Incidences of various etiological factors responsible for repeat breeding syndrome in cattle and buffaloes

J Singh, D Dadarwal, M Honparkhe, A Kumar

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Abstract

A total of 214 repeat breeding (Cattle-183; Buffalo- 31) and 30 normal (Cattle-20; Buffaloes- 10) animals from different dairy farms were selected. All the animals were subjected to repeated (3-5 days interval) clinico-gynaecological examinations along with blood sampling atleast for 21 days. The diagnosis was made on the basis of history, clinical signs, rectal findings, body condition scores (BCS) and blood plasma progesterone (P4) profiles. Out of 183 repeat breeding cattle, 13 (7.10 %) had acquired anatomical abnormalities, 52 (28.42 %) had hormonal aberrations, 33 (18.03 %) had genital tract infections, 27 (14.75 %) were affected with poor management and 58 (31.70%) were having a combination of more than one aforesaid factors. The number of repeat breeding buffaloes in the respective categories were 2 (6.46 %), 8 (25.80 %), 8 (25.80 %), 5 (16.14 %) and 8 (25.80 %). Out of the animals repeating as a result of acquried anatomical abnormalities, 8 (61.54 %) cattle and 2 (100 %) buffaloes were repeater due to hard and kinked cervix. Out of the animals affected with hormonal aberrations, 33 (63.5 %) cattle and 8 (100%) buffaloes were exhibiting prolonged estrus period. Poor semen quality or faulty AI techniques were found to be major managemental factors in cattle (25/27) and buffaloes (2/2). In the category more than one etiological factor, the combination of genital infections and hormonal aberrations was the major contributing factor to repeat breeding (Cattle- 23/58; Buffaloes- 3/8), followed by combination of anatomical defects and hormonal aberrations (Cattle-19/58; buffaloes- 1/58); genital infection and anatomical defects (Cattle- 19/58; Buffaloes- 1/58). Hence, it was concluded that hormonal aberrations and its combination with other factors constitute the major cause of repeat breeding syndrome in dairy animals.

INTRODUCTION

Repeat breeding syndrome is responsible for long service period and inter-calving interval thereby causing low milk and calf production resulting in to greater economic loss to dairy industries. To curtail these losses exact and early diagnosis of the underlying etiology followed by timely interventions is a prerequisite. The factors responsible for this malady are multiple viz. anatomical, hormonal, managemental and infectious, and vary from herd to herd, animal to animal and estrus to estrus. The incidence of repeat breeding in India has been reported from 5.5 to 33.33 % in cattle and from 6 to 30 % in buffaloes (Saxena, 2004). In view of the fact that the incidence of repeat breeding syndrome has increased over decades; surveys elaborating the major underlying factors are necessary. Therefore, a field oriented study was planned to identify the major factors causing repeat breeding, so that timely intervention could be done to avoid further loss to dairy industries.

MATERIALS AND METHODS

The study was carried out in 18 randomly selected villages of Malwa region of Punjab, India. A total of 214 animals (cattle- 183; buffaloes- 31) with the history of repeat breeding and 30 normal animals (cattle-20; buffaloes-10) were selected. All the animals were subjected to repeated clinicogynaecological examinations, culture sensitivity test of oestrual mucus and blood collection at 3-5 days interval for 1-2 estrous cycle. The diagnosis was made on the basis of history, rectal findings, body condition score (Edmondson et al.,1986) and blood plasma progesterone profiles. On the basis of diagnosis, all repeater animals were grouped as follows:

1. Anatomical abnormalities (Gp-1) – This group consisted of animals with kinked and hard cervix, ovaro-bursal adhesions (OBA), combination of OBA and kinked cervix and uterine tumor. Animals belonging to this group had clear cervico vaginal mucus, regular cycling, good BCS (3.5-4.0) and plasma P4 profiles comparable with normal animals.

2. Genital infections (Gp-II): This group included

animals with endometritis, salpingitis, combination of endometritis and salpingitis. Animals belonging to this group had turbid cervico vaginal mucus, regular cyclicity, good BCS (3.5-4.0) and plasma P4 profiles comparable with normal animals.

3. Hormonal (Gp-III): This group was made up of animals with cystic ovarian degeneration, delayed ovulatory conditions and luteal insufficiency. These animals had abnormal progesterone profiles over the estrous cycle and clear cervico-vaginal mucus discharge.

