprotein at embryonic day 17, growth hormone at embryonic days 12, 17, 19 and 21 of embryonic serum in low energy group were significantly lower than those in control group

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($P < 0.05$), whereas the contents of cholesterol at examined embryonic days except for embryonic day 13, triiodothyronine at embryonic days 15 and 17 and thyroxine at embryonic day 15 were significantly higher than those in control group ($P < 0.05$). 4) The contents of leptin throughout embryonic days and insulin at embryonic days 12, 13 and 17 were decreased with the decline of energy level in diets. The contents of triglyceride in serum throughout incubation except for embryonic days 15 and 21 were firstly reduced and then improved with the decline of energy level. The results display that maternal effect results from different maternal dietary energy levels would be observed in yolk and serum lipid metabolism with the improvements of the contents of crude fat, cholesterol in yolk and cholesterol, and triglyceride in serum during the middle laying period.

Keywords: energy level, broiler breeders, yolk, embryo, serum, lipid metabolism

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