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Oviductal Motility of Hens of Different Stages of Reproduction

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IMMATURE and adult birds in different reporductive phase of Baladi breed were chosen for this investigation. Results obtained showed that up to the age of 3 months, oviducts failed to show any rhythmic contraction, but the motility was very feeble and irregular in oviducts of 4 months old chicks. At 5 months old, the oviductal motility was still feeble but rhythmic and by the 6 *th* month, segments from oviducts of still immature birds showed stronger contractions than those mentioned previously. Hens with egg in the tract showed the highest amplitude and maximal frequency of contractions and consequently they had the highest activity index "frequency × amplitued". Birds with empty oviducts, as well as those in amoulting state showed very week oviductal motility. The magnum was almost of the highest amplitude, while the uterus showed the maximal frequency but minimal amplitude. It was also observed that as the egg remained in the tract, both of the magnum and isthmus showed strong motility, while the uterine motility strengthened only just before and during oviposition, but it was feeble during shell deposition and just after laying.Also the normal oviductal motility of high reproductive capacity hens was stronger than that of poor layers.

The first studies concerning the oviductal motility were performed (*in vitro*) by Mckenney *et al.* (1932). They showed that the oviduct responded only when used immediately after removal. Furthermore, only oviducts from reproductive hens gave satisfactory results. More advanced studies concerning the motility of the genital tract in female R.I R. were performed by Chen and Hawes (1969), using a Grass model 7 polygraph. They observed that the increases in ovary and tract weight with age was positively correlated with the magnitude but not with the frequency of contractions. They also noticed that the tract motility in immature birds was augmented by exogenous estrogens to resemble that of nature ones. Verma and Hawes (1970) showed that both the amplitude and frequency of contractions were shown to be increased at post-oviposition in all areas, except the uterus which showed a slight decrease.

Material and Methods

Birds used in this study were taken at random at the age of two weeks, from the flock bred by the Poultry Research Centre, Animal Science Department, Faculty of Agriculture, Cairo University. This experiment included 175 white Baladi chickens reared at about 20 months of age. These experiments were conducted (*in vitro*) to determine the normal motility for magnum, isthmus and uterus of approximately one inch length , representing the whole duct was recorded in birds at one, two, three, four, five and six months old for the immature birds. Also, for hens of different reproduction capacity and different cyclic behaviour and at pre-oviposition and post-oviposition. Each segment was suspended in oxygenated Dale's solution and its normal motility was recorded on smoked drum paper slowly moving. Both the amplitude (average height in mm) and frequency (contractions / 10 min) of the contractions were recorded for each portion and from these an activity index (frequency amplitude) was calculated according to Verma and Hawes (1970). A minimum of 5 birds was used to calculate the means for each tract area at each tages.

The apparatus used was the glass jar bath. It consisted of :

1. A glass container, consists of a botromles screw cap jar of aproximate 75 ml. Capacity fitted into metal stand in which was lacated a movable electric heater to adjust the water temperature about 40-52°.

2. A glass inner vessle of about 50 ml capacity, passes through the bottom of the stand and was connected to a bottle at a high level containing fresh Dale's solution.

3. Platinium ripped oxygen tube (glass conula) held by means of a clamp fitted to one of the two stand uprights. On the other stand there was a lever for recording on smoked kymographic drum paper slowly moving.

The apparatus was prepared by adjusting the temperature in the outer bath at about 40-40°. In this respect Mckenny *et al.* (1932) reported that the temperature of the bath should be maintained at about 37°. Filling the organ bath with Dale's solution and allowing oxygen or air bubbles to pass through it at the rate of 50-60 bubbles/min.

Freshly sacrificed birds, without anaesthesia, were used. The abdominal wall of the bird was opened, then the entire oviduct was carefully removed and immersed in a dish filled with Dale's solution. Strips of about one inch long from each of magnum, isthmus, uterus were suspended in the oxygenated physiological solution of the inner bath. Then the cever was left to record the normal motility. Three organ baths were in use so that the response of the circular and longitudinal muscles from the same hen could be compared simultaneously.