4. Managemental (Gp-IV): The animals of this group had clear cervico vaginal mucus, poor BCS (1.5-2.0), normal genitalia and plasma P4 profiles comparable with normal animals. These animals were inseminated with poor quality semen or at wrong time.

5. Multiple factors (Gp-V): This group included combinations of factors of Gp I & II, I & IV, II & IV and II & III.

PROGESTERONE ESTIMATION

The blood plasma progesterone concentrations were estimated by radioimmunoassay precoated tube method with the help of RIA kits supplied by FAO/IAEA Agricultural and Biotechnology, Seibersdorf, Austria. The mean intra- and inter-assay coefficients of variation were 6.71 and 10.08 % respectively. The sensitivity of the assay was 0.032 ng/ml.

RESULTS

OVERALL INCIDENCES OF VARIOUS ETIOLOGICAL FACTORS

The various abnormalities identified and their incidences in repeat breeder cattle and buffaloes have been depicted in Table 1. Out of 183 repeat breeding cattle, more number of cattle (31.70%) were suffered due to a combination of more than one factors i.e. multiple factor (Gp V), followed by hormonal aberrations (Gp III; 28.42 %), genital tract infections (Gp II; 18.03 %), poor management (Gp IV; 14.75 %) and acquired anatomical abnormalities (Gp I; 7.10 %). The number of repeat breeding buffaloes in respective categories were 8 (25.80 %), 8 (25.80 %), 8 (25.80 %), 5 (16.14 %) and 2 (6.46 %).

Figure 1

Table 1: Incidences of factors causing repeat breeding syndrome in cattle and buffaloes.

Condition identified	Cattle (n=183)	Buffalo (n=31)
Anatomical Abnormalities	13 (7.10 %)	2 (6.46 %)
a. Hard & kinked cervix	8	2
b. OBA (unilateral)	1	-
c. OBA (bilateral)	2	-
d. OBA & kinked cervix	1	-
e. Uterine tumor	1	-
Genital infections	33 (18.04%)	8 (25.80 %)
a. Endometritis	26	8
b. Salpingitis (unilateral)	3	-
c. Salpingitis (bilateral)	2	-
d. Endometritis and salpingitis	2	-
Hormonal aberrations	52 (28.41 %)	8 (25.80 %)
Managemental	27 (14.75 %)	5 (16.14 %)
Multiple factors	58 (31.70 %)	8 (25.80 %)

ANATOMICAL ABNORMALITIES

Out of the animals belonging to Gp I, 8/13 (61.54 %) cattle and 2/2 (100 %) buffaloes were repeater due to hard and kinked cervix. In the present study the incidence of OBA was found 2.2 % (4/183) in cattle whereas, no buffalo had OBA which might be due to less number (n=31) of buffaloes presented at field during the study. Among Gp I animals one cow and no buffalo were found with uterine tumor. The plasma P_4 profiles of Gp I animals were comparable with that of normal animals (Table 2).

INFECTIOUS CAUSES

Out of Gp II animals most of the cattle (26/33) and all the buffaloes were suffering from endometritis. The incidence of salpingitis in the present study was 2.7 % (5/183) in cattle whereas, the condition was not encountered in buffaloes. However, two cattle had combination of endometritis and salpingitis. The plasma P_4 profiles of Gp II animals were comparable with that of normal animals (Table 2).

Figure 2

Table 2 : Mean (±S.E.) plasma progesterone profiles of normal and repeat breeder cattle and buffaloes.

	Progesterone profiles on different days of estrous cycle (ng/ml)				
Animals	0	5	10	15	20
Normal					
Cattle (n=20)	0.23±0.05	1.85±0.11	2.52±0.18	2.49±0.17	0.18±0.05
Buffalo (n=10)	0.29±0.10	1.66±0.52	2.29±0.50	2.62±0.66	0.13±0.04
Repeat breeder					
a. *Anatomical*					
Cattle (n=13)	0.27±0.07	1.75±0.14	2.44±0.21	2.32±0.21	0.16±0.05
Buffalo (n=2)	0.34±0.12	1.56±0.62	2.23±0.58	2.50±0.76	0.12±0.03
b.*Genital infection*					
Cattle (n=33)	0.21±0.04	1.50±0.25	3.16±0.36	3.44±0.23	0.43±0.04
Buffalo (n=8)	0.26±0.09	1.67±0.08	2.61±0.34	2.48±0.21	0.17±0.03
c. *Managemental*					
Cattle (n=27)	0.23±0.07	1.68±0.23	3.66±0.57	2.85±0.22	0.19±0.06
Buffalo (n=5)	0.15±0.03	1.88±0.38	2.85±0.48	3.17±0.43	0.14±0.07

