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THE EFFECT OF DIETARY VITAMIN E AND SELENIUM ON OVERALL PERFORMANCE AND IMMUNE RESPONSE OF BROILERS FED EITHER BASAL OR OXYTETRACYCLINE TREATED DIET

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SUMMARY

The impact of dietary vitamin E-selenium on overall performance and immune response of broiler chickens fed either basal or oxytetracycline diet was studied. Four groups of day old broiler chicks, 35 of each, were used. Group 1 fed on basal diet treated with oxytetracycline at a ratio of 0.2 g/kg, while birds of group 2 received basal diet supplied with vitamin E and selenium at a level of 300 mg/kg and 0.25 ppm respectively. The birds of group 3 fed on basal diet provided with a combination of both oxytetracycline (0.2 g/kg) and vitamin E-selenium (300 mg and 0.25 ppm). Group 4 fed on basal diet and kept as untreated negative control. All groups were vaccinated against Newcastle disease using live vaccines. The experimental period extended for 35 days. Body weight development and feed conversion rate were recorded weekly. Individual blood samples were collected weekly to be subjected to Newcastle antibody ELISA titration. Oxytetracycline had a growth promoting effect in treated birds as compared with the untreated control group. Dietary vitamin E-selenium had a superior effect on body weight development as compared with either oxytetracycline treated or untreated control groups. Oxytetracycline had an immunosuppressive effect as detected by Newcastle disease ELISA antibody titres. Dietary vitamin E-selenium could compensate neutralizing the immunosuppressive effect of oxytetracycline that could be applied in broiler production practice.

INTRODUCTION

Antibiotics feed additives were employed in broiler production either for therapeutic or pro-

phylactic purposes. Tetracyclines are bacteriostatic antibiotics that widely used in veterinary medicine (Grondel et al., 1985). Oxytetracycline, as commonly used member of tetracyclines, can be administered either in drinking water or feed. Many researches were conducted to investigate the benefits of oxytetracycline as feed additive in chickens. The oxytetracycline inclusion rate of 1mg/kg in feed of chickens reduced mortality by 50% due to avian pasteurellosis (Little, 1948). Moreover, oxytetracycline feed additive was commonly employed treatment for mycoplasmosis that provide favorable results when used at ratio of 200-400 g/ton feed for at least several days (Furusawa, 1999; Evans et al., 2002). Bains (1968) used oxytetracycline successfully either in drinking water or in feed to control necrotic enteritis in chickens caused by Clostridium perfringens, while Zaki (1983) used oxytetracycline in feed of chickens to complete the treatment course of antibiotic therapy to control infectious coryza outbreaks in order to minimize the risk of developing carrier birds.

Many researches were carried out to study the effect of several antibacterial agents on the primary immune response. Forsgren and Gnarpe (1973) have reported that the use of antibiotics such as oxytetracycline can cause an inhibition of the immune system. Furthermore, Awaad et al. (1982) found no significant difference in HI antibody titres of vaccinated chickens treated with furazolidone and oxytetracycline, while protection rate against challenge with VVND virus in treated birds has ranged from 75 to 90% compared with untreated vaccinated controls which was 85%. On the other hand, vitamin E-selenium have significant improving effect on both performance and immune response of chickens. Bartov and Frigg (1992) have demonstrated that high concentration of vitamin E (100-150 mg/kg diet) fed during various age periods had a significant positive effect on the performance of drumstick meat of 7-week-old broiler chicks. Bassiouni et al. (1990) proved that diets supplied with 300 mg/kg vitamin E combined with 0.025 ppm selenium over normal requirement from those two elements resulted in stimulating the immune response of chicks vaccinated with live Newcastle disease and infectious bursal disease vaccines.

For that, the presented work was planned to cover the following objectives:

1. To investigate the influence of oxytetracycline used as feed additive on immune system of broiler chicks. 2. To study the possible effect of oxytetracycline on broilers performance. 3. To find out the effect of vitamin E-selenium as feed additive on both immune system and performance of broilers. 4. To determine the possible implication of vitamin E-selenium feed additive on immune system and performance of broilers fed diets containing oxytetracycline.

MATERIAL AND METHODS

Experimental birds:

One hundred and forty day-old commercial broiler Cobb chicks were used in this study. The birds were kept in the experimental animal facility in the College of Veterinary Medicine and Animal Resources, King Faisal University. They were reared in isolated floor pens with wood shaving deep litter. Water and feed were available on free basis. Daily records and data capture sheets were used.

Diets:

Commercial balanced diet specified for broiler chicks were used as a basal diet through out the experimental period.

