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Technical note

The effect of bromocryptine on plasma prolactin concentration and ovulation rate in ewe breeds with different fecundity rates

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Abstract

The objective of the study was to investigate the effect of bromocryptine on the neuro endocrine feedback mechanisms that control ovulation rate in two sheep breeds with different fecundity and ovulation rates (Scottish Black Face and Finnish Landrace). Bromocryptine was administered i.m. in doses of 1 mg at 12-h intervals for an entire estrous cycle (16.0 ± 0.5 days), to 12 Scottihs Black Face and 12 Finnish Landrace ewes. The aim was to record the blood prolactin levels and the effect of bromocryptine on ovulation rate. The experiment was carried out during the breeding season (November 1999) and repeated in January 2000. In the first study the ovulation rate was not affected by the low plasma prolactin (<0.5 ng/ml) levels induced by the drug. Ovulation rate in the Finnish Landrace was 2.85 ± 0.69 CLs/ewe for the control and 2.42 ± 0.53 CLs/ewe in the treated group. In the Scottish Black Face ewes, ovulation rate was 1.12 ± 0.35 and 1.37 ± 0.51 CLs/ewe for the control and treated ewes, respectively. When the experiment was repeated at the end of breeding season in January 2000, the ovulation rates were similar. It was concluded that the administration of bromocryptine during an entire estrous cycle at the beginning and the end of the mating season did not affect fecundity and ovulation rate in ewes with different prolificacies.

Keywords: Bromocryptine; Prolactin; Ovulation rate; Sheep

1. Introduction

The important role played by catecholamines in the neuroendocrine control of sexual behavior have been reported in the rat (Clemens et al., 1977; Kendall and Tongue, 1977), sheep (Jackson, 1977; Riggs and Malven, 1974; Wheaton et al., 1975), birds (El Halawani and Burke, 1976), and monkeys (Gala et al., 1978).

Kordon and Glowinski (1969) first reported dopamine to induce the release of LH in the rat and the stimulation of dopamine receptors with bromoergocryptine to reduce prolactin secretion in ewe (Nisweder, 1974; Picazo et al., 2000) and human (Strauch and Bricaire,

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1977). The drug bromocryptine is clinically used in the treatment of hyperprolactinaemic amenorrhea in women to re-establish the menstrual cycle and ovulation (Katz and Adashi, 1990; Freeman et al., 2000).

In preliminary studies a difference was recorded in the prolactin blood levels between ewes of different fecundity and ovulation rates. Ewes with a high ovulation rate (2.6 CLs/ewe) recorded lower levels of prolactin while, the plasma concentration of prolactin was significantly higher in ewes with low ovulation rate (1.9 CLs/ewe) (Fuentes, 1986).

The number of ovulations per cycle varies in different animal species. The feedback mechanisms that underline the number of ova shed per cycle are an expression of the biological balance between ovarian secretions and the central neuro transmitters that modulate the release of hypothalamic releasing factors, which in turn promote or inhibit the release of the hypophyseal gonadotrophic hormones (Dominguez-Gonzalez and Genaro, 1994; Doney et al., 1976; Fluder and Tongue, 1977; Hokfelt and Fuxe, 1972; Strauch and Bricaire, 1977; Vijayan and McCaan, 1978; Freeman et al., 2000).

In view of the important role played by dopamine in prolactin secretion (Smythe, 1977) and the experimental evidence that favors prolactin as a modulator of ovarian function (McNatty et al., 1975; Freeman et al., 2000), this trial was initiated. The aim of this experiment was to study the effect of administering the dopamine agonist bromocryptine on the ovulation rate of two breeds of sheep with different fecundity and ovulation rates.

2. Materials and methods

For the purpose of this study, 12 adult Scottish blackface ewes, 2–3 years of age with a mean body weight of 32 ± 3 kg, and 12 Finnish Landrace ewes, 3–4 years old with a mean body weight of 35 ± 3.5 kg were used based on their difference in ovulation rate (1.96 and 2.6 CLs/ewe, respectively) (Fuentes, 1986). Ewes were housed in open paddocks exposed to the natural photoperiod (latitude 19°N), fed oat hay ad libitum and supplemented with 0.4 kg concentrate per animal per day. Water was available throughout the observation period.

To detect estrus, both groups of ewes were teased twice (at 8:00 and 16:00 h) daily with the aid of vasectomised rams. Ewes displaying at least two natural consecutive cycles were selected and used in the trial. In the control and treated groups, estrus was synchronized with intravaginal sponges (40 mg medroxi progesterone acetate MAP) for 14 days. Ewes in each breed were randomly divided in groups of six animals each. One group for each breed was injected (i.m.) twice daily with bromocryptine (1 mg at 8:00 h and 1 mg at 20:00 h) while the control groups were injected with 2 ml saline. Injections were initiated on termination of the synchronized estrus, and continued until the onset of the following estrus (16.0 ± 0.5 days).

Blood samples were taken prior to injections to monitor the plasma prolactin levels, using a specific RIA assay as previously described by Fuentes (1986).

To record the effect of bromocryptine on the ovulation rate, ovaries were observed by laparoscopy 6–8 days following estrus.

The experiment was carried out in two phases, the first in November 1999 and the second repeated in January 2000. Analysis of plasma prolactin concentration and ovulation rate results was carried out using a 2×2 factorial analysis of variance (SAS).

3. Results

When the experiment was carried out during the breeding season in November 1999, it was observed that bromocryptine significantly ($p < 0.001$) decreased the blood plasma prolactin concentrations (<0.5 ng/ml) in both Scottish Black Face and Finnish Landrace ewes. Plasma prolactin levels increased in treated and control ewes on the 15th day of their cycle, reaching a peak on the 16th day, just prior to the onset of estrus. (Fig. 1).

When the corpora lutea were recorded by laparoscopy, the ovulation rate was recorded to be 2.4 ± 0.5 CLs/ewe for the treated and 2.9 ± 0.7 CLs/ewe for the control Finnish Landrace ewes. In the Black Face ewes the ovulation rate was 1.1 ± 0.4 and $1.4 \pm 0.$ 5 CLs/ewe for the control and treated ewes, respectively (Table 1). These differences were not significant.

To study the effect of season, the experiment was repeated in January 2000, and the ovulation rate in the bromocryptine-treated ewes was 3.0 ± 0.8 and