Dale's solution was prepared by dissolving 90 sodium chloride, 42 g of potassium chloride, 2.4 g of calcium chloride and 0.05 g of magnesium chloride in one litre of distilled water. A 200 ml of this solution was completed to 2 litre and one g of each of glucose and sodium bicarbonate was then added.

Results and Discussion

A. Oviductal motility for immature birds

At the age of 3 months oviducts failed to show any rhythmic contractions, but the motility was very feeble and irregulain oviducts of 4 months old chicks. As 5 months old, the oviductal motility was still feeble but rhythmic. Reaching 6 months, segments from oviducts of immature pullets showed much stronger contractions than those mentioned previously, specially when the comparison concerns the amplitude of waves.

B. Oviductal motility for adult hens

1. *For hen at sexual maturity* : It is evidently noticed that uterus showed the highest frequency followed by the isthmus and the magnum, while the highest amplitude was in the magnum followed by the isthmus and uterus (Table1). An activity gradient was observed, with the uterus showing the greatest activity followed by the magnum andisthmus.

2. *For hens with egg in magnum* : It is clear that the magnum showed the greatest activity in both the amplitude and frequency of contractions (Table 1). A greater activity index for isthmus than that for the uterus was observed. However, there was no increase in frequencyuterine contractions than for the isthmus.

3. *For hens with egg in isthmus* : As the egg reached the isthmus, it is obviously clear that frequency of contractions is greatest for uterus and minimum for the magnum. While the amplitude of contractions was greatest for magnum and minimnm for uterus. However, activity index showed an activity gradient, being greater for uterus followed by the isthmus and magnum (Table 1).

4. *For hens with incomplete egg in uterus* : It is noticed from Table 1 that the greatest frequency of contractions is for isthmus followed by the other two portions. The height of waves was maximal for magnum and minimal for uterus. An activity grandient is shown, with the magnum showing the greatest activity followed by the isthmus and the uterus.

5. *For hens during oviposition* : The uterus had the greatest activity followed by the isthmus and magnum. The frequency of contractions was greatest for uterus and least for magnum, while its height was maximal for magnum and minimal for uterus (Table 1).

6. *For hens just after ovipositions* : The magnum showed the greatest activity having maximal amplitude followed by isthmus and uterus, while the frequency of contractions was nearly equal for the three portions with a slight increase for the uterus (Table 1).

7. *For hens during interval* : During the pause between cycle, all the segments were greatly inhibited as compared with other stages previously examined. However, within the three portions the uterus showed the greatest activity having the greatest frequency of contractions followed by the isthmus and magnum, while the amplitude of contractions was maximal for magnum and minimal for uterus (Table 1).

TABLE 1. The normal oviductal morility (± S.E.) at different stages.

Stages	Magnum			Isthmus			Uterus		
	Frequency	Amplitude	Activity index	Frequency	Amplitude	Activity index	Frequency	Amplitude	Activity index
1. At sexual maturity	5.6±0.23	16±1.00	89.6	6.8±0.44	10±0.63	68.0	13±1.3	8.0±0.54	104
2. For hens with egg in magnum	16.8±0.56	30±1.26	504.0	8±1.25	10±1.28	80.0	9.2±0.47	8.0±1.04	73.6
3. For hens with egg in isthmus	3.2±0.29	20±1.61	64.0	5.6±1.37	12±1.72	67.2	11.2±0.75	8.0±0.83	80.6
4. For hens with incomplete egg in uterus	7.2±0.62	26±2.02	187.2	10.8±0.35	12±0.89	129.6	7.2±0.52	6.0±0.71	43.2
5. For hens during oviposition	14±1.82	14±1.30	198.0	18±1.92	11±0.89	198.0	32±1.52	7.0±0.92	224.0
6. For hens just after oviposition	5±0.83	11±0.89	55.0	5±0.71	7±0.71	35.0	6±0.71	5.0±0.17	30.0
7. For hens during pause	24±0.57	7±0.92	16.8	4±0.20	6±0.24	24.0	8±0.83	3.0±0.2	24.0
8. For non-laying hens	4±0.30	5±0.83	20.00	8±1.25	3±0.20	24.0	16±1.00	1.0±0.15	16.0
9. For hens of one egg laying cycle	14±1.31	16±..06	224.0	11±0.89	9±0.46	99.0	22±0.31	4.0±0.20	88.0
10. For hens of long sequence	7±0.70	35±0.88	245	10±0.56	18±1.30	180.0	14.4±1.04	9.0±0.46	129.6
11. For hens during moult	6±0.71	3±0.20	18.0	8±0.25	3±0.20	24.0	18.±1.92	1.5±0.06	27.0