Experimental design:

Chicks were divided at age of one day into 4 equal groups, 35 birds each, and assigned as groups 1 to 4. Each group was housed in isolated separated pen until the end of 35 days experimental period. Birds of group 1 were fed the basal diet supplied with oxytetracycline (feed grade) with final concentration of 0.2 g/kg, while birds of group 2 were fed the basal diet supplied with a-tocopherol acetate and selenium to final concentration of 300 mg/kg and 0.25 ppm respectively. Birds of group 3 were fed the basal diet supplied with oxytetracycline (0.2 g/kg) and vitamin E-selenium (300mg/kg and 0.25 ppm respectively). Group 4 was fed the basal diet and kept as non-treated negative control. The birds of different groups were fed the different diets from day old to the end of the experimental period. All experimented groups were vaccinated against Newcastle disease at age of 6 days using Hitchner B1 vaccine via eye drop route then revaccinated at age of 18 days with La Sota vaccine in drinking water.

Body weight was recorded weekly for individual birds per each group and body weight gain development was calculated. Furthermore, weekly feed consumption of each group was measured, and then the feed conversion ratio was calculated.

Ten random blood samples were collected weekly from each group and serum samples were separated and kept at -20OC until used for titration of Newcastle disease (ND) antibodies. ND antibody titers were estimated by ELISA technique using KBL kits. By the end of the experimental period, 5 chicks from each group were weighed, slaughtered, and lymphoid organs weight (spleen, bursa, thymus and Harderian gland) weight was estimated. All obtained data were analyzed statistically using SPSS soft ware.

Table 1: The effect of dietary vitamin E-selenium and/or oxytetracycline treatment on body weight development (g) of broiler chicks.

Aspect	Oxytetracycline (0.2g/kg)	Vitamin E-Se (300mg/kg)	Oxytetracycline +vitamin E-Se	Control
0	39.6±0.5^{a}	40.1±0.8^{a}	39.5±0.7^{a*}	38.9±0.4^{a}
1	136.4±2.14^{ab}	141.6±1.92^{a}	137.5±1.69^{ab}	134.9±2.27^{b}
2	332.8±8.4^{ab}	349.0±8.0^{a}	338.9±7.9^{ab}	328.5±6.7^{b}
3	576.1±14.6^{b}	625.3±12.7^{a}	602.3±13.1^{a}	532.5±11.8^{c}
4	945.0±18.4^{b}	1029.1±16.4^{a}	990.6±16.2^{ab}	891.2±14.2^{c}
5	1353.3±23.2^{b}	1553.6±33.1^{a}	1469.8±35.2^{a}	1281.2±31.6^{c}

* Values with different superscripts differed significantly ($p<0.05$)

Efect of dietary oxytetracycline and/or vitamin E-selenium on body weight development

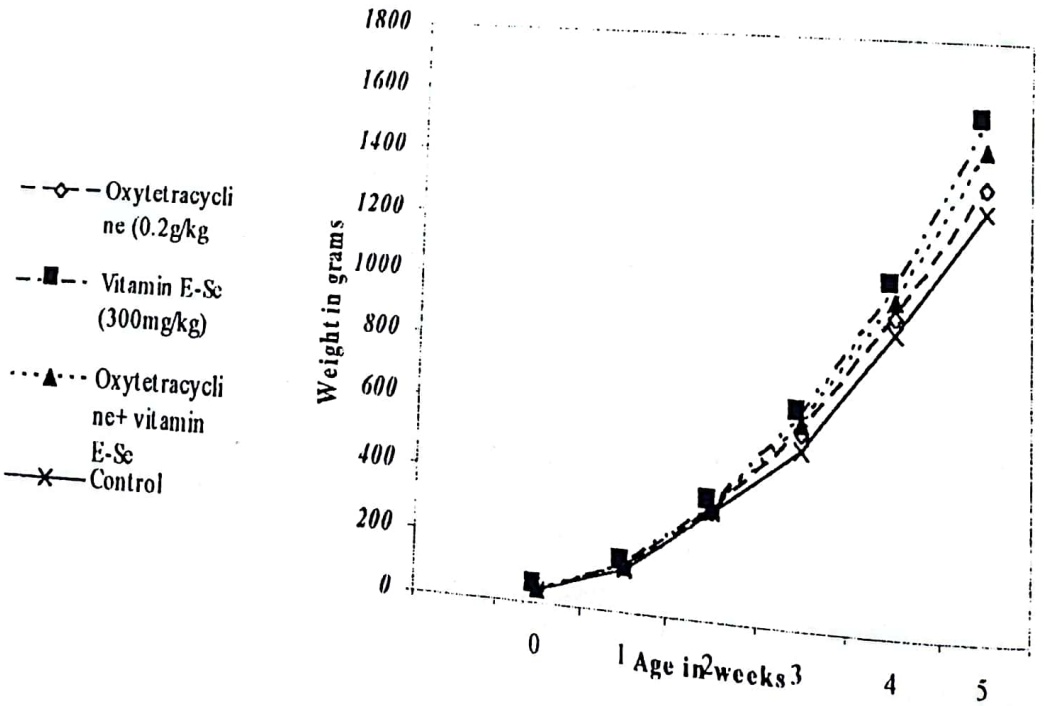
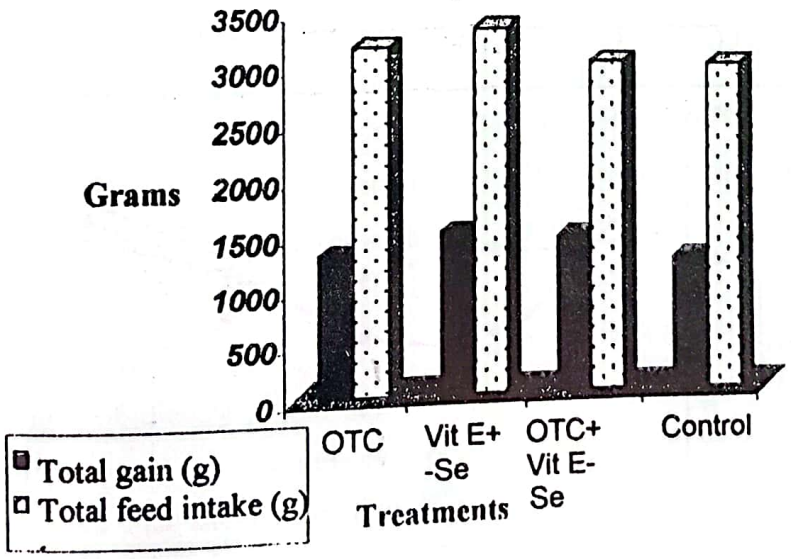


