EFFECT OF IN OVO INJECTION OF SOME NUTRIENTS AND VITAMINS UPON IMPROVING HATCHABILITY AND HATCHING PERFORMANCE OF OSTRICH EMBRYOS

By

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ABSTRACT: The present study was carried out in co-operation between the Poultry Production Unit, Nuclear Research Center, Atomic Energy Authority, Cairo, Egypt and Ostrich Farm belonging to Faculty of Agriculture, Al-Azhar University. In an effort to improve the hatchability and hatching performance of ostrich eggs via testing the effect of in ovo injection of several nutrients and vitamins, as no similar and complete data could be found on this aspect in the literature. A total of 90 fertile ostrich eggs weighed between 1300 and 1500 g. Eggs were divided into 9 groups as 10 eggs in each group. Eggs were injected at the 7th day of incubation to deposit test material in the air sac through the width end of the egg. The first group without injection (control), while, the second and third groups were injected with 1ml saline. The fourth, fifth and sixth groups were injected with 35, 10, and 1.5 mg proline, pyridoxine and biotin dissolved in 1 ml saline and seventh and eighth groups were injected with 180 and 350 IU Vit.D$_3$, Vit.E, respectively and the ninth group was injected with 2gm linolenic acid, hatchability and hatching performance were determined. The Results indicated that: the group of fertile ostrich egg received 180 IU Vit.D$_3$ injection realized the highest hatchability and embryo hit percent. In addition, hatchability was positively affected by both vitamin pyridoxine and biotin injection compared to non-injected group. While, in ovo injection with linolenic fatty acid improved the embryo hit percent. Vitamin E, proline and saline injected groups had more number of deaths after injection or just before pipping of chicks. Finally, In conclusion from the results reported in the present work we advise injection with Vit.D$_3$ in ostrich eggs with 180 IU to improve the hatchability of ostrich eggs and embryo hit percent.

INTRODUCTION

Hatchability of artificially incubated ostrich eggs was generally low and varied, ranging from 33% to 80% of fertile eggs hatching (Mushi et al., 2008; Dzoma and Motshegwa, 2009). Embryonic mortality reaches its maximum during the last few days of incubation (Deeming, 1995; Brown et al., 1996). Unfortunately, very little is known about the patterns of embryonic mortality in the ostrich. Moreover, 34 to 52% of the fertile egg failed to hatch and need assistance to hatch (if chick has not externally pipped after 12 hours of internally pipping we have to help them out) (Nashat, 2005). Unfortunately, the practice of helping chick out is common in the ostrich industry (Deeming, 1993). The lack of improved hatchability of ostrich eggs over the last twenty years may be associated with various factors including diet of the breeder hen.

Very little is known about the role of parent nutrients and the effect of nutrient...
deficiency in the embryonic mortality and hatchability of ostrich eggs (Brake et al., 1994). In attempt to solve the problems of the high rate of ostrich embryonic mortality, hatching performance of ostrich eggs and effectively helps hatchlings in their struggle to emerge from the shell and consequently, improve the hatchability (Uni and Ferket, 2004; Foye et al., 2006). However, since it is difficult to control egg composition via hen nutrition (breeder feed), in ovo feeding (direct application into the egg) offers a promising solution to provide developing embryos with the essential nutrients (Uni and Ferket, 2003). It can be commercially applied to achieve a better return on investment. The ability to directly supply growing embryos with in ovo technology with specific nutrient compounds may decrease the need for long-term formulation of enriched rations for maternal diets to achieve similar effect. In ovo injections may also provide a more accurate dose at the specific time for peak absorption of specific nutrients, cofactors by the embryo (Surai et al., 1999). Unfortunately, to our knowledge no studies were found for in ovo nutrients administration in ostrich eggs. Further research on improving hatchability should be a priority will lead to increased economic returns to the ostrich industry. Successful embryonic development is essential to ostrich industry profitability (Schaal and Cherian, 2007).

A number of studies have clearly demonstrated the importance and role of vitamin D₃ in chick embryonic development. The presence of cholecalciferol in eggs is very important to support the embryo Ca metabolism during incubation (Narbaitz and Tsang, 1989).

