Vol. 12 No. 1
JUNE, 1991

ISSN 0970-2997

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The Indian Journal of Animal Reproduction

JOURNAL OF THE
INDIAN SOCIETY FOR THE
STUDY OF
ANIMAL REPRODUCTION

(Regd. No. Bom. 253/78)

Printed at Majestic Printing Press, Near Tilak Statue, Mahal, Nagpur-440 002

ISSN 0970-2997

THE INDIAN JOURNAL OF ANIMAL REPRODUCTION

Official Organ of the Indian Society for the Study of Animal Reproduction

(Regd. No. Bom. 253/78)

Vol. 12 **No. 1** **June 1991**

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EDITORIAL

There is only á Ministry of Agriculture at the Govt. of India level with Animal Husbandry tagged on to it Independent status for Animal Husbandry is necessary to provide for rural development on sound lines.

It is high time that an independent and separate Ministry of Animal Husbandry is created at the National level under the care of a full fledged Cabinet Minister of Animal Husbandry for proper planning, funding and monitoring the all round progress of Livestock. Poultry and Fisheries development projects. Similar pattern be adopted at all State levels.

Democratic exercise for constituting Tenth Lok Sabha is in full swing culminating in the formation of a new Government at the Centre. We earnestly appeal to the powers that be to implement our honest suggestion for creating a separate Ministry of Animal Husbandry to enhance rural economy in the best interests of our Country.

* * *

Shri Rajiv Gandhi

(Photo Courtsey : Lokmat, Nagpur)

It is with deepest anguish that IJAR records the ghastly death of Shri Rajiv Gandhi, our former Prime Minister and doyen of youth, inflicting a terrible blow to democracy. We condemn this dastardly act. Our heartfelt sympathies go to Smt. Sonia Gandhi, Rahul and Priyanka.

May his soul rest in eternal peace!

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(ISSN 0970–2997)

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Effect of Seasonal Variations on Freezability of Surti Buffalo Bull Semen

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ABSTRACT

1,787 Semen ejaculates of eight Surti buffalo bulls were studied. Of these, 837 ejaculates (46.83%) were freezable - maximum in winter-408 (48.74%), followed by 305 (36.44%) in summer and 124 (14.82%) in monsoon, spread over a four year period. Post-thaw motility (PTM) was best in winter, followed by summer and monsoon seasons. PTM between bulls was significant but between seasons non-significant. Volume, mass activity and initial motility differences between seasons and between bulls in all seasons were found to be significant.

* * *

In India, buffalo plays a major role in milk production. More than 45% of India's milk supply is from buffaloes. Adequate attention is not being paid to the development of buffaloes. Scanty data is available regarding freezability of buffalo bull semen. Seasonal studies on freezability of buffalo bull semen will help in proper utilization of bulls. Hence these studies were undertaken.

Material and Methods

These studies were carried out during a four year period (1985-89) on 8 Surti buffalo bulls at the Frozen Semen Laboratory, Nagpur. Their ages ranged between 63 to 73 months. All the bulls were in good health, free from genital disorders and kept under identical conditions of care and management.

Semen ejaculates were collected by AV technique twice a week. Semen samples having density DD and above, mass activity ++ and above and initial motility 70% and above were subjected to freezability. Tris-egg yolk glycerol (7%) dilutor was used. Antibiotics were added to the dilutor @ 1mg/ml. Semen straws were subjected to equilibration time of four hours at 4° to 5° C. temp. Horizontal vapour freezing technique (Land Shut method) was used. Post thaw motility (PTM) was observed 30 m. after freezing as per Mathew (1974). Thawing was carried out in 37° C water for 15 sec. Frozen Semen samples having PTM 40% and above were considered as freezable. Season and temp range was :

Winter - Oct. to Jan. 9° C to 30° C
Summer - Feb. to May. 40° C to 45.5° C
Monsoon - June to Sept. 15°C to 35°C

The relevant data was statistically analysed as per Snedecor and Cochran (1967).

