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The transfer of maternally exposed 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) in chickens

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Introduction

Dioxins have been shown to exert reproductive and teratogenic effects in several strains of mice, rats, and chickens. We have reported that *in ovo* exposure to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) less than 7.5 ng/egg on day 0 did not influence hatchability, whereas that of more than 10 ng TCDD/egg completely inhibited the hatching. We have also reported that the maternal exposure to TCDD in chickens induced the reversible inhibition of egg lay. The hatchability of the eggs from TCDD exposed chickens was reduced and the eggshell thickness was thick. These results suggested that maternal exposed TCDD might be transferred to the egg and induced toxic effects to the egg.

In this study, to be clarify the transfer of maternally exposed TCDD into the egg, TCDD concentration in eggs from TCDD exposed chickens was measured using ELISA kit. TCDD concentration in maternal adipose tissue was also measured.

Methods

TCDD was obtained from Cambridge Isotope Laboratories (Andover, MA). TCDD dissolved in corn oil were intramuscularly administered to Barred Plymouth Rock females at 50 ng/kg (50 ng group) or 200 ng/kg (200 ng group) once a week from 14 weeks to 26 weeks of age. In control, the vehicle (corn oil) was administered. Blood were collected from a wing vein at 90, 120 and 160 days of age, and serum 17β-estradiol concentration was measured using EIA kit (Cayman). Egg production (%) and body weight were measured. Barred Plymouth Rock females at 26 weeks of age were crossed with Rhode Island Red males and the fertile eggs were collected.

At 33 weeks of age, the chickens were slaughtered and abdominal adipose tissue was excised. TCDD in abdominal adipose tissue and egg yolk were extracted with hexane and measured using ELISA kit (Otsuka Pharmaceutical Co., Ltd.).

Results and Discussion

A hatchability of the fertile eggs from 200 ng/kg TCDD exposed chicken was significantly lower than that in the control group. TCDD concentration in egg from 200 ng/kg TCDD exposed chickens at 32 weeks of age (7 weeks after stopping the TCDD administration) was 11.64±3.12 ng/egg yolk. These results coincided with our previous finding that *in ovo* exposure to TCDD more than 10 ng/egg inhibited the hatching. TCDD concentration in maternal abdominal adipose tissue at 33 weeks of age was 6.35±1.15 ng/g (n=3).

In control, Serum 17β-estradiol concentration at 120 days of age was significantly lower than that at 160 days of age. Serum 17β-estradiol concentration in TCDD exposed chickens was lower than that in the control group at both 120 and 160 days of age. The changes of serum 17β-estradiol concentration by TCDD exposure might be important roles for the inhibition of egg lay.

In conclusion, the maternally exposed TCDD was transferred to egg and influenced the hatchability and egg qualities.