Pyridoxine (vitamin B6) and Biotin are water-soluble vitamins (Bender, 1999), any deficiency results in embryonic growth retardation that leads to its death and eventually results in poor hatchability.

linolenic acid, an essential omega-3 fatty acid required for normal development of the brain, nervous tissue and retina (Cherian and Sim, 2001), seems to have a basic role for embryo viability in ostrich (Sussi et al., 2003).

Vitamin E is the major fat-soluble antioxidant, which has been proven to reduce harmful peroxidation of lipids and cholesterol (Singh et al., 2005). The role of vitamin E administered in ovo has also been reported to have improved the immune response and immunoglobulin (IgM and IgG) levels of chicks (Gore and Qureshi, 1997), may enhance the ability of the chick to produce energy for hatching and the antioxidant status of hatched chick tissues and protect lipid membranes from the harmful effects of radical oxygen species (Schaal, 2008).

L-Proline is an amino acid that is essential for the synthesis of collagen (Gloria et al., 2002). Collagen is the main structural protein of connective tissues, including skin, tendon, blood vessels, bone, ligaments and joints. Therefore, the present study aimed to offer new insight for hatchability improvement in ostrich eggs via injecting the incubated fertile eggs with some vital nutrients. Therefore, this study was planned to: Test the effect of in ovo injection of some nutrients and vitamins such as proline, pyridoxine, biotin, vit.D₃, vit.E and linolenic acid upon hatchability and hatching performance of ostrich embryos.

**MATERIALS AND METHODS**

The present study was carried out in cooperation between the Poultry Production Unit, Nuclear Research Center, Atomic Energy Authority, Cairo, Egypt and Ostrich Farm belonging to Faculty of Agriculture, Al-Azhar University.

**Ostrich eggs and incubation**

This experiment was carried out on a total number of 90 ostrich eggs weighed between 1300 and 1500 g obtained from hens fed on ostrich breeder ration (Table 1). Birds were fed 2.5 kg formulated...
In-ovo injection, Ostrich eggs, hatchability

breeder diet/ bird/day. The ingredient composition of the breeder diet and its content of essential fatty acids as recommended by NRC, (1994) are presented in (Table 1). Ostrich eggs were weekly obtained from healthy parents stock raised in hygiene conditions in patches of 30 eggs from Risk Company for Ostrich Production Nasr City, Cairo, Egypt and incubated in El-Shafey Farm, Belbas, Sharkia, Egypt using multi stage incubator. Eggs were collected daily as soon as possible after laying and cleaned immediately with a dry clean cloth, disinfectant solution sprayed on the surface of each egg and the shell was wiped dry with a clean toilet paper (Deeming 1997). Eggs were stored for up to 7 days in a clean storage room at 18 °C and 69 % relative humidity as recommended by Gonzalez et al., (1999). Each egg was numbered, weighed and incubated at 36.5°C and 25 % humidity up to 39 days. On day 39, the fertile eggs were transferred to the hatcher up to hatching. Temperature and humidity during hatch were 36°C and 40 % RH.