Results and Discussions

Volume : The mean semen volume recorded was 2.42± 0.02 ml. (Table-1). Maximum values obtained were (3.12 ml) in monsoon, followed by summer (2.36 ml)

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and winter (2.2 ml), Dhami and Kodagali (1988) recorded higher values in Surti buffalo bulls, whereas Choudhary and Gangwar (1978) reported lower values. Present findings are in agreement with that of Bhosrekar (1980) with a similar trend. Maximum variation among the bulls is indicated in the present studies (C.V.49.58%).

The variation in volume of buffalo semen is greatly influenced by temperature and climate (Choudhary and Gangwar, 1978). In the present studies, the semen volume in monsoon (3.12 ml) was highest. These findings are contrary to those recorded by Bhattacharya *et.al.* (1978) who reported higher values in summer.

Mass Activity : The mean mass activity recorded was 1.87 ± 0.018 (Table 1). It was poorest in winter (1.80), followed by monsoon (1.86) and summer (1.97). These findings are lower than those recorded by Bhosrekar (1980) in Murrah buffalo bulls. However, Dhami and Kodagali (1986) recorded higher values in Surti buffalo bulls. C.V. (41.39%) was comparatively lower.

Initial Motility : Mean initial motility recorded in the present study was 50.9 ± 0.54 % (Table 1). However higher values were recorded by Kerur *et.al.*(1979) in Jaffarabadi buffalo bulls and Dhami and Kodagali (1988) in Surti buffalo bulls. Present values are comparable with that of Tripathi and Saxena (1988). Season wise values for initial motility during monsoon, summer and winter were 45.70%, 51.65% and 52.96% respectively. C.V. (43.77%) was comparatively less. These results are not in agreement with Gopalkrishna and Rao (1978) who reported low motility in summer than in monsoon in Murrah buffalo bulls.

Post Thaw Motility (PTM) : Mean PTM recorded during the study was 38.4 ± 0.5% (Table 1). Higher values were recorded by Bhandari *et.al.* (1980) in Murrah buffalo bulls and Dhami and Kodagali (1988) in Surti buffalo bulls. However, Sharma *et.al.* (1979) recorded lower values using egg yolk Citrate dilutor (37.3%). During monsoon summer and winter seasons, the values recorded in the present study were 36.69, 38.18 and 39.11% respectively. C.V. (37.75%) was lowest indicating good freezability.

Though quality of semen was better in monsoon and summer than in winter, PTM was better in winter. Out of 322 samples, only 124 (38.5%) were freezable in monsoon; out of 576 samples, 305 (52.9%) in summer and in winter, out of 889 samples, 408 (45.89%) were freezable. This indicates that summer season is best for freezing Surti buffalo bull semen followed by winter and monsoon. As regards quality of semen, the present results are in agreement with the findings of Bhosrekar (1980) who also recorded better semen quality in monsoon season followed by summer and winter. However, as regards freezability it can be concluded from the present study that summer and winter seasons are best for freezing of Surti buffalo bull semen.

Acknowledgements

Authors thank Shri V.P. Rane, I.A.S. Director of Animal Husbandry, Maharashtra State, Pune for giving permission to use Technical data and Dr. P.M. Deshpande, Regional Joint Director of Animal Husbandry, Nagpur Region, Nagpur for his interest and encouragement.

Table 1 : Average Values of Surti buffalo bull semen.

No.	Item	Winter	Summer	Monsoon
1.	Volume (ml.)	2.2 (889)	2.36 (576)	3.12 (322)
2.	Mass Activity (0-5)	1.80 (814)	1.97 (560)	1.86 (409)
3.	Initial Motility (%)	52.96 (750)	51.65 (534)	45.70 (385)
4.	Post thaw Motility (%)	39.11% (408)	38.18 (305)	36.69 (124)

Figures in Paranthesis indicate number of observations.

Table 2 : Mean, Standard Error and Co-efficient of variation.

S.No.	Item	N.	Mean ± S.E.	CV %
1.	Volume (ml.)	1987	2.42 ± 0.020	49.58
2.	Mass Activity	1783	1.87 ± 0.018	41.38
3.	Initial Motility	1669	50.9 ± 0.54	43.77
4.	Post thaw Motility	837	38.4 ± 0.5	37.75

N - No. of Observations.

