

THE USE OF A GONADOTROPHIN RELEASING HORMONE IN CATTLE:  
CHANGES IN PLASMA PROGESTERONE AND REPRODUCTIVE EFFICIENCY  
FOLLOWING TREATMENT DURING EARLY POST PARTUM

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**OPSOMMING:** DIE GEBRUIK VAN 'N GONADOTROPIEN VRYSTELLINGS HORMOON IN BEESTE: VERANDERINGE IN PLASMA PROGESTEROON EN DIE AANTEELDOELTREFFENDHEID NA BEHANDELING GEDURENDE VROE POST PARTUM

Ondersoek is eerstens ingestel na die veranderinge in die ovaria en plasmaprogesteroon konsentrasies wat intree nadat 11 Afrikanerkoeie tussen dae 25 en 30 *post partum* met 'n nonapeptied Gonadotropien vrystellingshormoon behandel is. Agt van die 11 koeie het 'n reaksie getoon maar die aanvanklike styging in progesteron was van korte duur en waarskynlik van 'n nie lewensvatbare *corpus luteum*. Dit is egter gevolg deur 'n tweede siklus en waarskynlik 'n normale *corpus luteum*.

In 'n verdere eksperiment het 'n soortgelyke behandeling tussen dae 32 en 37 die uiteindelijke dragtigheids persentasie met 21% verhoog asook die tussenpose tussen die inplaa van hulle en besetting verkort. Die werklike beteknisvolheid van GnVh in hierdie verband is egter nie duidelik nie aangesien nie behandelde koeie ook reeds vroeg begin siklusse toon het.

**SUMMARY:**

Changes in the ovaries and in plasma progesterone concentrations following injection of a nonapeptide GnRh in 11 Africander cows between days 25 and 30 *post partum*, were studied. Eight of the 11 cows reacted by exhibiting a shortlived elevation of progesterone, presumably from a non-viable *corpus luteum*. This initial elevation was followed by a second cycle and apparently normal *corpus luteum*.

In the second experiment, a similar treatment between days 32 and 37 increased the final pregnancy rate by 21% and decreased the interval between the introduction of bulls and pregnancy. The contribution of GnRh treatment is discussed.

The annual reconception rate and the intercalving period of cattle is primarily dependent on the duration of the *post partum* anoestrous period. The duration of *post partum* anoestrus has been reported to be longer in *Bos indicus* than in *Bos taurus* cows (Alexander & Williams, 1973) and this is considered to be one of the main reasons for the low annual reconception rates in the Africander (Harwin, Lamb & Bisschop, 1967). The application of gonadotrophin releasing hormone (GnRh) to stimulate the onset of ovarian activity and ovulation in cattle during early *post partum* has been studied (Humke & Zuber, 1977; Lishman, Allison, Fogwell, Butcher & Inskeep, 1979). Injection of the decapeptide GnRh was found to cause ovulation, but a nonviable *corpus luteum* resulted (Webb & Haynes, 1976; Lishman *et al.*, 1979). In contrast, the more potent nonapeptide GnRh resulted in a normal *corpus luteum* (Humke & Zuber, 1977). These experiments were therefore planned to investigate the use of GnRh to enhance the onset of ovarian activity in the *post partum* Africander cow.

**Materials and Methods**

**Experiment 1**

Eleven lactating Africander cows, ranging from 25 to 30 days *post partum*, were injected intramuscularly (i.m.) with 20 µg GnRh (HOE 776, Receptal, Hoechst) (Day 12). For the sake of comparison a further 5 dry cows were injected with a prostaglandin (Estrumate, ICI) in order to obtain a synchronised cycle concomitant with the GnRh treatment. Blood samples were collected from the tail vein of all these cows at three- or four-day intervals, commencing immediately prior to the initial injection, at which time the ovaries were also examined by rectal palpation. Plasma progesterone was determined