Table (1): Composition and calculated analysis of breeder diet.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow corn</td>
<td>10</td>
</tr>
<tr>
<td>Soybean meal 44%</td>
<td>20</td>
</tr>
<tr>
<td>Wheat bran 12%</td>
<td>15</td>
</tr>
<tr>
<td>Alfa Alfa meal ,15 %</td>
<td>50</td>
</tr>
<tr>
<td>Corn oil</td>
<td>1</td>
</tr>
<tr>
<td>Yeast</td>
<td>0.3</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>1</td>
</tr>
<tr>
<td>Limestone</td>
<td>2</td>
</tr>
<tr>
<td>Salt (Nacl)</td>
<td>0.1</td>
</tr>
<tr>
<td>Premix**</td>
<td>0.5</td>
</tr>
<tr>
<td>DL-Methionine 99%</td>
<td>0.1</td>
</tr>
<tr>
<td>Total, kg</td>
<td>100</td>
</tr>
<tr>
<td>**Calculated analysis %</td>
<td></td>
</tr>
<tr>
<td>Crude protein</td>
<td>18.5</td>
</tr>
<tr>
<td>ME kcal/kg</td>
<td>2802</td>
</tr>
<tr>
<td>**Fatty acid</td>
<td></td>
</tr>
<tr>
<td>Lauric (C12:0)</td>
<td>0.005</td>
</tr>
<tr>
<td>Myristic (C14:0)</td>
<td>0.009</td>
</tr>
<tr>
<td>Palmitic (C16:0)</td>
<td>0.660</td>
</tr>
<tr>
<td>Palmitoleic (C16:1)</td>
<td>0.037</td>
</tr>
<tr>
<td>Stearic  (C18:0)</td>
<td>0.059</td>
</tr>
<tr>
<td>Oleic  (C18:1)</td>
<td>0.354</td>
</tr>
<tr>
<td>Linoleic (C18:2)</td>
<td>0.981</td>
</tr>
<tr>
<td>Linolenic (C18:3)</td>
<td>0.422</td>
</tr>
<tr>
<td>Arachidonic (C20:4)</td>
<td>0.002</td>
</tr>
</tbody>
</table>

** with ingredient indicated as follows: Vit.A 10000 IE ,VD₃ 1500 IE, Vit.E 3 mg, Vit.B1 (Thiamine)2mg , Vit., B2 (Riboflavin)8mg, Pantothenic Acid 19mg , Choline 1.430 mg ,Vit. B6 (pyridoxine) 5 mg, Niacin 57 mg, Biotin 0.2 mg, Folic acid 1.5 mg, Manganese 75 mg , Zinc 80 mg, Iron 100 mg, Copper 8 mg , Iodine 0.5 mg, Cobalt 0.5 mg and Selenium 0.2 mg.
In Ovo treatments

On the seventh day of incubation, fertile eggs were divided into 9 groups as 10 eggs in each group, each of 10 eggs, taken out of the incubator, candled and the width end of the eggs to be injected was sterilized with 70% ethanol. After sterilization of the surface, an injection was made according to the method of injection described by Elarousi et al., (1993), the first group without injection (control), while, the second group was injected in the width end of the egg with 1ml saline. The third, fourth and fifth groups were injected in the width end with 35, 10, and 1.5 mg proline, pyridoxine, biotin dissolved in 1 ml saline while the sixth and seventh groups were injected in the width end with 180 and 350 IU of Vit.D₃ and Vit.E, respectively. The eighth group was injected with 2g Linolenic acid. All injected eggs were returned immediately to the incubator, and maintained at the same temperature and humidity until the 39 day, eggs were transferred to hatching trays for the next 5 days or until hatching occurred. On the day of hatch, hatched chicks from each treatment were recorded to express hatchability as a measure of the effectiveness of the drug injected, and non-hatched eggs examined to determine embryo status (dead after injection - pipped assisted- non-pipped assisted- embryo hit and hatched (%)). Hatchability was recorded as percent of fertile eggs that hatched in each treatment as following equation:

\[
\text{Hatchability \%} = \frac{\text{Number of eggs hatch}}{\text{Number of fertile eggs}} \times 100
\]

Statistical analysis:
The chi-square test was used to show statistical significance in In ovo injection treatments with hatchability percentage.

RESULTS AND DISCUSSION

In ovo injection of ostrich eggs during incubation and hatchability traits:

The Effect of in ovo injection with amino acid proline, pyridoxine and biotin, Vit.D₃ (cholecalciferol), Vit.E and linolenic acid on hatchability of ostrich eggs are presented in Table (2). In general it was observed that the group of fertile ostrich egg received 180 IU Vit.D₃ by injection realized the highest hatchability and embryo hit percent. In addition, hatchability was positively affected by both vitamin pyridoxine and biotin injection compared to non-injected group. While, in ovo-injection with linolenic fatty acid improved only the embryo hit percent compared to non-injected group. It is appearing from the same Table that vitamin E, proline and saline injected groups had more number of deaths after injection or just before pipping of chicks.

