Neurotoxic and Teratogenic Effects of Enrofloxacin Against Newly Hatched Chicks Subjected to Omphalitis.

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Summary

This study was aimed to investigate any possible neurotoxic signs and teratogenic anomalies that may result from pre incubation dipping of fertile eggs in Enrofloxacin concentrations as a preventive measurement against omphalitis. *E. Coli* sensitivity against Enrofloxacin was examined in a dose dependent manner by using 2, 4, 6, 8, and 10 µg/ml. Forty two non-infected newly hatched chicks at age of 5-7 days were divided into six groups of seven chicks each, subjected to behavioral tests namely; Open Field Test and Tonic Immobility Test. For Open Field Test results showed that the lowest latency period was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (6±0.78 sec.) in comparison to control group (32.43±1.52 sec.) while the highest latency period was recorded insignificantly in chicks whose eggs dipped in 2µg/ of Enrofloxacin (29±1.61 sec.). The highest number of lines crossed by both feet was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (31.43 ±2.7) in comparison to control group (12.43 ±1.02) while the lowest number of lines crossed by both feet was recorded insignificantly in chicks whose eggs dipped in 2µg/ml of Enrofloxacin (14 ±1.87). The highest number of jumps was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (8.85 ±0.3) in comparison to control group (1.14 ±1.0) while the lowest number of jumps was recorded insignificantly in chicks whose eggs dipped in 2µg/ml of Enrofloxacin (2 ±0.17). The highest number of defecation times was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (1.6 ±0.23) in comparison to control group (0.86 ±0.26) while the number of defecation times were insignificant in the rest of groups. Both of call and backing times in all groups were insignificant in comparing with control group. Results for Tonic Immobility Test showed that shortest time needed by the chick to upright itself and stand unaided was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (1 sec. ±0.1) in comparing with control group (2 sec. ±0.11) while the longest time needed by the chick to upright itself and stand unaided was recorded insignificantly in chicks whose eggs dipped in 2µg/ml of Enrofloxacin (1.8 sec. ±0.1). Pre-incubation dipping of fertile eggs in Enrofloxacin concentrations showed insignificant changes in body weight, body length, leg length, wing length and beaker length. We concluded that using low concentrations of of Enrofloxacin and Ciprofloxacin to dip eggs in has resulted in minimized neurotoxic and teratotgenic effects.

Keywords: Omphalitis, Chicks, Fertile eggs, Enrofloxacin, Neurotoxicity.

Introduction

Early death of chicks frustrates and confounds aviculturists and professional alike. The reasons that chicks die are many therefore the serious aviculturist should seek to work with an experienced avian veterinarian who can help with all facets of aviculture. During the last 40 years the market age of broiler chicks has been reduced by approximately one day every year (1). This trend is continuing and emphasizing the importance of growth during the first week of life which presently constitutes 16% of the life span of the broiler. There are so many infectious organisms that can be transferred from the hen to the egg that may cause the egg to die including those which may infect the egg yet the chick may continue developing and may even hatch carrying the organism at hatch time (2).

Records of mortality during the first few days of brooding have been used to assess the quality of chicks in the broiler industry. Out of

total mortality 30- 50% occurs in first week of life (3). Omphalitis is one of the major problems of the early life of chicks which can be defined as a bacterial infection of the navel resulting from navel failure to close properly following the drawing of the yolk sac into the abdominal cavity and it occurs due to the entrance of bacteria present in the surrounding environment(4).

Different types of bacterial agents are attributed for causation of yolk sac infection or omphalitis in chicks such as *Proteus spp*., *Enterobacter spp.*, *Pseudomonas spp*., *Klebsiella spp.*, *Staphylococcus spp.*, *Streptococcu spp*., *Clostridium spp*., *Bacillus cereus* and *Enterococcus* (5). *Escherichia coli* (*E.coli*) is the most common contaminant of yolk sacs in chickens and about 70% of chicks with omphalitis had this bacterium in their yolk sacs(6).