8. *For non-laying hens* : The three portions showed an activity index similar to that obtained previously in hens during the pause. However, within the three portions the is isthmus showed the greatest activity followed by the magnum and uterus. In respect to frequency of contractions it was greatest for uterus followed by isthmus and magnum, while the amplitude of contractions was maximal for magnum and minimal for uterus (Table 1).

9. *For hens of one egg laying cycle* : It is clear that the magnum showed the greatest activity followed by isthmus and uterus. Amplitude of contractions was maximal for magnum and minimal for magnum and minimal for uterus, while its frequency was greatest for uterus and least for isthmus (Table 1).

10. *For hens of long sequency* : The oviduct showed greater activity than that obtained previously in hens of one egg cycle. However, within the three regions the isthmus showed the greatest activity followed by the magnum and uterus. The uterus showed greatest frequency and minimal amplitude of contractions, while the magnum had the least frequency but maximal amplitude (Table 1).

11. *For hens during moult* : the oviduct was nearly in a quiescent state resembling that for non-laying hens obtained previously. However, within the three regions, the uterus had the greatest activity followed by isthmus and magnum (Table 1).

The normal oviductal motility for the three regions of the tract; magnum, isthmus and uterus, as examined in the organ bath showed that only oviducts from reproductive hens gave satisfactory contractions (*in vitro*), on the other hand specimens from immature birds or from those at quiescent stage do not contract spontaneously. This may depend on the size and weight of the oviduct and ovary which are generally influenced by age as well as by the reproductive phase and the existing hormones. Kaupp (1918) and Hall (1926). claimed that the dimensions of the oviduct showed a great variability during the period of maximum reproductive activity. In this respect, Hafez and Kamar (1955), reported lhat in non-laying phase the length and weight of the oviduct were significantly less than those at onset of laying. Moreover, Smith *et al.*(1956), noticed that the hen's reproductive organs and their component parts exhibit cyclic morphological changes (weight/length) during different reprodutive phases.

On examining the motility of the uterus (*in vitro*), it gave contractions characterized by increased frequency and decreased amplitude, resembling those obtained by Sykes (1955) on the vagina. He, moreover added that the contractions of the vagina are different from those of the uterus. Verma and Hawes (1970), described the uterine activity and said that the uterine motility was decreased following oviposition in contrast to the increased activity in the other tract areas. Verma and Hawes results correspond to that obtained

in this present study. This variability in the activity could be a result of muscle fatigue caused by the continued stretching of the uterus during the period of shell formation or may be due to the rapid fall in the blood levels of posterior pituitary hormones following oviposition.

It is evidently seen in this present study that the activity of the oviduct is consistently higher in the hens with ovulated eggs in the tract than the non-ovulated ones. On comparing the motility of the different regions of the oviduct, it was noticed that the motility of the uterus differs from that of the magnum and isthmus, being of smaller amplitude and generally but not always of greater frequency. On the other hand, the magnum showed the greatest amplitude while the isthmus showed moderate activity of both the amplitude and frequency. This consistent variation in the activity of the different parts may be a result of the difference in their histological structure since the wall of both the magnum and uterus are markedly thick due to the presence of muscular tissues.

