

Impact of Foot and Mouth disease on ovarian activity in cows

Rita Nath¹, Ram Lakhan Prasad², Suraksha Subedi Deka³, Aftab Adil⁴, Manas Senapatti⁵, Muzaharul Islam⁶

¹Associate professor, Department of Veterinary Biochemistry, College of Veterinary Science, Khanapara, Guwahati, 781022 Assam;

²Dean, Ranchi Veterinary College, Jharkhand, 834006

³PhD. Scholar, Department of Veterinary Biochemistry, CVSc, Khanapara, Guwahati, 781022 Assam;

⁴T. A, Deptt of Veterinary Biochemistry, Ranchi Veterinary College, Jharkhand, 834006

⁵PhD. Scholar, Orissa Veterinary College, Bhubaneswar, 751003

⁶Post Graduate student, College of Veterinary Khanapara, 781022 Guwahati, Assam.

*Corresponding Authors

Name: Rita Nath & S.S. Deka

Email: surakshasubedi@gmail.com

Abstract: The aim of the study was to observe the ovarian activity in crossbred cows affected with Foot and Mouth disease. The study was conducted with two groups of animal. Group I consisted of twenty (20) crossbred cattle from Instructional Bovine Farm, Ranchi Veterinary College, India and group II consisted of forty (40) crossbred (Jersey and Holstein Friesian) cattle having clinical signs of Foot and Mouth Disease (FMD) from in around Ranchi, India. The animals were clinically examined for the presence of characteristic symptoms of FMD and were confirmed on the basis of enzyme linked immunosorbent assay (ELISA). Blood samples were collected, taking all aseptic precautions, from the animal by jugular vein puncture between 10 am to 12 noon. The serum progesterone levels during follicular and luteal phase were determined by method of ELISA using the standard curve and then analyzed by analysis of variance (ANOVA). In the present study, the serum progesterone level in control animals was 0.770 ± 0.110 ng/ml which decreased non-significantly to 0.660 ± 0.220 ng/ml in the FMD affected animals during the follicular phase of the oestrus cycle. Again, it was observed that during the luteal phase the concentration was 7.310 ± 1.546 ng/dl which also decreased non-significantly to 5.037 ± 1.066 ng/ml in the FMD affected animals. Serum progesterone level of serum samples from positively tested samples of crossbred cows were analyzed by ELISA during follicular phase and luteal phase of oestrous cycle. Thus, from the study it can be concluded that during FMD, the ovarian activity is affected.

Keywords: Ovary, Oestrous cycle Serum Progesterone, Foot and mouth disease, ELISA, Cow

INTRODUCTION

Foot and mouth disease virus (FMDV) is the first animal virus to be identified and is known as one of the most infectious viral pathogens of animals. Foot-and-mouth disease (FMD) is an economically devastating and highly contagious disease of domestic and wild cloven-hoofed animals, including cattle, sheep, goats and pigs. It limits access to markets for developing countries [1]. It is a positive-sense RNA virus belonging to the genus *Aphthovirus* in the family *Picornaviridae*. There are 7 immunologically distinct serotypes A, O, C, Asia 1, and SAT (Southern African Territories) 1, 2, and 3. Currently, 6 serotypes of FMD virus (O, A, Asia-1, SAT-1, -2, and -3) are circulating globally, and serotype C has not been recorded since 1995. In India, this disease is caused by serotypes O, A and Asia-1, of which serotype O is responsible for most of the outbreaks [2]. Annual direct loss due to FMD in India was estimated to the tune of Rupees 20,000 crore [3].

FMD is characterized by fever and vesicles in the mouth and on the muzzle, teats, and feet. In a susceptible population, morbidity approaches 100%

since it is highly contagious among all species of cloven-hoofed animals. For obvious reason, the disease is more important in cattle, buffaloes, bulls and bullocks in India [4]. Ovarian inactivity is among the most predominant causes of reproductive failure and economic losses in buffaloes as a result of fewer days in milk and fewer calves produced per year of life as well as high culling rate which is mainly due to failure of pregnancy [5]. Progesterone (P4) produced in the corpus luteum (CL) is the main steroid hormone, which regulates the duration of the estrous cycle and maintenance of pregnancy. Progesterone is the key enzyme hormone in reproductive biology and assaying of its level is important for investigating ovarian and uterine functions in farm animals, since it reflects the different developmental stages of corpora lutea after ovulation and it may be of some clinical significance in diagnosing of reproductive disorder [6]. The epidemiology and etiology of FMD have been extensively investigated but, a few published reports on the ovarian activity of cow with FMD are available [7]. Keeping this in view, the work was designed to study the ovarian activity during Foot and mouth Disease in

cows, so that FMD in Indian origin is better understood and a more effective treatment can be given.