Antibacterial are low to medium molecular weight compounds exhibiting a variety of chemical and biological properties, having the ability to kill or inhibit the bacterial growth, either produced naturally or synthesized in the lab. The use of antibacterial in veterinary field began soon after it was used for the treatment of bacterial diseases in humans. (7) has referred to the principle use of antibacterial in animal production was the treatment, prevention and control of diseases as respiratory disorders, mastitis, gastrointestinal infections, arthritis and other infectious bacterial diseases and also as feed additives to promote growth and improve feed efficiency **.**

In poultry, antibacterial are used extensively for treatment and prevention of several diseases, as well as to improve feed efficiency and promote growth (8). Moreover it helps to eliminate stress due to vaccination, environmental changes, debeaking and the other management practices (9). Fluoroquinolone is one of the antibacterial agents, introduced in veterinary medicine as enrofloxacin, has a fluorine atom attached to the central ring system, typically at the 6-position or C-7-position (10). Fluoroquinolone has been mentioned by Blondeau, (11) are bactericidal by inhibiting bacterial DNA replication and transcription through two mains targets of the topoisomerase family, DNA Topoisomerase II (Gyrase) and the DNA Topoisomerase IV (Topo IV) (12).

Fluoroquinolones are well tolerated with fewer adverse effects that are not very serious, especially when compared to their benefits (13). The most common side effects of enrofloxacin are digestive disorders including nausea, abdominal discomfort, vomiting and diarrhea. However some more serious adverse effects of enrofloxacin could appear targeting the juvenile joints and tendons have been mentioned by (14). Also some more adverse effects could appear targeting the reproductive system, the ocular system and the central nervous system (15 and 16). Lim *et al* (17) has mentioned that arthropathy, articular cartilage degeneration, tendonitis and other forms of tendon injury are the best known adverse effects of enrofloxacin concern the joints of young animals. The mechanism underlying fluoroquinolones-induced tendinopathy and cartilage degeneration suggesting that enrofloxacin-induced tendinopathy and cartilage damage could be attributed to the inhibition of cell proliferation, induction of apoptosis and DNA fragmentation (18). Also (19) have referred to Fluoroquinolones as one of the antibacterial agents most commonly associated with neurotoxic effect including seizures, encephalopathy, optic neuropathy, peripheral neuropathy and exacerbation of myasthenia gravis. Structure toxicity relationship shows that the C-7 substituent on the quinolone nucleus, particularly piperazine, plays an important role in the CNS effects of these compounds (20). The CNS excitatory action of quinolones is based on the binding inhibition of gamma amino butyric acid (GABA) to the receptors (21). Other receptors possibly involved in the CNS excitatory effects include N-methyl-D-aspartate, adenosine and amino acid receptors while effects on dopamine and opioid receptors has also been suggested (22)**.**

Bellaris and Osmond (23) described a series of stages encompassing the entire period of chicken incubation (21 day) based on the external feature, they defined three main phases: early, middle, and late stages based on(24).

The classical Hamburger and Hamilton staging table is widely used in classifying

development of the chick embryo into 45 stage, they used different prominent morphological changes and developmental features to classify different phases of development: The initial stages (1 to 6 day) are characterized by the development of the primitive streak, a thin opaque band of cells that extends from the edge of the embryonic disc as (25) has mentioned, followed by formation of major recognizable regions of the embryo e.g. head, trunk and tail, then specific organs such as limbs, eyes and lungs (26 and 27) The middle stages (7 to 14 day) are defined primarily by the number of somites and related features, 3) The late developmental stages (15 to 21 day) are identified by several typical morphological features and grouped by a series of standard measurable features. However, toward the end of development, the chick does not undergo further morphological changes and only increases in size; therefore, these late stages require identification by objective measurements such as the length of beak and third toe (28). Thus the study aimed to observe possible teratogenic and anomalies that may result from pre incubation dipping of fertile eggs enrofloxacine.

Materials and Methods

Fifty eggs (Ross 318) were collected and stored for a maximum period of two days prior to initiation of the experiments. The eggs were incubated with their broad end up in an automated incubator and set at a temperature of 37C^{o} and a humidity of 60–65%. Eggs were turned automatically every 6 h until the last 3 days before hatch. Eggs were candled; the unfertilized eggs were culled out.

Stock solutions were prepared by mixing 0.1ml from enrofloxacin with 300 ml of sterilized distilled water, to prepare the concentrations of (2µg/ml, 4µg/ml, 6µg/ml, 8µg/ml, and 10µg/ml) for enrofloxacin. Temperature differential technique mentioned by (29) was used to bring antibacterial solution into the egg through the shell pores. Eggs were warmed at 37C^{o} for 3 hours, followed by immediate dipping in prepared solutions kept in refrigerator at 4Co. Warming of eggs force egg content to expand and when they are cooled down egg content shrank allowing the solution to be sucked in.