The increase in hatchability of ostrich eggs, which was reported in this study following Vit.D₃ injection, confirmed the results of Ameenuddin et al., (1983) who observed that injections of chicken eggs with 0.20 micrograms/egg of 1, 25-dihydroxy vitamin D₃ or 0.60 micrograms/egg 25-hydroxy vitamin D₃ prior to incubation resulted in significant improvement in embryonic survival to hatching with lowest embryonic mortality, they indicated that 1,25-dihydroxy vitamin D₃ may be more active in supporting embryonic survivability when delivered directly by injection, since the embryo cannot synthesize 1,25(OH)₂D₃. Narbaitz and Tsang, (1989) reported that injection of vitamin D₃-deficient chicken embryos with 10 ng calcitriol, 1 microgram 24,25-(OH)₂D₃, or 2 micrograms 25OHD₃...
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on the 14th day of incubation improved hatchability, bone and muscle weights, and both bone mineralization and resorption than in the controls. Also, Elaroussi et al., (1993) reported that the injection of vitamin D$_3$-deficient Japanese quail embryos [from hens fed 1,25-dihydroxycholecalciferol (1,25-(OH)$_2$D$_3$)] die at Day 15 of incubation from severe calcium deficiency with Single doses of 125 to 1,250 ng cholecalciferol, 600 ng 24,25-dihydroxycholecalciferol [24,25-(OH)$_2$D$_3$], or 100 ng 1,25-(OH)$_2$D$_3$ per egg prior to incubation resulted in improving hatchability. Hart and Deluca, (1984) reported that injecting the affected eggs (embryos with a defective upper mandible) from the 1, 25-dihydroxy vitamin D$_3$ fed hens with vitamin D$_3$, 25-hydroxy vitamin D$_3$, or 1, 25-dihydroxy vitamin D$_3$ greatly increases the percentage of normal embryos. They concluded that 1, 25-dihydroxy vitamin D$_3$ is not transferred from hen to egg in sufficient amounts to support embryonic development and that vitamin D$_3$ or its metabolites, or both, are necessary for normal chick embryo development and normal egg hatchability. In ovo administration of cholecalciferol supporting sustained development of the skeleton, mobilization of shell calcium, and prevention of hypocalcemia, probably because cholecalciferol is utilized slowly as needed to support development of the chick skeleton (Elaroussi et al., 1993). Calcitriol treatment of chick embryos enhanced calcium uptake by the yolk sac as measured in vivo (Tuan and Ono, 1986) and in vitro (Lee and Clark, 1993). Narbaitz et al., (1987) and Richards, (1996) reported that the vitamin D$_3$ metabolites (1, 25(OH)$_2$D$_3$) are required by the embryo in order to mobilize calcium from the shell, across the chorioallantoic membrane (CAM) and decreased hatchability in vitamin D$_3$-deficient embryos is related to a defect in calcium mobilization from the shell. One mechanism of action of vitamin D$_3$ in the mobilization of eggshell calcium is the activation of carbonic anhydrase that acidifies the calcium carbonate shell (Elaroussi et al., 1994). They showed that, a single injection of 100 ng of 1,25-(OH)$_2$D$_3$ into vitamin D$_3$-deficient quail eggs at day 10 of incubation resulted in a significant increase in both body and yolk calcium. This is accompanied by an increase in carbonic anhydrase from low levels in deficiency to normal levels. Also, vitamin D$_3$ has an important role for early embryogenesis and skeletal embryonic development in the regulating mobilization of egg yolk calcium by the yolk sac during the first 10-12 days of development.

Further injections of 1,25-D$_3$ into eggs only partially restores hatchability and there is evidence that another dihydroxylated metabolite, 24,25-dihydroxy vitamin D$_3$, is needed in addition to 1,25-D$_3$ for full hatchability. Thus, both cholecalciferol and 25-D$_3$ in the diet of the hen can meet the full needs of the hatching chick for vitamin D$_3$. A number of studies have clearly demonstrated the importance and role of vitamin D$_3$ in chick embryonic development. The presence of cholecalciferol in eggs is an important factor in the calcium metabolism of the developing embryo during incubation, and feeding the hen inadequate vitamin D$_3$ results in reduced hatchability related to late embryo mortality (Edwards, 1995; Tuan and Suyama, 1996).