MATERIALS AND METHODS

Ethical approval

The prior approval from the Institutional Animal Ethical Committee was obtained for collection of the blood samples from animals used for the present study. Experiments should be carried out in accordance with the Guidelines laid down by the International Animal Ethics Committee or Institutional ethics committee and in accordance with local laws and regulations.

Source of animals

The study was performed with a total of sixty (60) numbers of 3-6 years old animals which were divided into two groups. Group I consisted of twenty (20) crossbred cattle from Instructional Bovine Farm, Ranchi Veterinary College, India and group II consisted of 40 (forty) crossbred (Jersey and Holstein Friesians) cattle having clinical signs of FMD. The control animals were screened on the basis that the animals were clinically healthy and free of disease since last six months and were non pregnant. A complete case history and owner complain were recorded for each animal under group II (test). All the animals under study were not vaccinated against FMD.

Clinical examination

The animals were clinically examined for the presence of characteristic symptoms of FMD along with complete case history. Special attention was given to presence of salivation, fever as well as vesicles in the mouth and on the muzzle, teats and feet. Gynecological examination was done by rectal palpation of the internal organs with and the size of the ovaries was examined. Besides, the oestrous behavior of animal during breeding season was also recorded.

Confirmatory diagnosis

The animals which were clinically tested positive for FMD were further confirmed by performing sandwich ELISA using material from the lesions and epithelial tissues. [8]

Collection of blood sample

About 10 ml of blood were collected from each animal of both the groups through jugular vein puncture at different phases of oestrous cycle taking all aseptic precautions. The stage of oestrous was determined by recording the reproductive cycle in conjunction with rectal examination. All blood samples were collected between 10 am and noon in order to reduce the variation associated with diurnal rhythms in blood. The tubes containing blood were kept undisturbed in slanting position for an hour. The tubes were then centrifuged at 3500 rpm for 10 minutes, the serum was separated and stored at -20°C for further analysis.

Analysis of serum progesterone

The progesterone concentration was determined by the method of Enzyme linked immuno sorbent assay (ELISA) as described by Prasad [9] using the standard curve. The conjugation of immunoglobulin with Horse – radish peroxidase (HRP) (Sigma Chemicals Company, USA) was done by modified glutaraldehyde procedure [9]. The progesterone concentration was analyzed by analysis of variance (ANOVA) as per Snedecor and Cochran [10].

RESULTS AND DISCUSSION

Clinical signs

The animals in group II were emaciated and there was reduction in feed intake and milk production. A rise in temperature ($103-105^{\circ}\text{F}$) was recorded in the initial phase. There were prominent vesicles on mouth, feet, interdigital space and teats of the affected animals. In this study, the characteristic clinical signs seen in the FMD infected cattle comply with those findings recorded in previous reports [11]. In 62.5% of the animals in group II, the ovaries were smooth, inactive and they failed to come to heat in the breeding season and similar finding was reported in earlier studies [5].

Ovarian activity of affected animals

The ovarian activity of the affected animals is given in Table 1. On rectal palpation, 62.5 % of group I animals showed smooth ovaries. The ovaries were regressed and there was absence of Graafian follicles or corpus luteum. The affected animals failed to come to heat during the breeding season. However in group I or healthy animals 18 out of 20 animals (90%) had normal cyclic ovaries.

The levels of serum progesterone during follicular and luteal phase of the control (group I) and affected (group II) animals are given in Table. 1. The standard curve has been provided in Figure 1. The serum progesterone level in Group I animals was 0.770 ± 0.110 ng/ml and it was 0.660 ± 0.220 ng/ml in the FMD affected animals (Group II) during the follicular phase. Again, it was observed that during the luteal phase the concentration was 7.310 ± 1.546 ng/dl which also decreased non-significantly to 5.037 ± 1.066 ng/ml in the FMD affected animals. A similar decrease in serum progesterone levels in the luteal phase was reported in earlier studies [5]. A similar decrease in serum progesterone levels in the luteal phase was reported in earlier studies [5]. Currently a lot of factors were incriminated for induction of ovarian inactivity in farm animals. As FMD affected animals in our study were suffering from anorexia or less feed intake which may be due to lesions in the oral cavity maybe another factor for decrease in serum progesterone level. Underfeeding led to high incidence of ovarian inactivity, low expression of oestrus and ovulation rate [12]. The non-significant decrease in P4 concentration in our study maybe due to inactivity of the ovary and so less serum progesterone was released from corpus

luteum. Oxidative stress condition of the animals due to foot and mouth disease maybe another reason which reflects on its ovarian activity [13] in which they reported that oxidative stress plays a number of

significant roles in female reproductive biology, mainly it influences ovarian function by affecting the growth of Graafian follicles and oocyte maturation.