Table 2: Effect of dietary oxytetracycline and/or vitamin E-selenium treatment on overall performance of broiler chicks.

Aspect	Oxytetracycline (0.2g/kg)	Vitamin E-Se (300mg/kg)	Oxytetracycline+vitamin E-Selenium	Control
Total gain (g)	1313.7	1513.5	1457.3	1242.3
Total feed intake (g)	3181.2	3357.7	3052.3	3021.8
Feed conversion	2.42	2.22	2.09	2.43

Efect of dietary oxytetracycline and/or vitamin E-selenium on body weight gain and total feed intake.



The effect of oxytetracycline and/or vitamin E-selenium on feed Conversion

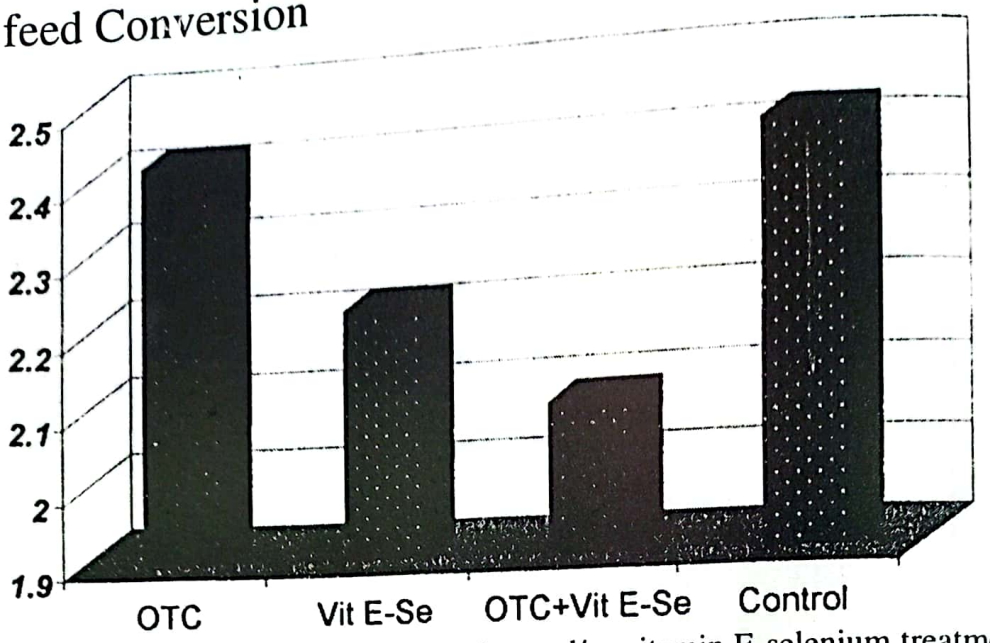


Table 3: Effect of dietary oxytetracycline and/or vitamin E-selenium treatment on Newcastle disease ELISA antibody titres in broiler chicks.