Neurotoxic study: were assessed in newly hatched chicks by applying :

a) Open Field Activity (30) .
b) Tonic Immobility Test (31).

Open field activity: Forty two non-infected newly hatched chicks at age of 5-7 days were divided into six groups of seven chicks each. Each chick was placed alone on the center of the arena of an open-field box (60 cm×60 cm×23 cm), the arena was divided into 16 equal squares. In the open-field test the following behavioral patterns were measured within 5 min as described by (30):

1. Latency to move from center of arena.
2. Lines crossed by both feet (ambulation).
3. Number of escape jumps.
4. Frequency of defecation times.
5. **Score of distress calls (vocalization).**

Calls	Score
No calls	**0**
1-2 calls	**1**
3-4 calls	**2**
5 calls or >	**3**

6. **Score of peaking.**

Peaking	Score
No peaking	**0**
1-2 peaking	**1**
3-4 peaking	**2**
5 calls or >	**3**

Each chick was subjected to the immobility test only once without any habituation trial . Tonic immobility test: Forty two non-infected newly hatched chicks at age of 5-7 days were divided into six groups of seven chicks each. Each chick was subjected to tonic immobility test. It was induced by holding the chick in both hands and placing it in lateral recumbency on a wooden table for 15 second, the hands were then withdrawn and the chick was timed to upright itself and stand unaided (31) as shown in (Fig.3).For Teratogenic Assessment: Forty two non-infected newly hatched chicks at age of 5-7 days were divided into six groups of seven chicks each. Teratogenic effects were assessed by observing the following parameters as described prevesouly(30) :

1- Body weight was recorded at the first week of their age.

Body weights of chicks were recorded from day (7th – 42nd day age)

2-Body length was recorded at the first week of their age.
3-Leg length was recorded at the first week of their age.
4-Wing length was recorded at the first week of their age.
Peak length was recorded at the first week of their age.
Statistical Analysis: Data were analyzed statistically by using Graph Pad Prism® version 7.0. Statistical analysis of data were performed on the basis of variance (ANOVA) utilizing a significant levels of ($p<0.05$). Differences between groups were resolved utilizing least significant differences (LSD) (32).

Results and Discussion

Enrofloxacin was used as reference antibiotics, E .coli was sensitive significantly ($p<0.05$) to Enrofloxacin in a dose dependent concentrations of 2, 4, 6, 8 and 10 µg/ml (Table,1). Minimum inhibitory concentrations (MIC) were determined by using of broth dilution assay method for both Enrofloxacin 30% and Ciprofloxacin 20% according to National Committee for Clinical Laboratory Standareds (33). Results showed that MIC of Enrofloxacin was 0.2µg/ml while MIC of Ciprofloxacin was 0.8µg/ml, which is meant that *E.coli* isolates were sensitive to Enrofloxacin MIC and Ciprofloxacin MIC those results findings are similar to those interpretive criteria to set break points for Enrofloxacin and Ciprofloxacin mentioned by National Committee for Clinical Laboratory Standareds (33).

Neurotoxic Effect of Enerofloxacin :

I-Open field activity: Forty two non-infected newly hatched chicks at age of 5-7 days were divided into six groups of seven chicks each and the following behavioural patterns were measured within 5 min. as shown in (Table, 2). Results showed that the lowest latency period was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (6 sec.±0.78) in comparison to control group (32.43±1.52 sec) while the highest latency period was recorded insignificantly in chicks whose eggs dipped in 2µg/ of Enrofloxacin (29 ±1.61 sec).

The highest number of lines crossed by both feet was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (31.43 ±2.7) in comparison to control group (12.43 ±1.02) while the lowest number of lines crossed by both feet was recorded insignificantly in chicks whose eggs dipped in 2µg/ml of Enrofloxacin (1.87± 14) .The highest number of jumps was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (8.85 ±0.3) in comparison to control group (1.14 ±1.0) while the lowest number of jumps was recorded insignificantly in chicks whose eggs dipped in 2µg/ml of Enrofloxacin (2 ±0.17). The highest number of defecation times was recorded significantly in chicks whose eggs dipped in 10µg/ml of Enrofloxacin (1.6 ±0.23) in comparison to control group (0.86 ±0.26) while the number of defecation times were insignificant in the rest of groups. Both of call and backing times in all groups were insignificant in comparing with control group.