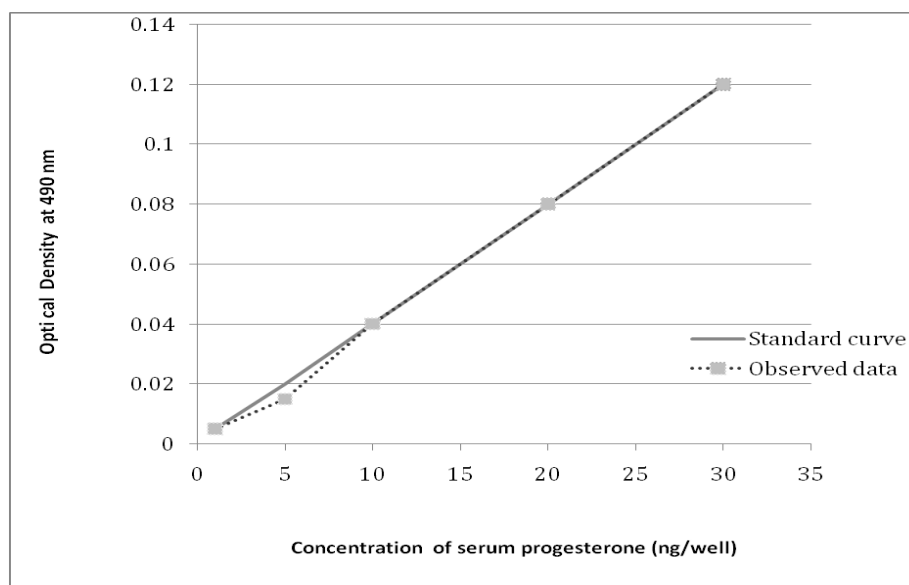


Fig-1: Concentration of serum progesterone (ng/well)

CONCLUSION

In this study the effect of FMD in ovarian activity of affected animals were tested by monitoring serum progesterone. Blood sample were taken from clinically tested FMD positive animals and control animals during both follicular and luteal phase of oestrous cycle. It was found that the serum progesterone level decreased in both the phases in diseased animals. Thus it can be concluded that FMD is associated with sub functional ovarian activity in cross bred cattle.

REFERENCES

1. Biswal J K, Sanyal A, Rodrigue L L, Subramaniam S, Artz J, Sharma GK, Hammond JF, et al; Foot and Mouth disease: Global status and Indian perspective. *Indian J. Anim. Sci.*, 2012; 82: 109-131.
2. Klein J, Hussain M, Ahmad P, Normann A, Alexandersen S; Genetic characterization of the recent foot-and-mouth disease virus subtype A/IRN/2005. *Virology*, 2007; 4: 122.
3. Patnaik B, Subramaniam S, Sanyal S, Mohapatra J K, Dash B B, Ranjan R, Rout M; Foot and Mouth Disease : Global status and future roadmap for control and prevention in India. *Agri. Res.*, 2012 ;1(2): 132-147.
4. Singh S N; Foot and Mouth Disease control strategies , global framework. *Int. J. Life Sci. Pharma Res.*, 2011; 1 (1): L 63-70.
5. Zaher K S, Ahmed WM; Impact of foot nad mouth disease n oxidative stress and ovarian activity in Egyptian buffaloes. *World J. Zoology*, 2008; 3(1): 1-7.
6. Peter T; An update to cystic ovarian degeneration in cattle. *Reprod.Domes. Anim*, 2004; 39: 1-7
7. Yang P C, Chu R M , Chung W B, Sung H T; Epidemiological characteristic and financial costs of the 1997 foot-and-mouth disease epidemic in Taiwan. *Vet. Rec.*, 1993; 145: 731-734.
8. Longjam N, Deb R, Sarmah A K, Tayo T, Awachat V B, Saxena, V K; A Brief Review on Diagnosis of Foot-and-Mouth Disease of Livestock: Conventional to Molecular Tools. *Vet. Med. Int.*, 2011; 11: 45-49.
9. Prasad R L; Comparative studies on physico-chemical and immunological properties of buffalo muscle protein. 1983; Ph.D, thesis, IVRI.
10. Snedecor G M, Cochran W G; *Statistical method*, 7th Edn.Oxford and IBH publishing co. New Delhi, 1994.
11. Blancou J; History of control of Foot and mouth disease. *Immunol. Microbiol. Inf. Dis.*, 2002; 25 (5-6): 283-296.
12. Ahmed W M, El-Khadrawy H H, Amal R, Hameed A E, Amer H A; Applied investigations on ovarian inactivity in buffalo-heifers. *Int. J. Acad. Res.*, 2010; 2(1): 123-135.
13. Behiman H I, Kodman P H, Preston S L, Gao S; Oxidative stress and the ovary. *Indian J. Anim. Res.*, 2001; 8: 540-542.
14. El-Wishy ; Acyclicity and anestrus. *Anim. Reprod. Sci.*, 2007; 97: 216-236.
15. Gee R W, Whittem J H; Foot and mouth Disease *Aust. Vet. J.*, 1973; 49(4): 196-201.