PROGESTERONE, METABOLITES AND MINERALS IN ANESTRUS, SUBESTRUS, REPEAT BREEDING AND CYCLIC COWS

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ABSTRACT

A comparative field study on serum profile of progesterone (p_4) and metabolites of 21 anestrus, 10 subestrus, 31 repeat breeding and 8 normal cyclic crossbred cows revealed that the serum P_4 was significantly (P<0.01) higher in subestrus cows than in the anestrus and repeat breeders and even normal cyclic cows. The serum total protein was significantly (P<0.01) lower in repeat breeders and normal cyclic cows than in anestrus and subestrus cows. The cholesterol was significantly (P<0.05) lower in animals with all three reproductive disorders as compared to normal cyclic ones. The calcium was significantly (P<0.01) lower in anestrus and repeat breeding cows than in subestrus and normal cyclic cows, but the trend of inorganic phosphorus was reversed, the subestrus and repeat breeding cows had significantly higher serum inorganic phosphorus level as compared to normal cyclic cows. The serum magnesium was significantly (P<0.05) higher in normal cyclic cows than that in all three categories of infertile animals. Among the trace minerals, zinc content was significantly (P<0.05) higher in anestrus and repeat breeders than the subestrus and normal cyclic cows, whereas iron content was higher in anestrus and subestrus cows. The serum levels of copper, cobalt and manganese did not show any variation among the normal cyclic and other three treatment groups of infertile cows. These findings suggested the importance of these elements in maintaining normal reproductive rhythm of dairy cows.

Key words: Blood profile, Cows, Anestrus, Subestrus, Repeat breeders, Normal cyclic.

Reproduction is known to be influenced by environment, nutrition, hormonal status, and infections along with the genetic traits. For every successful pregnancy and parturition a proper synergism between anabolic and catabolic reactions is essential (Martson *et al.*, 1972). Certain biochemical and mineral constituents in blood serum during estrus period have also been found to be associated with the fertility status of cows and their reproductive behaviour (Sharma *et al.*, 1984). Comprehensive information on endocrine, metabolic and mineral status of anestrus, subestrus, repeat breeding and normal cyclic cows under a common plateform of work is meagre. Hence, the present study was undertaken mainly to explore the possible association of these data in maintaining normal reproductive rhythm in crossbred cows.

MATERIALS AND METHODS

The study was conducted from September 2007 to March 2008 at two villages of Anand district in Gujarat. All together 416 cross4bred cows managed individually by the farmers and presented in sexual health control

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camps were examined thoroughly to know the reproductive disorders. The problem breeders were confirmed by rectal palpation twice 10 days apart. The jugular blood samples were collected from the representative numbers of anestrus (21), subestrus (10), repeat breeders (31) and normal cyclic (8) crossbred cows, when presented for treatment or AI. The serum samples were stored with a drop of merthiolate (0.1%) at -20°C till analyzed.

Serum progesterone was estimated by RIA employing standard technique of Kubasic *et al.* (1984). Labelled antigen (with I^{125}), antibody coated tubes and standards were procured from Immunotech-SA, France. The serum biochemical constituents, viz. total protein, total cholesterol, calcium, inorganic phosphorus and magnesium were estimated using standard procedures and kits procured from Coral Clinical Systems, Goa, with the help of Chemwell auto-blood analyzer (Awareness Technology, Germany). Estimations of trace elements, viz. copper, cobalt, zinc, iron and manganese were done from the residues of wet digested sera samples on an Atomic Absorption Spectro photometer (Model- 3110, Perkin Elmer). The data were analyzed statistically using CRD and critical difference test.

RESULTS AND DISCUSSION

The random serum progesterone concentration was significantly (P<0.01) higher in subestrus cows than in the anestrus and repeat breeders. The progesterone profile of normal cyclic cows at estrus was, however, at par with that of repeat breeders in estrus (Table 1). The higher progesterone level in subestrus and anestrus animals could be due to presence of functional corpus luteum on the ovary at the time of blood sampling, while repeat breeders and normal cyclic animals were in estrus when sampled. These findings of insignificant variation in P_4 levels between anestrus and repeat breeders and/or fertile cows corroborated well with the previous report of Bugalia and Sharma (1990) and Shukla *et al.* (2000). Bage *et al.* (2002) reported suprabasal progesterone levels (e"0.5 nmol/l) in repeat breeding heifers. They suggested that this increased suprabasal progesterone level during the estrus is one of the causes of repeat breeding syndrome.

The serum total protein content was significantly (P<0.01) lower in repeat breeders and normal cyclic cows in estrus as compared to anestrus and subestrus cows. The serum total protein content in repeat breeders and normal cyclic cows did not differ significantly, which is in agreement with the reports of Sharma *et al.* (1984) and Singh and Pant (1998). Although significantly higher total protein level in normal cyclic than the repeat breeding (Chandrakar *et al.*, 2003) and anestrus cows (Arosh *et al.*, 1998) have been documented by others.