Table, 1: Antibacterial activity of Enrofloxacin against *E.coli.*

Con.(µg/ml) Zone of inhibition (mm)	2 µg/ml	4 µg/ml	6 µg/ml	8 µg/ml	10 µg/ml
Enrofloxacin	16.0±0.81 D a	20.8±0.26 C a	22.0±0.42 B a	23.0±0.70 A a	**24.0±0.51 A a**
D.W	**0.0±0.0 A b**	**0.0±0.0 A b**	**0.0±0.0 A b**	**0.0±0.0 A b**	**0.0±0.0 A b**

*Different capital letters mean significant ($p<0.05$) results between different concentrations.
*Different small letters mean significant ($p< 0.05$) results between solvent and enrofloxacin.

Table, 2: Open field Observations of newly hatched chicks whose eggs were dipped in different concentrations of Enrofloxacin.

Groups	No. of Chicks	Age of day	Open Field Observation					
			Latency Period/Sec	Ambulation/ Times	Number of Jumps	Defecation/ Times	Calls/ Times	Becking/ Times
(A) Control group	7	5-7	32.43 ± 1.52 A	12.43 ±1.02 A	1.14 ±0.1 A	0.86 ±0.26 A	2.4 ±0.1 A	1 ±0.02 A
(B) Egg dipped in 2µg\ml of Enro. conc.	7	5-7	29 ±1.61 A	14 ±1.87 A	2 ±0.17 A	0.86 ±0.26 A	2.6 ±0.2 A	1 ±0.02 A
(C) Egg dipped in 4µg\ml of Enro. conc.	7	5-7	22.57 ±1.49 A	17.71 ±2.41 A	3 ±0.2 A	0.57 ±0.2 A	3 ±0.2 A	1 ±0.02 A
(D) Egg dipped in 6µg\ml of Enro. conc.	7	5-7	16.71 ±1.61 B	20.57 ±0.9 B	4.4 ±0.2 B	1.1 ±0.22 A	3 ±0.2 A	1 ±0.02 A
(E) Egg dipped in 8µg\ml of Enro. conc.	7	5-7	10 ±1.21 C	28 ±1.5 C	7.4 ±0.3 C	1.2 ±0.23 A	3 ±0.2 A	1 ±0.02 A
(F) Egg dipped in 10µg\ml of Enro. conc.	7	5-7	6 ±0.78 C	31.43 ±2.7 C	8.85 ±0.3 C	1.6 ±0.23 B	3 ±0.2 A	1 ±0.02 A
Least Significant Difference			4.76	5.53	1.8	0.71	0.31	0.1

*Values represent mean ± S.E.

*Different capital letters mean significant ($p<0.05$) among the groups.

II- Tonic immobility Test:

Forty two non-infected newly hatched chicks at age of 5-7 days were divided into six groups of seven chicks each. Each chick was subjected to tonic immobility test (Table, 3) Results showed that shortest time needed by the chick to upright itself and stand unaided was recorded significantly in chicks whose eggs dipped in10µg/ml of Enrofloxacin (1 Sec. ±0.1) in comparing with control group (2 ±0.11 sec) while the longest time needed by the chick to upright itself and stand unaided was recorded insignificantly in chicks whose eggs dipped in 2µg/ml of Enrofloxacin (1.8 ±0.1 sec).

Table, 3: Tonic immobility test applied on newly hatched chicks whose eggs were dipped in different concentrations of Enrofloxacin.

Groups	No. of Chicks	Age of day	Time/sec
(A) Control group	7	5-7	2±0.11 A
(B) Egg dipped in 2µg\ml of Enro. conc.	7	5-7	1.8±0.1 A
(C) Egg dipped in 4µg\ml of Enro. conc.	7	5-7	1.6±0.14 B
(D) Egg dipped in 6µg\ml of Enro. conc.	7	5-7	1.2±0.14 C
(E) Egg dipped in 8µg\ml of Enro. conc.	7	5-7	1±0.1 C
(F) Egg dipped in 10µg\ml of Enro. conc.	7	5-7	1±0.1 C

*Values represent mean ± S.E.