HORMONAL ABERRATIONS

The plasma P_4 profiles of Gp III animals have been depicted in Table 3. Among this group, maximum numbers of cattle were having cystic ovarian degeneration (19/52), followed by delayed ovulation (17/52) and luteal insufficiency (16/52), whereas, buffaloes in this group had delayed ovulation (50%) and early luteal deficiency (50 %). Among the delayed ovulators, 10 cows and 4 buffaloes had suprabasal P_4 (0.87±0.21ng/ml & 0.50±0.07 ng/ml respectively) on the day of estrus. All these animals had prolonged estrus period (3-5 days). However, 7 cattle showed prolonged estrus even with basal progesterone level (0.14 ± 0.02ng/ml) comparable to that of normal animals on the day of estrus.

Out of the cattle suffering from luteal insufficiency, maximum number of cows were early luteal deficient (day 5 post-ovulation 68.7 %), followed by mid (days 5-10 post-ovulation; 12.5%), late (days 10-15 post-ovulation; 12.5 %) and during both early and mid (up to day 10 post-ovulation; 6.25 %) luteal deficient.

Figure 3

Table 3: Mean (± S.E.) progesterone profiles (ng/ml) of repeat breeding cattle and buffalo having progesterone aberrations on different days of estrous cycle.

Hormonal Causes		0	5	10	15	20
C.O. D. Cattle (n=19)	Luteal cyst (n=3)	6.59±1.19	5.96±0.74	6.04±0.52	5.14±0.47	5.50±0.80
	Follicular cyst (n=9)	0.33±0.13	0.27±0.11	0.26±0.11	0.29±0.12	0.13±0.05
	Cyst & CL (n=7)	0.26±0.09	0.74±0.35	1.83±0.45	2.31±0.35	1.98±0.43
D. O. Cattle (n=17)	Basal P_4 (n=7)	0.14±0.02	0.73±0.20	2.40±0.17	2.83±0.16	0.19±0.09
	Supra-basal P_4 (n=10)	0.87±0.21	2.43±0.26	2.63±0.27	3.37±0.43	0.91±0.21
D. O. Buffalo (n=4)	Supra-basal P_4 (n=4)	0.50±0.07	1.13±0.40	2.51±0.72	3.55±0.68	0.59±0.14
Luteal insufficiency Cattle (n=16)	Early (n=11)	0.22±0.07	0.54±0.09	2.46±0.59	3.14±0.62	2.46±0.46
	Mid (n=2)	0.29±0.14	1.04±0.05	1.45±0.21	1.27±0.05	1.14±0.18
	Early & mid (n=1)	0.02	0.15	0.28	1.86	0.37
	Late (n=2)	0.20±0.06	1.59±0.64	1.69±0.47	0.79±0.31	1.55±0.32
Luteal insufficiency Buffalo (n=4)	Early (n=4)	0.08±0.04	0.58±0.23	2.68±0.45	2.84±0.30	0.14±0.05

C.O.D. – Cystic ovarian degeneration, D. O. – Delayed ovulators

MANAGEMENTAL

Despite having clear cervicovaginal mucus, anatomically normal genitalia and normal plasma P_4 profiles (Table2), 14.7 % (27/183) cattle and 16.1% (5/31) buffaloes of Gp IV were repeater due to managemental and nutritional factors (Table 1). Either they had poor BCS (1.5-2.0) or inseminated with poor quality semen. Poor semen quality or faulty AI techniques were found to be major managemental factors in cattle (25/27) and buffaloes (2/2).

MULTIPLE FACTORS

In the category of Gp V animals (Table 4), the combination of genital infections and hormonal aberrations was the major contributing factor to repeat breeding (Cattle- 23/58; Buffaloes- 3/8), followed by combination of anatomical defects and hormonal aberrations (Cattle-19/58; buffaloes-1/58); genital infection and anatomical defects (Cattle-19/58; Buffaloes- 1/58).

Figure 4

Table 4: Mean (± S.E.) progesterone profiles (ng/ml) of repeat breeding cattle and buffalo with multiple etiology on different days of estrous cycle.

