

琉球大学学術リポジトリ

鶏において排卵が放卵におよぼす影響(生物生産学科)

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Influence of Ovulation on Oviposition in the Domestic Fowl

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Summary

In hens prevented natural oviposition by a surgical means, and subsequently injected with Luteinizing Hormone (LH), the relationship between ovulation and oviposition was examined. The post-mortem examination revealed that the hens which had laid following the treatments were always accompanied by induced or natural ovulation in their body cavities. On the other hand, in the hens which had not laid for the period of observation, no ovulation occurred.

From these results it is suggested that ovulation may be closely involved in the induction of oviposition in the domestic fowl.

Introduction

In hens, time of ovulation influences time of oviposition because the induction of premature ovulation results in premature oviposition (Fraps, 1942)¹⁾. However, time of ovulation is not influenced by time of oviposition because neither premature oviposition, which can be induced by certain drugs, nor retarded oviposition, which can be produced by epinephrine, influences ovulation (Weiss and Sturkie, 1952)⁵⁾. Nakada and Tanaka (1990)²⁾ have reported that the retained egg in the uterus induced by the short-term vaginal ligation was expelled from the uterus in association with ovulation. The fact also suggests that the close relationship between ovulation and oviposition exists in the domestic fowl. To elucidate the relationship between them in more detail, the influence of induced ovulation on oviposition of the egg which was being held in the uterus by a surgical means was examined.

Materials and Methods

Hens from a commercial hybrid egg-laying stock were used. They were maintained in individual laying cages and were exposed to a 14-hr photoperiod (0500 to 1900). All hens selected for the present study exhibited clutches of more than 4 eggs, with a pause of only

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a single day. Oviposition was checked every 0.5h in the morning hours for at least three consecutive cycles. On the basis of the egg laying record of each hen, the laying hens which have been generally laid the terminal egg (Ct) of a clutch about 15:00 were used.

Hens were operated just before Ct oviposition to keep the egg in the uterus by the temporal ligation of the vagina according to the method of Tanaka (1976)⁴⁾. In hens treated so, the egg in the uterus was generally held for about 1 beyond the expected time of lay. Ovulation was induced by an intravenous injection of Luteinizing Hormone (NIH-LH-B8; LH, 0.2mg/hen dissolved in 0.9% NaCl) while the egg was being held in the uterus. All hens used in this experiment were killed and autopsied just after oviposition or 3 days after the surgery in non-laid hens.

Results

Of a total of 20 hens subjected to the short-term ligation of the vagina followed by LH injection, 15 hens laid the retained egg in the uterus 7 - 11h after LH injection while 5 hens laid nothing (Table 1). Post-mortem examination revealed that ovulated yolks were observed in body cavities in the laid hens but not in the non-laid hens. Ovulated yolks were judged as the one immediately after ovulation on the basis of the appearance of their most recently ruptured follicles.

In hens which were subjected to the same treatment as above except for LH injection, the number of hens laid and ovulated were shown in Table 2.

Table 1 Influence of induced ovulation on expulsion of the egg retained in the uterus

Treatment	No.hens treated	Time of		No.hens laid or non-laid	Post-mortem examination No.hens ovulated
		Vaginal ligation	LH injection		
Vaginal ligation and LH injection	20	Just before Ct oviposition	1-2h after vaginal ligation	Laid 15 (8.81±1.91) #	15
				Non-laid 5	0

Time interval from LH injection to lay (mean±S.D.)

Table 2 Effect of natural ovulation on expulsion of the egg retained in the uterus

Treatment	No.hens treated	Time of Vaginal ligation	No.hens laid or non-laid	Post-mortem examination No.hens ovulated
Vaginal ligation	13	Just before Ct oviposition	Laid 10 (15.28±0.42) #	10
			Non-laid 3	0

*Time interval from the expected time of Ct oviposition to actual lay in 8 hens which had laid at the next day following the treatment(mean±S.D.).

The eggs of 8 hens out of 13 hens were laid at 05:30 to 07:00 on next day following the treatment. This time corresponded to the expected time of ovulation of the first ovum (C1) of a clutch. In two hens out of the 13 hens, the time of lay was delayed and brought over the morning hours of next but 1 day. In these hens which had laid at 1 or 2 days later, autopsy revealed that ovulated yolks were observed in body cavities. These yolks were also estimated as ones ovulated near the time of lay by the morphology of the recently ruptured follicles. However, in non-laid hens, ovulation had not occurred.

Discussion

In hens, ovulation and oviposition have been considered to be independent events, since the events are controlled by different hormones. Fraps (1942)¹⁾ have suggested that ovulation might be associated with oviposition from the facts that premature ovulation resulted in premature oviposition. In the present experiment, induced ovulation or natural ovulation also gave the great influence on the time of oviposition of the egg which was beforehand held in the uterus (Table 1 and 2). Some cases showed no ovulation even with injection of LH. It suggests that the influence of ovulation on oviposition is not due to the causing factor of ovulation (LH) but due to ovulation itself. Sharp et al. (1978)³⁾ reported that the injection of an antiserum to chicken LH in laying hens caused not only to block ovulation but also to cease laying. It suggests the close relationship between ovulation and oviposition. The cessation of laying caused by antiserum suggests that the relative long interval from ovulation to oviposition in Ct egg may result from the lack of associated ovulation, while the short interval of that in mid-clutch eggs may result from having associated ovulation. However, there remain much to clarify the mechanism how ovulation induces oviposition.

References

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鶏において排卵が放卵におよぼす影響

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鶏において排卵と放卵の生理的関連性を調べるため、放卵を一時的に阻止して子宮内に卵を滞留させ、次いで卵が子宮内に滞留中にLH投与によって新たな排卵を誘起した。

その結果、LHを投与され20羽のうち投与後ほぼ9時間目に子宮内滞留卵を放出したのは15羽であった。それらを剖検したところ腹腔内に誘起排卵が認められた。一方、同様な処置した後でも放卵しなかった5羽においては排卵を認めなかった。

次に、放卵の一時的阻止の処置を行なった後LHを投与せずそのまま放置した13羽において、放置後ほぼ15時間目と3日目に8羽と2羽においてそれぞれ放卵が起った。いずれの場合でも腹腔内に自然排卵が認められた。しかし、放卵しなかった3羽においては排卵が認められなかった。

以上のことから、排卵は放卵の誘起に密接に関与していると思われた。

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