*Different capital letters mean significant ($p<0.05$) among the groups.

Consumption of quinolones coupled with the problem of inappropriate prescriptions can result in increased incidence of adverse effects as been mentioned by Mohammed *et al* (30) of particular importance is the central nervous system (CNS) adverse effect which including: seizures, encephalopathy, optic neuropathy, peripheral neuropathy and exacerbation of myasthenia gravis (19). There are several mechanisms by which quinolones affect CNS functions. These include pharmacokinetic interactions with other drugs which act on the CNS, a pharmacological action of the quinolones alone, direct and/or a pharmacodynamic interaction between quinolones and other drugs in the CNS. In an attempt to explain the underlying mechanisms, the adenosine or GABA receptor has been

proposed as a possible target for fluoroquinolones (34). More frequently seizures have been roughly correlated with fluoroquinolones binding at the GABAA receptors in the brain, thus blocking the natural ligand, GABA, leading to CNS stimulation. The effect on the GABA receptor it is likely that it is coupled with other mechanisms that increase the penetration fluoroquinolones into the CNS to produce the toxicity (35). The piperazine or piperdine groups at position c-7 of fluoroquinolones play an important role in CNS effects by inhibiting binding between GABA and its receptor. This decrease GABAergic inhibition leads to stimulation of the CNS and a series of nervous system adverse effects (36). Agents like Enrofloxacin and Ciprofloxacin demonstrate high-affinity binding to GABAA and interfere with GABA binding to its receptor (37). Neurobehavior is a sensitive indicator of the influence of toxicants on the integral CNS in animals and can reflect effects on sensation, motor control, attention and motivation. It can be used to detect changes in brain functions in a comprehensive and unbiased way (38).

To assess the neurotoxic effect of Enrofloxacin in newly hatched chicks which eggs were dipped into different concentrations of Enrofloxacin (2µg/ml, 4µg/ml, 6µg/ml, 8µg/ml and 10µg/ml), Open Field and Tonic Immobility Tests have been employed for this purpose (30). The behavioral paradigms of open-field activity and tonic immobility tests present novel tasks and challenging environment for the test animal to deal with according to the activity status of the CNS (39). These are robust observational tests, but can be considered markers of behavioral anomalies and provide initial insights on the possible general central actions of drugs and chemical agents in the test animal (40). For Open Field Test, behavioral analysis of newly hatched chicks their ages ranged between 5 to 7 day old showed that increasing the concentrations of antibacterial solutions have significantly produced a state of hyperactivity by mean of lessening time of latency period (29±1.61) to (6±0.78), increasing times of ambulation (14±1.87) to (31.43±2.7), increasing number of jumps (2±0.17) to (8.85±0. 3) and increasing defecation times (0.86±0.26) to (1.6±0.23) in comparing with control group as shown in table (2). For Tonic Immobility Test, one of the most commonly used fear tests for poultry, behavioral analysis of newly hatched chicks their ages ranged between 5 to 7 day old showed that increasing the concentrations of antibacterial solutions have significantly decreased time needed by chick to upright itself and stand unaided from (1.8±0.1) to (1±0.1) in comparing to control group as shown in table (4-19), The enhanced tonic immobility is believed to be reflection of heightened fear (41).

Results findings of Open Field and Tonic Immobility Tests can be attributed to the fact that Enrofloxacin as fluoroquinolone compound have the ability to inhibit the interaction of gamma amino butyric acid with the receptors, thus preventing γ-aminobutyric acid (GABA) transmission (42). γ-aminobutyric acid (GABA) is inhibitory neurotransmitter acts at inhibitory synapses in the brain by binding to specific transmembrane receptors in the plasma membrane of both pre and postsynaptic neuronal processes causes the opening of ion channels to allow the flow of either negatively charged chloride ions into the cell or positively charged potassium ions out of the cell results in a negative change in the transmembrane potential, usually causing hyperpolarization (43). In another word prevention of GABA transmission by fluoroquinolone compounds can increase nervous system activity by increasing transmission of nerve impulse and locomotor activity. As nerve impulse travels down an axon changing in polarity across the membrane of the axon. In response to signal from another neuron, sodium (Na+) and potassium (K+) gated ion channels open and close as the membrane reaches its threshold potential. (Na+) channels open at the beginning of the action potential and (Na+) moves into the axon causing depolarization. It was reported that prenatal disruption of signaling mechanisms of central neurotransmitters by drugs may alter postnatal behavioral development and performances (44). During the past few decades it has become increasingly evident that animal embryos are subjected to the toxic effects of