The increase in hatchability of ostrich eggs, which was reported in this study following pyridoxine injection, confirmed the results of Elsayed et al., (2010) who reported that injection of quail eggs with 120 µg/egg pyridoxine (B6) before incubation resulted in apparently higher hatchability (89.0 %) than in un-injected control (79.9 %). Also, Elaroussi et al., (2003) reported that the injection of quail eggs with 10 mg/egg pyridoxine (B6) at 7 day of incubation period resulted in improving hatchability (86.7%) compared to (75.8%) control (non-injected).
Bhanja et al., (2007) reported that the injection of chicken eggs with 100 µg/egg pyridoxine (B6) at 14 day of incubation period resulted in apparently higher hatchability (81.5%) than in un-injected control (80%). Vitamin B6 plays an important role in the synthesis and degradation of aspartate aminotransferase in the chicken embryo (Sharma and Gehring, 1987). Pyridoxine has an important role in amino acid, carbohydrate, and fatty acid metabolism and also plays a major role in the energy-producing citric acid cycle (McDowell 1989). Deficiency of pyridoxine leads to early embryonic death and decreased IgM and IgG response to antibody challenge (Blalock et al., 1984).

The increase in hatchability of ostrich eggs, that was reported in this study following biotin injection, confirmed the results of Robel and Christensen, (1987) and Robel, (2002) who found that the injection of turkey eggs with 87 µg/egg D-biotin at 25 day of incubation period resulted in approximately 4.6% higher hatchability than the control (non-injected). The improvement in hatchability was due to a reduction in the numbers of early dead and late dead in shell embryos. Also, Couch et al., (1948) reported that eggs from breeders fed biotin-deficient diets produced healthy embryos after the eggs were injected with biotin between 72 and 96 hours of incubation. Biotin is important water-soluble vitamin, biotin is a cofactor in carboxylation and decarboxylation reactions involving fixation of carbon dioxide. These reactions have important roles in anabolic processes and in nitrogen metabolism (Calnek et al., 1997).

Biotin is vitamin with important characteristics due to the presence of the inhibitors avidin and ovoflavoprotein in egg albumen, which affects biotin levels or biotin availability in the egg, and its availability to the embryo, and may affect egg hatchability (Robel, 1987; Vieira, 2007). Biotin deficiency alters the unsaturated fatty acids profile in tissue lipids in such a manner as to suggest that it impairs the conversion of linoleic acid to arachidonic acid (Watkins and Kratzer, 1987). The latter is a precursor of the prostaglandins, prostacyclin I₂ and thromboxane A₂, which have marked effects on the vascular system. Robel, (1991) observed that feeding turkey hens 623 micrograms of biotin/kg of diet resulted in an increase in the hatchability with observed reduction in the embryonic deaths (early dead, late dead in shell embryos). Robel, (2002) reported that with the progression of maternal age, higher dietary biotin level was required for hatchability and chick weight.

As a result, the hypothesis that in ovo feeding of exogenous linolenic fatty acid would increase hatchability can not be supported. However, the use of linolenic fatty acid has been implicated in increased the embryo hit percent (the ability of chick to break the shell without assistance). This result is in agreement with that obtained by Schaal, (2008) who reported that the injection of broiler breeder eggs with 0.1gm/egg the alpha-linolenic acid on day 14th of incubation resulted in apparently lower hatchability (55%) than in injected group with saline (80%). This finding suggest that the improvement of the embryo hit percent may be due to the increasing of embryonic viability during incubation where the alpha-linolenic acid (LNA), polyunsaturated fatty acid (PUFA), an essential omega-3 fatty acid. Providing embryos with exogenous fatty acids may allow for increase energy production, as well as allow for more polyunsaturated fatty acid accretion in vital tissues during the stressful process of hatching. The yolk fat of an egg is crucial to the development of the chicken embryo in terms of energy production. Nearly 80% of the 5-6g of lipids found in the yolk of the chicken egg is absorbed by the embryo for energy production and structural membrane synthesis (Noble and Cocchi, 1990; Cherian et al., 1996; van Kempen and
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McComas, 2002). As a result, fatty acid oxidation provides over 90 percent of the energy requirements for the chick embryo (Romanoff, 1960). With such important roles in energy production for the embryo, fat sources are essential to fuel the heart and for deposition of polyunsaturated fatty acids (PUFA) in tissues such as the brain (Cherian and Sim, 1992).