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IJAR:12:1:4-5:1991

Studies On Preservation Of Red Kandhari Bull Semen At Refrigerant Temperature*

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ABSTRACT

Red Kandhari bull semen was preserved at refrigeration temperature on diluting the semen with three different dilutors. Motility of the extended semen samples after 72 hrs of preservation at refrigerant temperature in Tris egg yolk, Laciphos and Egg yolk citrate dilutors was 47.5, 43.61 and 42.78 per cent respectively. There was no significant difference in motility on semen preservation between the different extenders used.

* * *

Red Kandhari is a recently recognised breed of cattle from Marathwada region. Red Kandhari bulls have high breeding efficiency. Studies on preservation of semen of this breed are not reported in literature. Hence, present studies were undertaken.

Materials and Methods

Three Red Kandhari mature bulls were selected for the present study. Semen from each bull was collected twice a week over a period of three months using 'Artificial Vagina' method. Ejaculates with optimum mass activity (+++) and initial motility (70-80%) were extended and preserved at refrigerant temperature. Extenders used were Tris-Egg Yolk, Laciphos and Egg yolk citrate extenders. All the extenders were prepared prior to semen collection by adding 2 ml of fresh egg yolk to 8 ml of each of the 3 buffer solutions. Semen was extended at the dilution rate of 1:10 at 37^{0}C and cooled at the rate of 1^0 per minute upto 5^{0}C and preserved in refrigerator. Motility and abnormal sperm count were recorded after 0,24,48 and 72 hours of preservation.

Results And Discussion

The average motility was 47.5 per cent in Tris-Egg yolk, 43.61 per cent in Laciphos and 42.78 per cent in Egg yolk citrate dilutors after 72 hours of semen preservation at 5^{0}C (Table 1) Motility in tris extender in the present study was better than in Laciphos and Egg yolk citrate dilutors. These observations are in agreement with those of Davis *et.al.* (1963) and Edwin *et.al.* (1975). Observation on motility in Egg yolk citrate extender study is in close approximation with Bhatnagar *et.al.* (1979) who reported 40 to 50 per cent motility on bull semen preservation.

There was no significant difference in motility on semen preservation between the different extenders used. Similar results were recorded by Ansari *et.al.* (1984) on preservation of Holstein Fresian bull semen.

Abnormal sperm counts on preservation of semen at 5^{0}C in Tris-egg yolk, Laciphos and Egg yolk citrate dilutors were 17.88, 20.11 and 16.77 per cent. Though the

* Part of MVSc thesis submitted by senior author to MAU, Parbhani.

abnormal sperm count was slightly higher, majority were tertiary sperm abnormalities. Percentage of abnormal sperms varied significantly in between the extenders used.

It is concluded that the Red Kandhari bull semen is preservable at refrigerant temperature. Better results were recorded with semen samples extended in Tris egg yolk dilutor.

Table 1 : Percentage of progressively motile sperms at 5°C. in different extenders (N-12)

S. No.	Name of the Extender	No. of bull	Initial motility	Percentage of motile sperms at 0 hour	24 hours	48 hours	72 hours
1	Tris-Egg Yolk.	RK 1	78.33	75.83	65.83	59.16	45.83
		RK 4	72.50	70.00	60.83	55.83	45.00
		RK 24	79.16	74.16	67.50	59.16	51.66
		Overall Average	76.66	73.33	64.72	58.05	47.50
2	Laciphos Egg Yolk.	RK 1	78.33	73.33	62.50	57.50	43.33
		RK 4	72.50	65.83	57.50	52.50	41.66
		RK 24	79.16	72.50	61.66	55.00	45.83
		Overall average	76.66	70.55	60.55	55.00	43.61
3	Egg Yolk-Citrate	RK 1	78.33	74.16	63.33	58.33	45.83
		RK 4	72.50	63.33	53.33	48.33	37.50
		RK 24	79.16	70.83	60.00	53.33	45.00
		Overall average	76.66	69.44	58.89	53.33	42.78