many drugs.Post Natal Teratogenic Effect of Enrofloxacin:Forty two non-infected newly hatched chicks at age of 5-7 days were divided into six groups of seven chicks each. Teratogenic effects were assessed as shown in (Table, 4) by observing a number of parameters. Results showed insignificant changes in body weight, body length, leg length, wing length and beaker length.

This study also was aimed to assess teratogenic effect of Enrofloxacin in newly hatched chicks which eggs were dipped into different concentrations of Enrofloxacin (2µg/ml, 4µg/ml, 6µg/ml, 8µg/ml and 10µg/ml), measurements of body weight/Kg of one day old and 45 day old, body length/cm, leg length/cm, wing length/cm and beaker length/cm of one day old were taken.The chick quality has gained increased importance for hatcheries and also for broiler producers because it has been accepted as an indicator of broiler growth performance. It is known that there is a critical relationship between the day-old chick quality and post-hatch broiler performance (45). When optimum incubation conditions are provided, yolk sac is absorbed exactly by embryos and navel of chicks is closed well; thus the number of good quality chick increases and early stage chick mortality due to uncovered navel or yolk sac and *E. coli* infections can be reduced (46). The relationship between chick quality parameters was studied by (47) found that quality parameters were linked with each other; for example, chicks with poor condition of the navel area were low-quality chicks and it was highly correlated with the conditions of the appearance and activity.

Results showed insignificant changes in measurements of body weight/Kg of one day old and 45 day old, body length/cm, leg length/cm, wing length/cm and beaker length/cm of one day old as shown in table (3). These results findings may be attributed to the low concentrations of Enrofloxacin in which eggs were dipped in, in another word less concentrations available to bind yolk the less inhibitory effect of antibacterial on DNA gyrase the enzyme essential for negative super helical twisting into double stranded DNA in the rapidly divided embryonic cells. The complete damage of DNA could be resulted in embryo lost or resorption, while partial damage could be induced embryo malformation (48). These results are disagreed with those recorded by (27), who reported high resorption ratio and malformations in rats exposed to Enrofloxacin during pregnancy.

Table (4): Teratogenic effects of different concentration of Enrofloxacin were assessed by observing the following parameters.

Groups	No. of Chicks	Body Weight (1 DAY) /KG	Body Length (cm)	Leg Length (cm)	Wing Length (cm)	Beaker Length (cm)	Body Weight (45DAYS) /KG
(A) Control group	7	0.12 ±0.002 A	13 ±0.05 A	7 ±0.04 A	7 ±0.04 A	1 ±0.02 A	1.85 ±0.04 A
(B) Egg dipped in 2µg\ml of Enro. conc.	7	0.12 ±0.003 A	12.9 ±0.0.3 A	6.9 ±0.09 A	7 ±0.02 A	1 ±0.04 A	2 ±0.05 A
(C) Egg dipped in 4µg\ml of Enro. conc.	7	0.12 ±0.005 A	12.9 ±0.1 A	7 ±0.09 A	6.9 ±0.04 A	0.9 ±0.04 A	1.87 ±0.03 A
(D) Egg dipped in 6µg\ml of Enro. conc.	7	0.13± 0.007 A	12.9 ±0.07 A	7 ±0.05 A	6.8 ±0.04 A	1.01 ±0.03 A	1.89 ±0.02 A
(E) Egg dipped in 8µg\ml of Enro. conc.	7	0.13± 0.006 A	12.9 ±0.1 A	7.1 ±0.05 A	7.1 ±0.04 A	0.9 ±0.03 A	1.9 ±0.02 A
(F) Egg dipped in 10µg\ml of Enro. conc.	7	0.13 ±0.004 A	13 ±0.1 A	7.2 ±0.09 A	7 ±0.02 A	1 ±0.02 A	2 ±0.04 A
Least Significant Difference		0.004	0.2	0.9	0.87	0.12	0.3

*Values represent mean ± S.E *Different capital letters mean significant (<0.05) among the groups.