The hypothesis for in ovo feeding of exogenous vitamin E and proline cannot be supported as hatchability was not increased. It is appearing from the Table (2) that vitamin E group caused more number of deaths after injection or just before pipping of chicks. This result is in agreement with that obtained by Bhanja et al., (2007) who documented that hatchability percentage in the vitamin E (0.5 IU) injected group was apparently lower (54.7%) than in un-injected control (80%) in broiler breeders. However, Schaal, (2008) reported that chicks that received Vit.E in ovo hatched at a slightly higher rate (88% for both 10 IU and 20 IU treatments) than the non-injected control in broiler chicken (85.4%). Further studies by Singh et al., (2005) showed the importance of vitamin E as the major fat-soluble antioxidant, the use of antioxidant vitamin E has been proven to reduce harmful peroxidation of lipids and cholesterol in animal models. The antioxidant system of the brain is of great importance because of the development of nutritional encephalomalacia which occurs in young chicks as a result of vitamin E deficiency. The role of vitamin E administered in ovo has also been reported to have improved the immune response and immunoglobulin levels in turkeys and broilers as measured by increased the IgM levels of poults and the IgG levels of chicks when measured 7 and 14 th days, respectively, after embryonic exposure to Vit.E (Gore and Qureshi, 1997). Low quality fats added to diets of breeder hens as an inexpensive energy source may be counteracted with the in ovo administration of antioxidants to protect the lipids of the yolk as well as the plasma membranes of chicks’ cells from damage. Increased incidence of peroxidation of membrane lipids caused by free radical species may cause harm to the health of the developing embryo.

It is appearing also from the Table (2) that amino acid proline group had more number of deaths after injection or just before pipping of chicks. This finding disagree with the result obtained by Elaroussi et al., (2003) who reported that in ovo administration of amino acid proline 1 mg/quail egg at 7 day of incubation resulted in significant increase in the hatching weight and hatchability (92.8%) of quail egg as compared to control (non-injected) 75.8%. They showed the important of proline in embryogenesis.

The decrease in hatchability of ostrich eggs, that was reported in this study following Proline injection may be due to Proline is a nonessential amino acid, which means that it is manufactured from other amino acids in the liver; it does not have to be obtained directly through the diet. Although proline can be made in the body and biosynthetically derived from the amino acid L-glutamate (Lehninger et al., 2000). This is confirmed by Ohta et al., (1999, 2001) and Al-Murrani, (1982) who reported that all amino acids content of egg decreases as incubation time increases and that all amino acids content of egg and embryo decreases, except glycine and proline, which increased with progress of incubation.

As a result, the hypothesis that in ovo feeding of exogenous linolenic fatty acid would increase hatchability cannot be supported. However, the use of linolenic fatty acid has been implicated in increased the embryo hit percent (the ability of chick to break the shell without assistance). Also, the hypothesis for in ovo feeding of exogenous vitamin E and proline cannot be supported as hatchability was not increased. On the other side, the hypothesis for in ovo feeding of exogenous Vit.D₃,
pyridoxine and biotin can be supported as hatchability was improved. **Finally,** In conclusion from the results reported in the present work it is advised that injection with Vit.D$_3$ in ostrich eggs with 180 IU improves the hatchability of ostrich eggs and embryo hit percent. In addition, hatchability was positively affected by both pyridoxine and biotin injection compared to non-injected group.