Etiology	Progesterone profiles on different days of estrous cycle				
	0	5	10	15	20
Genital infections & anatomical					
Cattle (n=9)	0.26±0.05	2.21±0.31	3.29±0.35	3.04±0.49	0.23±0.14
Buffalo (n=1)	0.25	1.58	2.75	2.94	0.21
Hormonal & Managemental					
EarlyLuteal deficiency (Cattle =1)	0.26	0.96	3.50	2.69	0.19
Delayed ovulation (Cattle =1)	0.03	0.07	2.73	2.41	0.21
Hormonal & anatomical					
Luteal cyst (cattle =1)	4.69	9.23	6.92	5.62	8.72
Follicular cyst (cattle =3)	0.16±0.15	0.06±0.05	0.01±0.009	0.24±0.49	0.11±0.10
Cyst & CL (Cattle =7)	0.27±0.05	0.78±0.35	3.03±0.71	3.48±0.55	0.38±0.07
Supra-basal P_4 (Cattle =4)	0.62±0.26	1.13±0.11	2.74±0.32	3.15±0.55	0.65±0.14
Delayed ovulation (Cattle =4)	0.08±0.03	0.09±0.01	1.26±0.05	2.14±0.50	0.33±0.23
Infectious & hormonal					
Delayed ovulation (Cattle =10)	0.19±0.04	0.69±0.17	2.93±0.50	2.02±0.43	0.21±0.12
Delayed ovulation (Buffalo =1)	0.21	0.41	1.56	3.72	0.65
Cyst (Cattle =12)	0.09±0.03	0.58±0.23	2.58±0.52	2.12±0.27	0.34±0.12
Cyst (Buffalo =1)	0.12	1.038	2.207	3.613	0.31
Supra-basal P_4 (Cattle =5)	0.74±0.10	1.21±0.51	2.66±0.59	2.07±0.72	0.66±0.10
EarlyLuteal deficiency (Cattle =1)	0.27	0.76	4.81	4.92	0.21
EarlyLuteal deficiency (Buffalo =1)	0.11	0.64	1.65	2.99	0.23
Infectious & managemental					
Vaginitis & Poor semen quality (Buffalo=4)	034±0.15	1.99±0.47	3.76±0.16	4.32±0.29	0.27±0.09

DISCUSSION

OVERALL INCIDENCES OF VARIOUS ETIOLOGICAL FACTORS

Higher incidence of repeat breeding due to combination of multiple etiologies than other single causes was observed in the present study. This is the fact that lack of expertise and

inappropriate interventions at farmer's doorsteps exaggerate the condition of repeat breeding syndrome and hence involve multiple factors to complicate the situation. Rao (1981) also observed relatively higher incidence of functional abnormalities (73.14 %) followed by infections (20.85 %) and anatomical abnormalities (6.0%) in crossbred cows.

ANATOMICAL ABNORMALITIES

Many of known inherited causes of infertility involve anatomical abnormality like kinked cervix. The hardness of cervix may appear due to trauma or lacerations during calving and AI followed by infection and fibrosis. The incidence of cervicitis varied from 0.9 – 5.52% in cattle (Mylrea, 1962; Rao, 1981) and 0.5 – 2 % in Indian buffalo (Kumar et al., 1988). The another important anatomical anomaly i.e. ovarobursal adhesions (OBA) develop between ovary and ovarian bursa as a result of faulty handling of ovary, intrauterine infusion of irritating drugs in large volume under pressure and due to infections. The incidence of OBA has been reported earlier as 0.29 - 1.8 % in cattle (Rao, 1981; Dobson and Kamonpatana, 1986) and 0.8-2.0 % in buffaloes (Rao and Sremannarayana, 1982). However, in the present study the incidence of OBA was found 2.2 % (4/183) in cattle whereas, no buffalo had OBA which might be due to less number (n=31) of buffaloes presented at field during the study. Tumors of bovine reproductive organs are quite rare (Salisburry, 1985) while the incidence of uterine tumor in buffaloes has been reported very low i.e. 0.3 – 0.72 % (Agarwal and Tomer, 1998).

INFECTIOUS CAUSES

The endometritis and pyometra are the most commonly encountered anomalies causing infertility in cattle and buffaloes under field or farm conditions. The incidence of endometritis has been reported to be 3.0 – 13.97 % in cattle (Zemjanis et al.,1961; Rao, 1981) and 2.4 – 20.0 % in buffaloes (Rao and Sreemanarayana, 1982) during clinical investigations. Slaughterhouse studies and clinical investigations revealed higher incidence of endometritis in buffaloes than in cattle (Dobson and Kamonpatana, 1986). The reason being habit of wallowing, not closely opposed vulval lips and improper postpartum care renders buffaloes more prone to endometritis (Agarwal and Tomer, 1998).