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تقييم التأثيرات السمية العصبية والماسخة للإنروفلوكساسين في افراخ الدجاج المعرضة لالتهاب السرة

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الخلاصة

هدفت هذة الدراسة الى التحري عن التأثيرات السمية العصبية و الماسخة و التي ممكن ان تنتج عن التغطيس المسبق للحضن لبيض الدجاج المخصب بتراكيز مختلفة من الانروفلوكساسين كأجراء وقائي ضد التهاب السرة.تم فحص حساسية جرثومة الاشريكيا القولونية ضد تراكيز الانروفلوكساسين المختلفة (2 و 4 و6 و 8 و 10) مايكروغرام/ بالمليتر. تم تقسيم اثنا واربعون فرخ حديث الفقس غير مصاب بالتهاب السرة و بعمر (5-7) ايام ست مجاميع وبواقع 7 افراخ لكل مجموعة لغرض اجراء اختباري الميدان المفتوح وتقييد الحركة. اظهرت نتائج اختبار الميدان المفتوح ادنى فترة كمون (الفترة التي يستغرقها الفرخ ليتحرك من وسط الميدان) في الافراخ التي تم تغطيس بيضها بتركيز 10مايكروغرام/مل من الانروفلوكساسين حيث بلغت (6± 0.78 ثانية) مقارنة مع مجموعة السيطرة (32.43 ± 1.52 ثانية) اما اعلى فترة كمون فقد سجلت في الافراخ التي تم تغطيس بيضها بتركيز 12مايكروغرام/مل من الانروفلوكساسين حيث بلغت (29 ± 1.61 ثانية). اعلى عدد خطوط تم اجتيازها من قبل الافراخ سجلت في الافراخ التي تم تغطيس بيضها بتركيز 10مايكروغرام/مل من الانروفلوكساسين حيث بلغت (31.43 ±2.7) مقارنة مع مجموعة السيطرة (12.43± 1.02) اما ادنى عدد خطوط تم اجتيازها من قبل الافراخ سجلت في الافراخ التي تم تغطيس بيضها بتركيز 12 مايكروغرام/مل من الانروفلوكساسين حيث بلغت (14.0 ± 1.87). اعلى عدد قفزات تم تسجيله في الافراخ التي تم تغطيس بيضها بتركيز 10مايكروغرام/مل من الانروفلوكساسين حيث بلغ(8.85 ±0.3) مقارنة مع مجموعة السيطرة(1.14 ± 1.0) اما ادنى عدد قفزات تم تسجيله في الافراخ التي تم تغطيس بيضها بتركيز 12 مايكروغرام/مل من الانروفلوكساسين حيث بلغ (2 ± 0.17). اعلى عدد لمرات التغوط تم تسجيله في الافراخ التي تم تغطيس بيضها بتركيز 10مايكروغرام/مل من الانروفلوكساسين حيث سجل (1.6 ± 0.23) مقارنة مع مجموعة السيطرة (0.86 ± 0.26). كلا من معياريي الصوت والنقر لم يسجلا اهمية احصائية مقارنة مجاميع السيطرة. اظهرت نتائج اختبار تقييد الحركة ان اقصر وقت استغرقه الفرخ لتصحيح وضعية جسمه بدون مساعدة (1 ± 0.1 ثانية) في الافراخ التي تم تغطيس بيضها بتركيز 10مايكروغرام/مل من الانروفلوكساسين مقارنة بمجموعة السيطرة (2±0.11ثانية) اما اطول وقت استغرقه الفرخ لتصحيح وضعية جسمه بدون مساعدة (1.8± 0.1 ثانية) في الافراخ التي تم تغطيس بيضها بتركيز 12مايكروغرام/مل من الانروفلوكساسين. لم يظهر التغطيس المسبق للحضن لبيض الدجاج المخصب بتراكيز مختلفة من الانروفلوكساسين اي تغيرات في وزن الجسم، طول الجسم، طول الساق، طول الجناح وطول المنقار.

الكلمات المفتاحية: التهاب السرة، الدجاج، بيض مخصب، الانروفلوكساسين، تاثيرات سمية عصبية.