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Precocious mammary enlargement in a 14-month-old Jersey crossbred heifer

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Abstract

A virgin Jersey crossbred heifer of fourteen month of age with mammary enlargement was presented for inspection. The udder appeared swollen; similar to a lactating gland, 18-cm deep, and teats were 2.5 cm in length. The genital organ of the heifer was examined by per rectal palpation and right ovary was distended, with approximate 2 to 3 cm in diameter. The concentration of protein, fat, and lactose of mammary secretion were 10.25%, 0.2% and 0.42%, respectively; somatic cell count was $2.8 \times 10^6/\text{mL}$. Further, the case was suspected as mammary gland fibro adenomatous hyperplasia. The heifer was further suffering from mastitis and it was treated with broad spectrum antibiotic Ceftriaxone @ 10mg per kg body weight O.D I/M, Meloxicam 3ml O.D I/M, Mammidium powder 50gm daily for five days. In conclusion, the case was suspected to be fibro adenomatous hyperplasia of the mammary gland and the conception was not affected by precocious mammary enlargement and the heifer had full-term gestation and calving.

Keywords: Heifer, mammary enlargement, mastitis

Introduction

In heifer, the mammary growth is noticed as an intensifying connective tissue, ductal growth, and growth of the fat pad before puberty^[1]. The growth begins isometric during prepubertal stage, and growth becomes allometric before puberty^[1]. Early lactation is the quick increase of the udder and the beginning of lactation not associated with the process of calving^[2]. The animals which undergo udder swelling throughout pregnancy subsequently produce milk from the mammary gland or milk come out from the teats. A proportion of animals that do produce milk, especially those that subsequently leak milk, may also go on to develop mastitis in one or more quarters^[3]. As per report, feeding of heifer during prepubertal period with high energy diets suppresses serum bovine somatotropin (bST) levels, which having positive correlation with prepubertal mammary growth^[4]. The nutrition at prepubertal stage can have a considerable effect on future milk yield. Limited feeding to the heifers also has up to 30 percent larger mammary glands at puberty. Neoplasms of the ovary has also been associated with precocious mammary development in heifers^[3, 5] or exposure to feedstuffs containing estrogens or contaminated by mycotoxins i.e. zearaleoneone toxicosis^[6].

Case History and Clinical Observation

In the present study, a virgin Jersey crossbred heifer at 14 month of age presented to the State Veterinary Dispensary, Krishnai, Goalpara, Assam with precocious mammary enlargement. The body weight and height of the heifer was 112 kg and 118 cm, respectively (Figure 1). The owner fed a commercially available concentrate feed @ 2 kg per day and with ad libitum access to green grass and water.

On clinical examination it was found that the heifer had normal rectal temperature (101°F), heart (60 beats/min) and respiratory (38 breaths/min) rates. The udder was swollen and 18-cm deep, the teats were 2.5 cm in length, had a consistency akin to a lactating animal (Figure 1). Whilst hand-stripping of all the four quarters, a pale yellow like secretion which was skim milk-like consistency has been observed. The oozing was collected aseptically and sent to the College of Veterinary Science, Khanapara within 4 hours in an ice box, for analysis of its content and bacterial load. The protein, fat, and lactose concentrations along with somatic cell count were analyzed by using a midinfrared analyzer.

(MilkoScan 605; A/S N Foss Electric, Hillerod, Denmark) and the values were 10.25%, 0.2% and 0.42%, respectively. The genital tract of the heifer was examined by per rectal palpation. The right ovary was found to be engorged, with a probable diameter of 2 to 3 cm. There was absence of distinct palpable follicles or corpus luteum on the surface of the right ovary. The left ovary was found to be small (1 cm in diameter) and smooth with no palpable structures. The uterine horns were normal in size and remained flabby at palpation. The cervix was 3.0 cm long and appeared to be normal. After examination, 10 ml blood sample was collected from the jugular vein into an evacuated tube containing sodium heparin; plasma was separated by centrifugation (1500 rpm, 20 min) for estimation of estradiol, progesterone, prolactin, calcium, phosphorus, sodium and chloride analysis and the values were depicted in Table 1. The heifer was monitored by repeated transrectal examination, performed at approximately 2-week intervals to record the changes in the ovarian structures. The structure was regressed progressively at each examination and the abnormal ovarian structure eventually disappeared over a period of 6 weeks. The mammary gland size remained same during the period. At 15 months of post precocious mammary growth, the heifer was in estrus, in which ovulation and normal corpus luteum was detected on the right ovary. At subsequent estrus, the heifer was artificially inseminated and pregnancy was confirmed by transrectal examination at 90 days of post insemination.

