

# ***The effects of different Ochratoxin A contaminated starter diets on the performance and some physiological parameters of broiler chicks***

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## ***Abstract***

Ochratoxin A (OTA) is a secondary metabolite of several species of *Aspergillus* and *Penicillium*, produced during storage of grains and means a potential food safety risk factor. In our experiment a control and different OTA contaminated diets (0,05, 0,2, 2 ppm) were fed to broiler chicks in the first ten days of their life. The effect of treatments on growth, relative organ size (bursa of Fabricius, liver, kidney, proventriculus and gizzard, pancreas) energy utilisation and protein digestibility was measured. Ochratoxin A caused a significant enlargement of the kidney, proventriculus and gizzard, pancreas and liver, but declined the relative size of bursa of Fabricius. All diets, containing OTA reduced the body weights of birds. Both energy utilisation and protein digestibility of diets were reduced by the treatments; the effect being most significant in the case of protein digestibility, which was reduced by 50% at 2 ppm of OTA. The results showed that Ochratoxin A has a deleterious effect on young broiler chicks even at low concentration.

## ***Introduction***

Ochratoxin A, a nephrotoxic mycotoxin, is secondary metabolite produced by severe species of genera *Aspergillus* and *Penicillium*. Ochratoxin A is toxic to the domestic animals, poultry being also sensitive to this toxin.

Natural field outbreaks of ochratoxicosis have been reported in the poultry in the United States with OTA levels in the feed ranging from 0.3 to 16 ppm (Hamilton et al. 1982).

The most commonly observed clinical symptoms are retardation of growth, dullness, decreased appetite, reduced feed intake, weakness and diarrhea (Dwivedi and Burns, 1984). Gross pathological changes have been observed in the kidney, liver, pancreas, and bursa of Fabricius (Huff et al, 1974; Dwivedi and Burns, 1985).

## ***Materials and Methods***

In the experiment 40 male broiler chicks were reared. Experimental diets containing 0 (TK), 0.05 (T3), 0.2(T2), 2 ppm (T1) ochratoxin A were fed to groups of ten broiler chicks. During the ten days chicks were fed the same starter diet. The nutrient content of the diets were calculated according to the recommendations of the breeder company (Ross Breeders Ltd, 1999).

Crystalline OTA (Sigma Chemical Company) was dissolved in chloroform and mixed with the diet to give the desired concentration. Diets contained titanium-dioxide, as a marker, in order to calculate energy utilisation and protein digestibility. On the fifth, seventh, tenth days excreta samples were taken, and their dry matter, crude protein, gross energy and titanium-dioxide content have been determined.

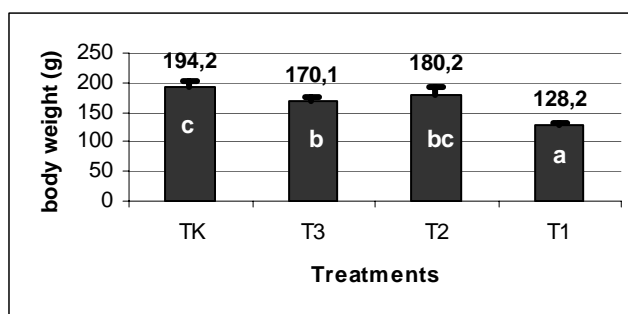
At the end of the starter period the weight of birds and the feed intake were measured. Five birds per treatment were slaughtered and the relative size of bursa of Fabricius, liver, kidney; proventriculus and gizzard, pancreas was measured.

All results of the experiment were evaluated statistically by one way analysis of variance (ANOVA) with the *Statgraphic 5.0* (1991) software.

## ***Results and Discussion***

Live weight of chicks was influenced significantly by the treatments (Fig. 1.). Significant depression in all ochratoxin fed groups was registered, compared to the control, the effect being most marked at 2 ppm OTA.

**Figure 1:** Effect of treatments on average body weight of broilers



Averages with no common letter marks differ significantly ( $p < 0.05$ )

The effect of treatments on the relative weight of kidney, proventriculus and gizzard, pancreas is shown in Table 1. The weight of organs increased in the presence of 2 ppm OTA. The effect was most marked in the case kidney, which was enlarged at 2 ppm OTA to more than eight times, compared to the control.

**Table 1:** Effect of treatments on the relative weight of kidney, proventriculus and gizzard, and pancreas

	Rel. weight of kidney (%)	Rel. weight of proventriculus and gizzard (%)	Rel. weight of pancreas (%)
<b>T</b>	$0.53 \pm 0.161^a$	$3.894 \pm 0.053^a$	$0.488 \pm 0.031^a$
<b>T</b>	$1.04 \pm 0.043^a$	$4.275 \pm 0.151^a$	$0.547 \pm 0.031^a$
<b>T</b>	$0.99 \pm 0.02^a$	$3.937 \pm 0.063^a$	$0.629 \pm 0.069^a$
<b>T</b>	$4.52 \pm 0.22^b$	$16.753 \pm 0.814^b$	$2.129 \pm 0.251^b$

Averages with no common letter marks differ significantly ( $p < 0.05$ )

The effect of different OTA levels on the relative weight of liver and bursa of Fabricius is shown in table 2. The weight of bursa of Fabricius decreased significantly when 2 ppm OTA contaminated diet was fed. At the same OTA level the relative size of liver increased significantly.

**Table 2:** Effect of treatments on the relative weight of liver and bursa of Fabricius

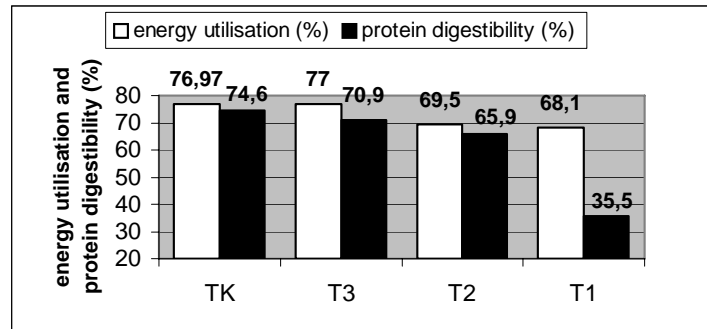
	Rel. weight of bursa (%)	Rel. weight of liver (%)
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TK	0.271±0.00001 <sup>b</sup>	3.22±0.15 <sup>a</sup>
T3	0.291±0.00001 <sup>b</sup>	3.601±0.0867 <sup>a</sup>
T2	0.313±0.00001 <sup>b</sup>	3.48±0.159 <sup>a</sup>
T1	0.105±0.00001 <sup>a</sup>	4.209±0.272 <sup>b</sup>

Averages with no common letter marks differ significantly (p<0.05)

Both energy utilisation and protein digestibility (Fig. 2) decreased the toxin contaminated treatments. This effect was more significant in the case of protein digestibility, which was reduced by 50% at 2 ppm OTA.

**Figure 2:** The effect of treatments on the energy utilisation and protein digestibility value



Huff et al (1974) detected an increase in the weight of the liver and a decrease in the bursa of Fabricius only at 8 ppm OTA. Chang et al (1981) observed an enlargement of proventriculus and gizzard at 4 and 8 ppm OTA in turkey. This study shows that OTA even at a level of 0.05 ppm decrease significantly the weight gain of young chicks in the starter period. low level of the toxin caused numerical, 2 ppm significant changes in the relative weight of some vital organs. OTA has reduced the weight of all organs, except for bursa of Fabricius, which has been decreased in weight, when OTA contaminated diets were fed. OTA decreased both energy utilisation and protein digestibility of young chicks.

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