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Citation	Japanese Journal of Veterinary Research, 45(4), 224-224
Issue Date	1998-02-27
Doc URL	<a href="https://hdl.handle.net/2115/2616">https://hdl.handle.net/2115/2616</a>
Type	departmental bulletin paper
File Information	KJ00002398583.pdf



## A physiological study of egg shell formation in the domestic fowl

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There is some evidence that the effective stimulus for secretion of any part of the oviduct is mechanical. Pearl and Surface<sup>1)</sup> showed that when the intestine was anastomosed to the above the uterus the feces extruded through the vagina or retained in the uterus were covered with a deposit of shell material. They concluded that the immediate effective stimulus to shell secretion was mechanical and that shell formation was a local reflex not depend upon a specific activity of other parts of the reproductive apparatus. However, Nakada et al.<sup>2)</sup>, reported that shell formation did not always follow the introduction of agar-agar into the oviduct. The other possible factors responsible for the shell formation have not been fully understood.

To investigate this, the artificial yolk (A. Y.) which was made of 3% agar was inserted into the empty oviduct at various times before and after ovulation. The results obtained were as follows :

When the A. Y. was inserted near the expected time of ovulation, the normal set of egg envelopes including the chalazae, albumen, shell membrane and shell was formed around the A. Y., and most of eggs containing A. Y. were laid as hard-shelled eggs. On the other hand, the egg shell was not formed around the A. Y. which had been inserted into the oviduct beyond the time of ovulation or pause day of ovulation.

On the other hand, even though the A. Y. was inserted beyond the time of ovulation or pause day of ovulation, the insertion of it follow-

ing the pretreatment with estrogen led to shell formation.

When a normal oviposition of the oviducal egg was prevented from occurring by the vaginal ligation and thus the egg was kept staying for a longer period, additional shell deposition of the retained eggs took place significantly only when the next ovulation occurred and the ovum ovulated entered into the oviduct during the prolonged period of lay.

Additional shell formation was significantly advanced on the eggs which were held for 1 to 3 days in the uterus by an intramuscular injection of progesterone in spite of occurring or non-occurring of next ovulation while lay was inhibiting.

From these results it was concluded that shell formation might be achieved under the control of ovulation system, especially by estrogen or progesterone which are responsible for the system. The mechanical stimulation of the egg in the uterus to egg shell secretion might be accelerated by the combination with the ovulation system.

## References

- 1) Pearl, R. and Surface, M. F. 1909. The nature of the stimulus which causes a shell to be formed on a bird's egg. *Science*, 29 : 428-429.
- 2) Nakada, T., Koja, Z. and Tokashiki, S. 1976. Influence of ovulation and gonadal hormones on shell formation in the domestic fowl. *Jpn. Poult. Sci.*, 13 : 169-175.