Age in weeks	Oxytetracycline (0.2g/kg)	Vitamin E-Se (300mg/kg)	Oxytetracycline +vitamin E-Se	Control
1	97.25	143.75	223.67	229.00
2	38.40	126.40	145.00	28.50
3	12.60	167.60	101.25	38.75
4	59.20	146.40	98.00	117.00
5	182.0	350.80	265.50	193.75

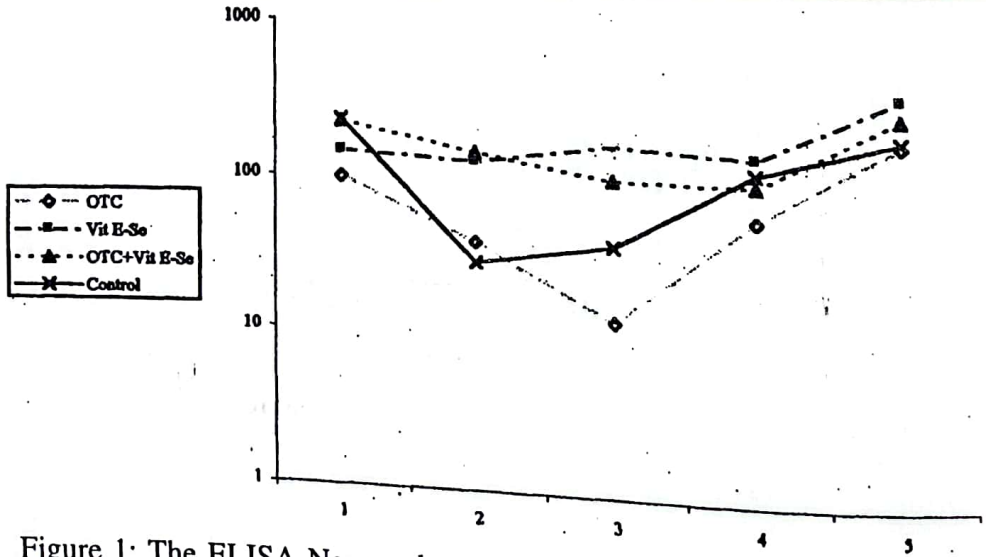


Figure 1: The ELISA Newcastle antibody titres of the different treated and control groups.

The effect of dietary oxytetracycline and/or vitamin E-selenium treatment on body weight development (g) of broiler chicks was illustrated in table 1. It has been clearly demonstrated that oxytetracycline feed additive at level of 200 g/ton feed significantly ($p<0.05$) increased body weight gain and final body weight as compared with untreated control birds. This result could be supported by the observation of Al-Ankari and Homeida (1996). Furthermore, the use of vitamin E-selenium, at level of 300 mg/kg and 0.25 ppm respectively, had a significant ($p<0.05$) superior effect on body weight development as compared to either oxytetracycline treated or untreated control birds. The growth promoting effect of vitamin E-selenium in broiler chicks is in agree with Bassiouni et al. (1990). No significant ($p < 0.05$) difference could be detected between body weight development of both vitamin E-selenium and vitamin E-selenium-oxytetracycline combination treated groups. As far as we know, no available literature could be obtained on the effect of dietary vitamin E-selenium-oxytetracycline combination on body weight development.

Regarding the effect of dietary oxytetracycline and/or vitamin E-selenium on overall performance, table 2 shows that dietary vitamin E-selenium-oxytetracycline combination induced the best feed conversion ratio (2.09) followed by vitamin E-selenium alone (2.22) while both oxytetracycline treated and untreated control group were found very similar.

Table 3 shows the effect of dietary oxytetracycline and/or vitamin E-selenium on Newcastle disease ELISA antibody titres. It has been observed that oxytetracycline had an immunosuppressive effect on comparing the titres of both oxytetracycline treated and untreated control groups. The immunosuppressive effect of oxytetracycline on chickens was previously demonstrated by Forsgren and Gnarpe (1973). On the contrary Awaad et al. (1982) failed to show such immunosuppressive effect with chickens treated with furazolidone and oxytetracycline. Furthermore, vitamin E-selenium proved to have an immunostimullating effect as expressed by antibody titres. This observation could be supported by the findings of Bassiouni et al. (1990). On the other hand, vitamin E-selenium succeeded in compensating the immunosuppressive effect of oxytetracycline. It is the first time, as far as we know, to study the effect on dietary vitamin E-selenium on the immunosuppression induced by oxytetracycline.

It could be concluded that:

Dietary vitamin E-selenium significantly increases body weight development more superior than oxytetracycline feed additive.

Dietary oxytetracycline has a severe immunosuppressive effect in broiler chicks when given during the whole growth period.

Dietary vitamin E-selenium could be used to compensate the immunosuppressive effect induced by dietary oxytetracycline.

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