Salpingitis is one of the major disorders of fallopian tube. The incidence varied from 2.2 –3.6 % in cattle (Mylrea, 1962; Rao, 1981) and 0.8 – 4.5 % in buffaloes (Agarwal and Tomer, 1998).

HORMONAL ABERRATIONS

The cystic ovarian degeneration was not encountered in buffaloes in the present study. The incidence of cystic ovarian degeneration observed in earlier studies varied from 8.8 – 27.4 in cattle (Tanabe and Brofee, 1982; Zemjanis, 1987) and 0.9 – 2.0 % in buffaloes

(Rao and Sreemanrayana, 1982; Kumar and Agarwal, 1986). The lower incidence of cystic ovarian degeneration in buffaloes may be due to lower stress of milk production than dairy cows (Agarwal and Tomer, 1998). The plasma P_4 concentration more than 0.35 ng/ml at the time of standing estrus is considered as suprabasal progesterone, which may be a cause of prolonged estrus (Bage et al., 2002). The fate of dominant follicle is dependent on Luteinizing hormone (LH). The LH secretion is governed by combination of P_4 and estradiol, as higher P_4 inhibit the LH pulse frequency, whereas, the higher estradiol inhibit the LH pulse amplitude (Goodman and Karsch, 1980). Hence, the suprabasal P_4 causes decrease in LH pulse frequency thereby responsible for dominant follicle to grow up to a larger size and stay for longer duration and secretion of higher estradiol concentarion (Bigelow and Fortune, 1998) and consequently prolonged exhibition of estrus. Various other workers (Kimura et al., 1987; Kasrija et al., 2006) also observed higher incidence of progesterone deficiency during early phase of estrous cycle. Normal early embryonic development and pregnancy were found to be associated with P_4 activity initiated on days 4.5 – 10 postinsemination (Laming et al.,1989; Alhibin et al., 1991; Larson et al., 1997). Delayed function of CL either alone or in combination with lowered secretion of P_4 during luteal phase is one of the major causes of repeat breeding syndrome (Thatcher et al., 1994). There could be possibility that luteal inadequacy due to diminished response to circulating LH may account for early embryonic mortality leading to repeat breeding syndrome (Shelton et al.,1990).

MANAGEMENTAL

Besides, genetic, infectious and endocrine factors, managemental and nutritional factors also play an important role in causation of repeat breeding syndrome. The BCS is a useful field tool for estimating changes in body weight, tissue reserve and for assessing dairy managemental practices and ration. The recommended BCS for a dairy cow is 3.25-4.0 (Edmondson et al., 1989). Large negative energy balance during post partum period is associated with reduced BCS and subfertility (Royal et al., 2000).

In the present study, there was a slack in any one of the steps involving storage, thawing, post-thaw handling of semen, incorrect and inappropriate insemination with respect to stage of estrus. Correctness and precision of these steps are mandatory in achieving high success rate with AI (Salisburry et al., 1985).

MULTIPLE FACTORS

Involvement of more than one factor for causing repeat breeding was observed in maximum number of cattle and buffaloes in the present study. Kutty and Ramchandran (2001) also observed high incidence of repeat breeding because of combination of ovulatory disturbances and reproductive tract infection. The results of other combination factors could not be compared due to scarcity of similar type of work.

Hence, the present study indicated that hormonal aberrations and its combination with other factors constitute the major cause of repeat breeding syndrome in dairy animals.

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Author Information

Jagir Singh, Ph.D.
Senior Gynaecologist, Department of Animal Reproduction, Gynaecology & Obstetrics, Guru Angad Dev Veterinary and Animal Sciences University

Dinesh Dadarwal, M.V.Sc.
Assistant Gynaecologist, Department of Animal Reproduction, Gynaecology & Obstetrics, Guru Angad Dev Veterinary and Animal Sciences University

Mrigank Honparkhe, M.V.Sc.
Assistant Gynaecologist, Department of Animal Reproduction, Gynaecology & Obstetrics, Guru Angad Dev Veterinary and Animal Sciences University

Ajeet Kumar, M.V.Sc.
Assistant Professor, Department of Animal Reproduction, Gynaecology & Obstetrics, Guru Angad Dev Veterinary and Animal Sciences University