**Table (2):** Effect of in ovo injection with saline, proline, pyridoxine, biotin, Vit.D$_3$, Vit. E, and Linolenic acid on hatchability of ostrich eggs.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Egg types</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Death after injection (%)</td>
</tr>
<tr>
<td>Non-injected</td>
<td>30</td>
</tr>
<tr>
<td>Saline carrier 1ml</td>
<td>50</td>
</tr>
<tr>
<td>Oil carrier 1ml</td>
<td>50</td>
</tr>
<tr>
<td>Proline 35mg</td>
<td>50</td>
</tr>
<tr>
<td>Pyridoxine 10mg</td>
<td>20</td>
</tr>
<tr>
<td>Biotin 1.5mg</td>
<td>20</td>
</tr>
<tr>
<td>Vit.D$_3$ 180 IU</td>
<td>0</td>
</tr>
<tr>
<td>Vit. E 350 IU</td>
<td>50</td>
</tr>
<tr>
<td>Linolenic acid 2gm</td>
<td>30</td>
</tr>
</tbody>
</table>

*On the bases of fertile eggs.*

![Internal pipping](#) ![External pipping](#)
In-ovo injection, Ostrich eggs, hatchability

Hatch without assistance

Non-pipped assisted

Pipped assisted

Embryo hit and hatched
REFERENCES


Brake, J., Davis, G.S., Rosseland, B., and Delfel, S. (1994). Further refinements in the incubation and
In-ovo injection, Ostrich eggs, hatchability


In-ovo injection, Ostrich eggs, hatchability


الملخص العربي
تأثر حقن بعض العناصر الغذائية والفيتامينات على تحسين الفقس والأداء لأجنة النعام

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*قسم التطبيقات البيولوجية - نسمة الطاقة النووية - هيئة الطاقة النووية

تمت هذه الدراسة بالتعاون بين وحدة بحوث الدواجن - قسم التطبيقات البيولوجية - مركز البحوث النووية - هيئة الطاقة النووية - وتحقيقية.

الطاقة النووية وكلية زراعة جامعة الأزهر في يناير 2009 لدراسة اختبار تأثير حقن بعض العناصر المخصب بالعديد من العناصر الغذائية والفيتامينات في تحسين نسبة الفقس. حيث لا توجد دراسة مشابهة ومعلومات كاملة متعلقة بهذا الموضوع من البحث.

تم استخدام عدد 128 بيضة مخصبة من مزرعة شركة راسك لانتاج الفقس مقسمة إلى 9 مجموعات للحقن على أربعة ترددات من التغذية داخل الغرفة الهوائية: مجموعة كونترول: مجموعة لحقن 10 مللي مللي لكل بيضة، مجموعة لحقن 1 مللي مللي لكل بيضة (محمض البيونين). مجموعة لحقن 35 مللي مللي لكل بيضة (محمض البيونين). مجموعة لحقن (350 مللي مللي) وحدة دولية (محمض فيتامين هـ) وحدة دولية (محمض فيتامين د) وحدة دولية (محمض فيتامين 350 مللي مللي).

وقد اقتبض النتائج على ما يلي:

1. وجد أن المجموعة التي تم حقن البيض فيها بجرعة 180 وحدة دولية من فيتامين D كانت أعلى المجموعات في نسبة الفقس وكذلك نسبة الكتاكليك التي خرجت بدون مساعدة في كسر القشرة.
2. حققت المجموعة التي تم حقن البيض فيها بجرعة 10 و1.5 مللي مللي (محمض البيونين) بمستويات ألبان في نسبة الفقس أعلى من مجموعات أخرى مكونة الغير محفزة.
3. كان للأحمض دهني غير مشبع (الدوسير) فعال في تأثيرها إيجابياً زيادة نسبة الكتاكليك التي خرجت بدون مساعدة في كسر القشرة.
4. خفضت نسبة الفقس في جميع البيض المحفزة بكل من الحمض الأميني البرولين 35 مللي مللي (ويذك فيتامين هـ) ووحدة دولية (نتيجة زيادة نسبة نفوذ الأجنة بعد الحقن وقبل القشرة مباشرة).

ومن النتائج السابقة فإننا ننصح بحقن بيض النعام من فيتامين هـ بجرعة 180 وحدة دولية حيث زادت من معدلات الفقس ونسبة الكتاكليك التي خرجت بدون مساعدة في كسر القشرة.