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J. S. Willis

Department of Physiology and Biophysics,
University of Illinois,
Urbana.

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Thyroid Function of Friesian Cows during the Œstrous Cycle and in Conditions of Ovarian Abnormality

The physiological symptoms of heat in cows do not appear unless there is an optimal level of the thyroid hormone[1]. There is evidence that thyroid activity varies during the œstrous cycle, with maximal activity during œstrus[2–4]. Thyroidectomized cows failed to show physical signs of heat[1,5]. A low level of protein-bound iodine in the blood of infertile cows has also been demonstrated[6]. The levels of thyroid and thyrotrophic hormones in the blood of Friesian cows during œstrous cycle as compared to those affected with ovarian inactivity and cystic ovaries have been investigated as follows.

Fifty ml. of blood was obtained from the jugular veins of 58 Friesian cows, 3–7 years old. Ten were in œstrus, 10 in dicestrus, 23 affected with ovarian inactivity and 15 with cystic ovaries. The procedure for the determination of thyroid hormone was that adopted by D'Angello and Gordon[7], namely, 'the stasis tadpole method'. Tadpoles were divided into five groups of 20 each; one group was injected with saline; the other groups received five injections of 0·01 ml. of serum obtained from the four groups of cows on alternate days. Twenty-four hours after the last injection, the tadpoles were killed with chloroform and stored in 80 per cent alcohol. Their hind limbs were then measured and their length used as a criterion of thyroid hormone activity. Thyrotrophic hormone extracted from the sera of cows[8] was assayed by the use of one-day-old male chicks[9]. The chicks were injected daily with a subcutaneous injection of 0·5-ml. serum for 4 days. They were then killed by ether 24 h after the final injection. The thyrotrophic hormone level was indicated by its effect on the weight of the thyroid and expressed in terms of chick units (a chick unit represents 50 per cent increase above control).

Table 1. Levels of the thyroid and thyrotrophic hormones in the blood of Friesian cows during the œstrous cycle in comparison with those affected with ovarian inactivity and cystic ovaries

	Saline control	Œstrus	Dicestrus	Inactive ovaries	Cystic ovaries
Length of tadpole hind limbs (mm)	0·99 ± 0·33	2·42 ± 0·33	1·77 ± 0·19	1·83 ± 0·11	3·16 ± 0·17
Thyrotrophic hormone (chick unit)	—	0·34	1·59	0·26	0·00

± Standard error.

It appears from Table 1 that the level of thyroid hormone was significantly high during œstrous as compared to that of dicestrous cows. The level of thyroid hormone in cows with cystic ovaries was even higher than that observed at œstrus, but in cows affected with inactive ovaries it was similar to that of the dicestrous cow.

The thyrotrophic hormone level was highest during dicestrus and low at œstrus and in cows with inactive ovaries, while it was totally absent in cows with ovarian cysts.

In the case of œstrous cows and those with ovarian cysts the increase in the level of thyroid hormone was accompanied by a decrease in thyrotrophic hormone. On the other hand, during dicestrus decreased thyroid hormone level was accompanied by a sharp rise in thyrotrophic hormone level. In the case of animals with inactive ovaries, thyroid and thyrotrophic hormone levels were low, suggesting that such a condition accompanies pituitary hypofunction.

The increased thyroid activity at œstrus and in animals with ovarian cysts is most probably due to an increase of œstrogen in the blood[10].

F. A. Soliman
K. Zaki
M. K. Soliman
M. S. Abdo

Department of Animal Physiology,
Faculty of Veterinary Medicine,
University of Cairo.

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Serum Calcium and Phosphorus in Rabbits during Fracture Healing, with Reference to Parathyroid Activity

The level of serum androgens, and thyroid activity, are both increased in the second and third weeks after bone fracture during cellular regeneration of the callus[1,2]. The early period of catabolism was found to be accompanied by increased adrenal function[3].

The present work was planned to investigate the levels of serum calcium and inorganic phosphorus during fracture healing in rabbits. The hormone content of the parathyroid glands of these animals was also determined.

Thirty-five Boscat male rabbits of an average weight of 1·5 kg were used. They were divided into 7 groups of 5 animals each. One group was left intact and served as a control. The other groups were subjected to experimental fracture of the left tibia by a closed method under ether anæsthesia[4]. The operations were so arranged that rabbits were obtained 1, 2, 4, 8, 15 or 21 days after fracture. The animals were killed and blood samples were obtained. Double determinations of serum Ca (ref. 5) and inorganic phosphorus[6] were made. Analysis of variance was carried out to evaluate the differences between the serum Ca and P levels in the experimental rabbit groups.

The thyroid and parathyroid glands of the rabbits of each group were kept in acetone and preserved in the deep freeze. Parathyroid hormone was extracted[7] and a saline suspension of the extract was prepared so that the hormone from each animal was contained in 1·0 ml. saline. It was assayed by the method depending on its antagonism to magnesium narcosis[8]. Groups of 10 mice were injected subcutaneously with 3 doses of 0·1 ml. of the parathyroid suspension at intervals of 3 h; 90 min after the final injection the animals were given 20 mg of magnesium sulphate contained in 0·1 ml. saline. After half an hour the dead, narcotized and unnarcotized animals were counted. The percentage of animals unnarcotized is