Table 1. Comparative serum progesterone and biochemical profile in anestrus, subestrus, repeat breeding and normal cyclic cows

Reproductive Status	N	Serum profile					
		Progesterone (ng/ml)	Total protein (g/dl)	Total cholesterol (mg/dl)	Calcium (mg/dl)	Phosphorus (mg/dl)	Magnesium (mEq/L)
Anestrus	21	1.65±0.17^{b}	8.96±0.31^{b}	172.59±13.19^{a}	7.29±0.28^{a}	8.07±0.24^{ab}	3.24±0.18^{a}
Subestrus	10	3.99±0.58^{c}	9.69±0.53^{b}	199.76±26.48^{a}	10.87±0.50^{c}	9.32±0.35^{b}	3.42±0.31^{a}
Repeat breeders	31	0.77±0.07^{a}	7.56±0.19^{a}	214.12±14.85^{a}	8.87±0.28^{b}	8.80±0.29^{b}	3.65±0.20^{a}
Normal cyclic	8	0.76±0.10^{a}	7.39±0.26^{a}	310.74±25.22^{b}	10.03±0.48^{c}	7.26±0.25^{a}	4.31±0.32^{b}

Means bearing superscript in common do not differ significantly within the column.

The serum total cholesterol concentration was significantly (P<0.05) lower in animals with all the three reproductive disorders as compared to normal cyclic ones (Table 1). These levels and trend are in agreement with the report of Arosh *et al.* (1998) and Singh and Pant (1998), while Prasad *et al.* (1984) recorded similar trend with much higher values (224.44±6.87 vs 212.35±12.08 mg/dl) in anestrus and normal cyclic crossbred cows. Further, the present significantly lower value of total cholesterol in anestrus cows as compared to repeat breeding cows is in agreement with findings of Mishra *et al.* (2007). In contrast, Sharma *et al.* (1984) could not see significant difference in cholesterol profile of anestrus, repeat breeding and normal cyclic cows.

The serum calcium level was significantly lower in anestrus and repeat breeding cows as compared to subestrus and normal cyclic cows, which corroborated with the report of Sharma *et al.* (1984). Sivaiah *et al.* (1986) however failed to see significant difference in serum calcium level of estrus and anestrus cows. Significant differences noted in the serum inorganic phosphorus levels of anestrus, subestrus, repeat breeding and normal cyclic cows under study (Table 1) corroborated well with the report of Agarwal *et al.* (1985). Dutta *et al.* (2001) reported significantly higher level of phosphorus (P<0.01) in cyclic than in repeat breeding and anestrus cows. The serum calcium and inorganic phosphorus showed inverse relationship among different categories of animals. The magnesium content was significantly (P<0.05) higher in normal cyclic cows than in all three categories of infertile animals, which did not differ significantly (Table 1). These findings corroborated well with previous report of Dutta *et al.* (2001).

Among the trace minerals studied (Table 2), zinc content was significantly (P<0.05) higher in anestrus and repeat breeders than the subestrus and normal cyclic cows, whereas iron content was higher in anestrus and subestrus cows. However, the serum levels of copper, cobalt and manganese did not show any variation among the normal cyclic and other three groups of infertile animals. Comparable overall values of iron and copper, but higher zinc level have been documented earlier by Desai *et al.* (1979). Like present findings, Parmar *et al.* (1986) found significantly higher zinc level in repeat breeders than the normal cyclic cows at most phases of cycle. Sharma *et al.* (1988) noted higher zinc concentration in anestrus cows and suggested that excessive zinc concentration could be considered as a cause of infertility in heifers. Manickam *et al.* (1977), however, found significantly higher zinc level in regular breeders than repeat breeders and noted same trend for iron, manganese and copper also between two categories of animals.

Table 2: Comparative profile of serum trace minerals in anestrus, subestrus, repeat breeding and normal cyclic cows

Reproductive Status	Number of animals	Serum trace minerals profile (ppm)				
		Zinc	Iron	Copper	Cobalt	Manganese
Anoestrus	21	1.16±0.13^{b}	2.95±0.16^{ab}	0.58±0.04	0.14±0.02	0.07±0.01
Suboestrus	10	0.73±0.07^{a}	3.27±0.24^{b}	0.64±0.06	0.13±0.02	0.07±0.01
Repeat breeders	31	1.17±0.09^{b}	2.43±0.11^{a}	0.58±0.02	0.21±0.02	0.08±0.01
Normal cyclic	8	0.96±0.06^{a}	2.33±0.21^{a}	0.68±0.07	0.14±0.02	0.05±0.01

Means bearing superscript in common do not differ significantly within the column.

From the present findings, it was inferred that the elements investigated in different categories of normal and infertile animals are important in maintaining normal reproductive rhythm of dairy animals. If there is drop or deficit in them either singly or in combination, it would hamper normal fertility of dairy animals.

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