Discussion

Based on the preliminary depiction of the engorged mammary gland, the case was tentatively diagnosed as fibro adenomatous hyperplasia of the mammary gland, which is common in queen [7, 8] and, rarely in women [9]. In that case, the situation may encounter in one or more teats, and swelling has been seen just because of rapid propagation of mammary duct epithelium and stroma [10]. The mammary secretion has more protein, little amount of fat and lactose, and somatic cell count also found to be higher (Table 1). The animal was suffering from mastitis due to bacterial infection and it was treated with broad spectrum antibiotic Ceftriaxone @ 10mg per kg body weight O.D I/M, Meloxicam 3ml O.D I/M, Mammidium powder 50gm daily for five days.

The ratios of calcium and phosphorus if maintains 1.5:1 and 2.5:1 for normal cows, then it should not effect on any reproductive events [11, 12]. There has been much argument on phosphorus supplementation and its effects on female reproductive function [13]. Deficiency of phosphorus may lead to decreased fertility rate, ovarian inactivity, aberrant estrous cycles, cystic ovaries, deferred sexual maturity and less conception rates have been reported [14, 15]. In the present case, the level of calcium and phosphorus found to be normal range. As per report, the antepartum diets having excessive salt increase the severity of udder edema [16], but in the present case, the blood sodium and chloride level was found to be normal. In case of udder oedema there might be oedematous swelling of the tissues neighboring to the udder but in present study the involvement the mammary tissue of

the gland has not noticed. Moreover, udder oedema may not be related to initiation of lactation.

The ovarian tumour [3, 5] and zearaleone toxicosis [6] also related to precocious mammary enlargement in heifers. It was also reported that the precocious lactation in heifers was linked with granulosa cell tumors [3, 5].

The level of progesterone, estradiol and prolactin were found to be in normal range (Table 1). In cattle, the mammary duct growth was stimulated by estrogen, and synergistic effect of estrogen and progesterone initiated the lobulo-alveolar development of the udder [17]. Estrogen and progesterone initiates lactation in nonpregnant heifer [18]. It was reported that the granulosa cell tumor was linked with precocious mammary swelling and lactation and serum concentrations of estrogen and progesterone found to be high [3]. Though clinical signs were related to granulosa cell tumor [3, 5] but it has been ruled out, as the ovarian structure regressed impulsively in due course of time. The impulsive regression of a granulosa cell tumor in cattle was not reported by earlier study. The estrogen level is habitually high in follicular cysts [19], as compared to progesterone concentrations [20]. In the present study, the level of progesterone was associated with reported range of follicular cysts in cow. Bearing in mind the level of progesterone was lower than expected to be found during luteal phase. It is supposed that the uncharacteristic structure of the ovary has persistent follicle, later it become follicular cyst with higher estradiol, and then luteinized progressively. The variations in estrogen and progesterone level does not associated with mammary gland growth in heifers [21], but higher level of estrogen and progesterone over a stipulated period might be provoke mammary development [22]. It was reported that the follicular cysts incidences are relatively less in younger than the older cattle. It was also reported that estrogen secreted at an initial phase and progesterone by successive luteinization of the cyst expected to be enhanced mammary gland growth and related secretions. In the other cases of precocious mammary enlargement and lactation in a heifer [5], fat and protein content of the udder oozing was normal for milk. Prolactin is said to be acts synergistically with insulin and cortisol to induce secretion of milk proteins [23]. And its absence stimulate the expression of milk protein mRNA [24]. The mammary secretions of heifer having low prolactin and high protein content (Table 1). It may not be a contributing factor for remarkable high protein content of the mammary secretion [25]. The somatic cell count was found to be higher than the accepted limit (Table 1), which was also reported by Palmer *et al.* [5]. The higher level of somatic cell count might be associated with an udder infection. The current case is exceptional in that the mammary development and secretion has been noticed in absence of ovarian neoplasia or toxicosis. The heifer was found to be cyclic after impulsive regression of the uncharacteristic ovarian structure and finally became pregnant following artificial insemination. The case was neither confirms as an ovarian cyst nor found any literature that precocious mammary development was associated with ovarian cysts.

Table 1: Mammary oozing composition and level of certain plasma hormones and minerals in a heifer having precocious udder enlargement

Composition of mammary secretion	Concentration	Normal range ^(1,16)
Protein (%)	10.25	3.1 to 3.5
Fat (%)	0.2	3.3 to 4.0
Lactose (%)	0.42	4.6 to 4.9
Somatic cell count ($\times 10^6/\text{mL}$)	2.8	0.1 to 0.4
Plasma hormone and minerals		
Progesterone (ng/mL)	1.2	0.5 to 14.0
Estradiol (PG/mL)	4.4	2.0 to 16.0
Prolactin (ng/mL)	3.1	20 to 40
Calcium, total (mg/dL)	10.2	9.7– 12.4
Phosphorus (mg/dL)	5.4	5.6– 8.0
Sodium (mmol/L)	138	132– 152
Chloride (mmol/L)	98	95– 110

**Fig 1:** Precocious mammary enlargement in a Jersey crossbred heifer

Conclusion

Based on the interpretation in the current case and available in literature it was concluded that the conception is not necessarily affected by precocious mammary development. The heifer has a full-term gestation and calving as reported by the owner.

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