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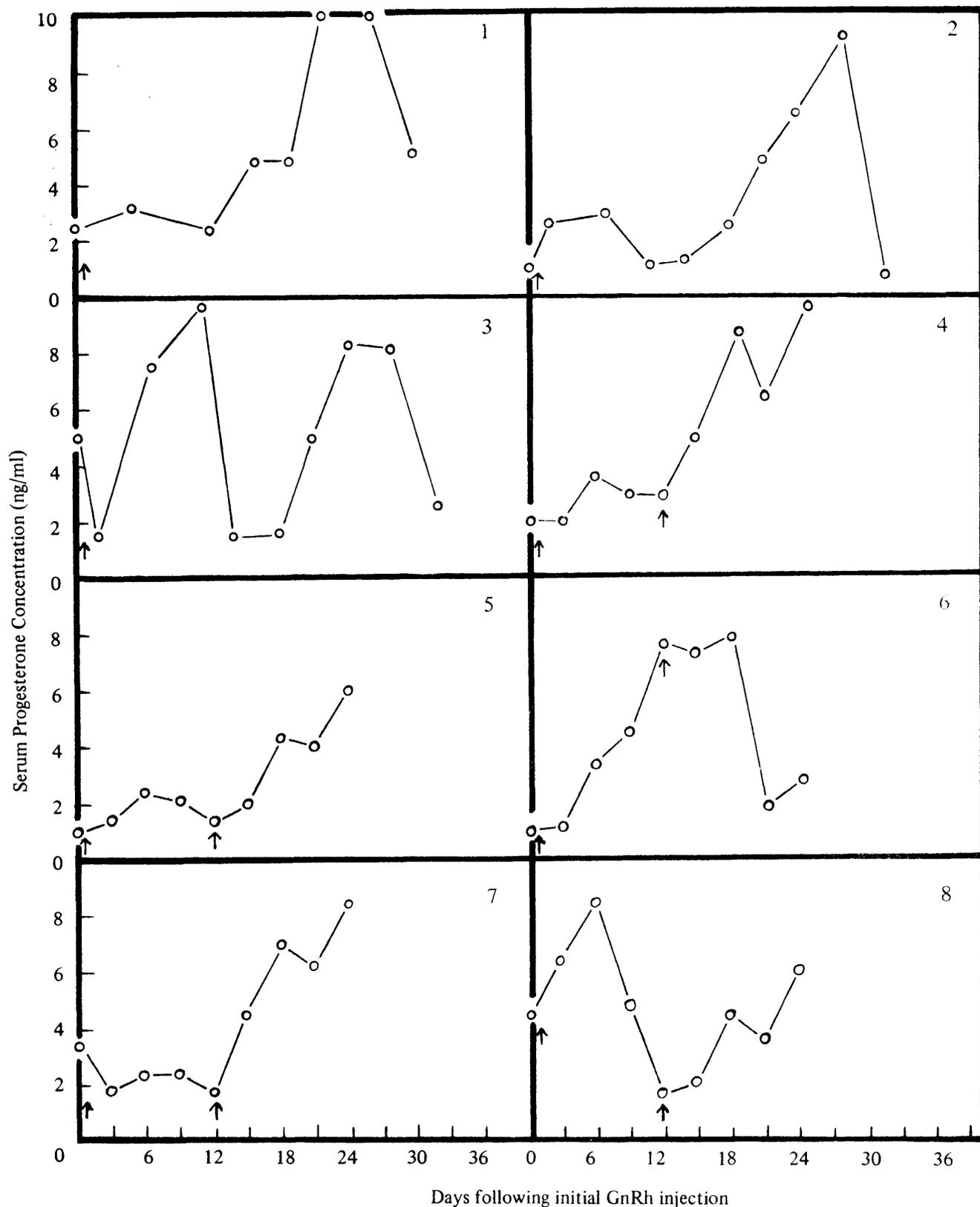


Fig. 1 Changes in the serum progesterone concentrations of cows in response to GnRh injections (↑)

by radioimmunoassay technique of Youssefnejadian, Florensa, Collins and Sommerville (1972), as modified by Faure (1975).

#### Experiment 2

Bulls were introduced, under rancing conditions, to 85 lactating Africander cows between 32 and 37 days

*post partum*. On the day of joining with the bulls 60 cows were injected with 20 µg GnRh (HOE 776, Lutal Forte, Hoechst). Ten days later 26 of these cows received a second GnRh injection. The remaining 25 cows served as controls. The bulls remained with the cows for approximately 90 days. Subsequent calving dates were used to estimate the date of conception, assuming 293 days as the duration of pregnancy (Mentz 1977).