It is very interesting to notice that during moult the motility of the oviduct is diminihed to a great extent. This could be explained by the excessive decrease in the development of the oviduct and the decreased levels of the different hormones. This agrees with Smith *et al.* (1956) who reported that the reproductive organs of laying hens decreased greatly in size often a moult inducing stimulus.

References

Chen, T.W. and Hawes, R.O. (1969) Genital tract motility in the female chickens. *Poultry Sci.* 49, 640.

Hafez, E.S.E. and Kamar, G.A.R. (1955) Developmental changes in the reproductive organs of domestic fowl. Poultry Sci. 34, 1002

Hall, G.O. (1926) The relation of the internal anatomy of fowls to intensity, cycle and annual egg production. *Diss. Cornell Univ. Ithaca*, New York, P.76.

Kaupp, B.E. (1918) "*The Anatomy of Domestic Foul*". W.B. Saunders, Philadelphia, P. 373.

Mckenney, F.D., Essex, H.E. and Mann, F.C. (1932) The action of certain drugs on the oviducts of the domestic fowl.*J. Pharm. and Exp. Thera.* **45**, 113.

Smith, A.H., Bond, G.H., Ramsey, K.W., Reck, D.G. and Spoon, J.E.. (1956) Involutlan of the reproductive organs of hens. *Poultry Sci.* **36**, 346.

Sykes, A.H. (1955) The effect of adrenaline one oviduct motility and egg production in foul. *Poultry Sci.* **34**, 622.

Verma, .O.P and Hawes, R.O. (1970) The effect of semen on motility of the chicken oviduct. *Poultry Sci.* **50**, 199.

حركة قناة المبيض للدجاج أثناء المراحل المختلفة من الانتاج

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يشمل هذا البحث دراسة الحركة الطبيعية للاجزاء المختلفة من قناة المبيض (المعظم ، البرزخ ، الرحم) دراسة مستفيضة فى الاعمار المختلفة وخلال المراحل الانتاجية وأيضا فى الطيور ذات الكفاءة الانتاجية المتباينة وذلك باستخدام الأجهزة خارج جسم الطائر • وكانت النتائج كما يلى :

١ ـ الكتاكيت الصغيرة (قبل النضج الجنسى) :

دلت نتائج هذه الدراسة أنه حتى عمر ٣ شهور لم يمكن تسجيل أى حركة لقناة المبيض ككل ، أذ أنه فى هذه السن المبكرة صعب تقسيمها الى مناطق ودراسة كل جزء بمفرده ، ولكنه أمكن ببلوغ الشهر الرابع تسجيل حركة متناهية فى الضعف وغير منتظمة ، الا أنه عند الشهر الخامس أخذت هذه الحركة شكل التموجات المنتظمة ولكنها ظلت ضعيفة • وعندما وصلت الكتاكيت الى الشهر السادس من العمر وقبل أن تنضج جنسيا زادت قوة هذه الانقباضات نوعا ما عن تلك سالفة الذكر •

٢ ـ الطيور البالغة (بعد النضج الجنسى) :

دلت النتائج بصفة عامة على أنه طالما كانت هناك بيضة فى القناة فى دور التكوين فان حركة الأجزاء الثلاثة تميزت بالقوة الواضحة عن تلك التى للأفراد ذات القناة الخالية أو تلك التى كانت فى دور القلش ، أما بالنسبة للتباين بين الاجزاء الثلاثة بينها فلقد وجد أن حركة المعظم تتميز بأكبر ارتفاع للانقباضات بينما كان لانقباضات الرحم أكبر تكرار ولكن مع أقل أرتفاع • وكذلك لوحظ أنه خلال وجود البيضة فى القناة فان كلا من المعظم والبرزخ كان لهما أقوى حركة بينما لم تشتد حركة الرحم الا قبيل وضع البيضة مباشرة •

الى جانب ذلك من المهم أن نقول أن حركة قناة المبيض فى الدجاجات ذات الانتاج العالى كانت أقوى من قرينتها ذات الانتاج المنخفض •