Luteinizing Hormone, Prolactin, and Interval to Ovulation After Melengestrol Acetate in Cattle

Abstract

Nine Holstein heifers were fed 1 milligram melengestrol acetate daily for 18 days. After melengestrol acetate withdrawal, duration and magnitude of ovulatory surge of luteinizing hormone resembled that reported for control estrus, and serum prolactin was elevated the day before or on the day of luteinizing hormone surge. In another experiment 25 Holsteins lactating 60 to 90 days were fed 1 milligram melengestrol acetate daily for 14 days and injected with 2,500 international units of human chorionic gonadotropin on day 17. Based upon twice-a-day rectal palpations, 22 cows ovulated at an average of 36±3 hours after injection.

Introduction

Orally active progestogens inhibit estrus and ovulation in cattle; estrus and ovulation usually occur within 7 days following withdrawal of progestogen (3, 13, 16). Graves and Dzuik (2) suggested that ovulation could be synchronized with greater precision by injecting human chorionic gonadotropin (HCG) after progestogen treatment. However, most reports reveal a 10 to 30% depression in fertility of inseminations at the synchronized estrus (1, 11, 15, 17). Our experiments were to determine serum luteinizing hormone (LH) and prolactin after melengestrol acetate (MGA) withdrawal and to synchronize ovulation by HCG injection after MGA treatment.

Experimental Procedures

To evaluate the ovulatory surge of LH after MGA treatment, nine Holstein heifers of 14 mo were fed 1 mg of MGA daily for 18 days in stanchions. On the last day of MGA feeding, heifers were moved to a dry lot with 35 heifers of similar age and observed twice daily for signs of estrus. Starting on day 18, jugular blood was obtained by venipuncture each afternoon for 8 days, and LH and prolactin were quantified by radioimmunoassays (5, 6, 12).

In a second experiment 25 first-calf Holsteins at 60 to 90 days postpartum were group-fed 1 mg MGA daily for 14 days to determine interval to ovulation after intramuscular injections of 2,500 international units (IU) HCG at 0800 on day 17 (3 days after last MGA). Ovulation was determined by twice-daily (0800 and 1700) rectal palpations starting on the afternoon of day 17. When palpation revealed an ovulated follicle, ovulation was estimated to have occurred midway between that time and the previous palpation. Cows were killed on the morning of day 21, and reproductive tracts were returned to our laboratory and luteal diameter was measured.

Results and Discussion

In the first experiment only three of the nine heifers were in estrus within 6 days after MGA withdrawal. We observed estrus regularly in the other 35 heifers in the same lot, and all experimental heifers returned to standing heat at an average of 24.7±.82 days after MGA withdrawal. Moving the heifers from stanchions to a dry lot on day of MGA withdrawal may have interfered with expression of estrus. We detected ovulatory surge of LH (>4.0 ng/ml) in six of the nine heifers after MGA withdrawal. However, most reports reveal a 10 to 30% depression in fertility of inseminations at the synchronized estrus (1, 11, 15, 17). Our experiments were to determine serum luteinizing hormone (LH) and prolactin after melengestrol acetate (MGA) withdrawal and to synchronize ovulation by HCG injection after MGA treatment.

![Fig. 1. Serum LH and prolactin, adjusted to peak LH at time 0, in six heifers after MGA withdrawal.](image-url)
LH increased from less than 1 ng/ml to a maximum of 8.2±2.3 ng/ml and returned to basal amounts within 24 hr after the peak. These changes in LH are similar in magnitude and duration to comparable observations on once-daily bleedings of fertile heifers and cows at estrus (4, 10, 14). Thus, the ovulatory surge of LH after MGA appeared normal. All six heifers with LH greater than 4 ng/ml after MGA withdrawal also had elevated prolactin (Fig. 1) the day before or day of LH peak, as has been reported for control estrus (9, 12). Serum prolactin increased (P<.05) from 29±13 ng/ml at 2 days before the LH peak to 83±3 ng/ml on day before the LH peak.

In the second experiment ovulation occurred in 22 cows at an average of 36±3 hr after HCG injection, and visual examination of ovaries after slaughter verified these ovulations. Three cows did not ovulate. Graves and Dziuk (2) estimated that ovulation occurred in synchronized cows about 40 hr after HCG given 1.5 to 2.5 days after the last feeding of medroxyprogesterone acetate. During estrous cycle, ovulation occurred 15 to 32 hr after LH peak (8, 9). Corpora lutea averaged 1.1±.1 cm diameter at slaughter about 60 hr after ovulation.

Results of the first experiment suggest that ovulatory surge of LH after MGA has normal magnitude and duration; it occurs from 2 to 7 days after MGA withdrawal. Data from the second experiment suggest that ovulation can be synchronized more precisely by HCG given 3 days after MGA withdrawal.

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SYMPOSIUM: Milk Composition Variability and its Relation to Milk Marketing

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Introduction

The word “marketing” in the title of this symposium reflects the increasing concern felt by many individuals and organizations about the per capita use of milk during the past decade. It has declined slowly but steadily. The reasons are unclear and complex. The words “composition variability” suggest one of the reasons, and provide a major challenge which the discussions to follow will try to meet.

Are variations in composition apparent to the consumer? Do such variations influence the decision to purchase? Should we alter the present composition of milk? If so, how, and how much? What controls are necessary, and are they workable? What about “double standardization”? How do pricing systems influence these concepts? These are some of the searching questions which must be answered.

No other single food commodity equaled milk in its annual usage of 558 pounds per capita in 1971. This means that a lot of things have been done right in its production, processing, distribution, and utilization over the years. Yet we are still seeking answers.

The American Dairy Science Association has long been interested in the composition of milk. Members of the Association have researched in depth the many and diverse factors which determine the composition of milk as produced by the cow. Other members have studied almost every conceivable fractionation of that product. Now we must look ahead to the application of that research.

Nutritional labeling provides both an awesome challenge and a golden new opportunity to proclaim to consumers the goodness of milk if we can be creative enough in using it. Iron fortification may provide another opportunity. With open minded, visionary approaches we can be assured of success in the future.