**Table 1**

*The reproductive performance of Africander cows treated with GnRh commencing 32 – 37 days post partum*

	GnRh treatment:		
	Single injections	Two injections 10 days apart	Control
Number of cows	34	26	25
Days post partum GnRh injected	34.5	34.5	34.6
Intercalving period (days)	358.6	376.0	370.6
Interval between introduction of bulls and conception (days)	31.1**	48.5	42.4
Interval between calving and conception (days)	65.6	83.5	77.1
Conception rate	85.3	80.8	64.0

\*\* P < 0,01

**Results**

**Experiment 1**

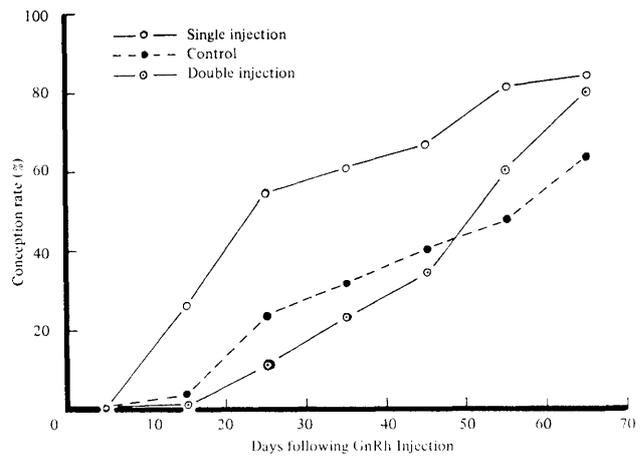
Figure 1 illustrates progesterone levels in the 8 (out of 11) treated cows which responded to GnRh treatment. The ovaries of 5 of these cows contained small corpora lutea. In 6 of the 8 cows which reacted a small, but shortlived elevation of plasma progesterone concentration. This second increase occurred irrespective of whether or not a second GnRh injection was administered. The increase in plasma progesterone concentrations measured in the GnRh-treated cows was often larger than obtained in the prostaglandin-treated dry cows.

**Experiment 2**

The injection of GnRh in *post partum* cows significantly increased (P < 0,01) the overall conception rates following the 90-day breeding period (Table 1). This treatment did not significantly decrease the intercalving period, but tended to enhance the onset of fertile oestrus and conception (Fig. 2). The double injection regime failed to enhance the onset of oestrus and conception.

**Discussion**

In the present experiments, the injection of the nonapeptide GnRh was followed by increases in the ovarian activity and plasma progesterone concentrations of early *post partum* cows. In addition it appeared to enhance



**Fig. 2** *Cumulative conception rates of cows following a single GnRh injection; two injections at a ten day interval, and control cows*

the onset of oestrous activity and conception rates of Africander cows injected approximately 35 days *post partum*. So for instance, 55% of treated cows conceived within 30 days of the introduction of bulls as compared to 24% for untreated controls.

From the plasma progesterone concentrations it is obvious that the GnRh-induced ovulation usually produces a non-viable *corpus luteum* which is subsequently followed by a second cycle in which progesterone concentrations appear normal. This unsustained *corpus luteum* following the decapeptide GnRh injection has been described by several workers (Webb, Haynes, Hafs & Lamming, 1975; Lishman *et al.*, 1979) but was not followed by a second increase in progesterone or a fertile cycle (Lishman *et al.*, 1979). In contrast, the injection of anoestrous dairy cows with nonapeptide ethylamide GnRh was followed by fertile oestrus with 48% of the treated cows conceiving within 12 days after treatment and 67,3% within 24 days (Humke & Zuber, 1977). Thus, although both these compounds release sufficient LH to induce ovulation, the more potent nonapeptide ethylamide GnRh (HOE 776) with its superior and longer lasting LH and FSH releasing properties (Crighton, 1976, Nawito, Schallenberger & Schams, 1977) appears to trigger the onset of cyclic oestrous activity which mimics the normal situation. However the elevated levels of progesterone and the presence of *corpora lutea* at the start of the first experiment and the onset of breeding activity of the control cows within 10 days of the introduction of bulls in the second experiment indicates that several cows were already approaching the end of their *post partum* anoestrous period. The success of GnRh in inducing regular oestrous cycles during early *post partum* anoestrus could therefore, in part, be due to the fact that many of these cows were approaching the endocrine threshold for the onset of oestrous cycles.

Since the intensity and duration of oestrus is affected by nutritional status and age (Meaker 1978) it is import-

ant that the response to GnRh of beef cows of different ages and nutritional status is investigated.

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