Table 2: Average percentage of abnormal sperms at 5°C. in different extenders

Preservation hours	Tris-Egg Yolk Abnormalities (%)				Laciphos Abnormalities (%)				Egg Yolk-Citrate Abnormalities (%)			
	Head	Mid	Tail	Total	Head	Mid-	Tail	Total	Head	Mid-	Tail	Total
0 h.	1.72	0.99	8.38	11.11	1.86	0.85	10.66	13.38	1.60	0.53	9.23	11.38
24 h.	2.13	0.85	10.11	13.10	2.52	0.77	10.75	14.05	1.85	0.73	9.85	12.44
48 h.	2.88	0.83	11.49	15.22	2.21	0.63	14.25	17.11	2.55	0.74	10.92	14.22
72 h.	2.73	0.66	14.48	17.88	3.11	0.94	16.05	20.11	2.98	0.77	13.01	16.77

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IJAR:12:1:6-12:1991

Development Of Some Rapid "Test-Freezing Methods" For Predicting The Freezability Of Bovine Semen

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ABSTRACT

An attempt was made to develop rapid "Test freezing methods" for predicting the post-thaw motility (PTM) of Bovine semen. Treatments based on achieving faster cooling to 5°C within 15 minutes and further equilibration period of 30 minutes were adequate for obtaining post-thaw results for predicting the suitability or otherwise of semen ejaculates for commercial freezing by routine methods. A highly significant correlation value (r = 0.7) was obtained between the post-thaw results of test freezing and standard/routine methods. A ready reckoner for predicting the post-thaw values from values based on "Test freezing" was developed for rejecting or accepting a particular ejaculate for bulk freezing. It could also form a sound basis for determining the final dilution rate consistent with minimum number of progressively motile spermatozoa required in each straw of frozen semen. Any ejaculate which gave a PTM of 10% at test freezing could be suitably diluted and frozen commercially within the existing standards of acceptance.

* * *

Wide variations exist in the freezability of semen between bulls and between different ejaculates of the same bull (Elliot, 1978) which necessitates the availability or some rapid test freezing methods to predict the post-thaw result of a particular ejaculate when frozen by some standard/routine methods.

The basic principle involved in developing test-freezing methods is to reduce the total time involved between semen collection and its post-thaw evaluation. The objective is to make available the freezability result of the split ejaculate quite early before undertaking the freezing of the bulk ejaculate by standard/routine method. Reports of such quantitative test-freezing methods are meagre in literature. Docke (1957), Heuke (1971) Mathew and Sasikumar (1976) and Negotia (1984) had tried test-freezing of cattle semen but the tests advocated by them were either qualitative in nature or took a long time (more than two hours) for getting the results.

In the present study, the freezability result of some rapid test-freezing methods, developed through our earlier experiments (Mathur, 1989) were compared and correlated with two standard freezing methods. By these methods, the freezability of a semen ejaculate could be predicted quantitively within 45 minutes of semen collection.

* Part of M.V.Sc. Thesis, I.V.R.I. Izatnagar.

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4. Head of Division.

Materials and Methods

The study was carried out on 30 ejaculates from 5 Holstein-Friesian bulls (6 ejaculates per bull) at the Germ Plasm Centre, IVRI, Izatnagar.

Freshly collected ejaculates were evaluated for volume, mass motility, sperm concerntration, percent dead sperm, percent abnormal sperm and percent normal acrosomes. The sample was diluted at 30°C with Tris-glycerol-egg yolk dilutor (containing 20% egg yolk and 7% Glycerol) to have 80 million sperm/ml. The diluted semen after assessing its initial motility, was filled and sealed in 0.5ml French Straws. Eight different treatments in cooling time to 5°C and equilibration period at 5° C (4 straws per treatment) were given thus:

Treatment 1 (T-1) involved placement of straws at "10°C height" followed by its cooling to 5°C in 15-20 mts in liquid nitrogen (LN2) vapour (in Thermoware container).

Treatment 2 (T-2) same as in T-1 but further the straws were equilibrated at 5°C for 30 minutes in LN2 vapour itself, after cooling to 5°C in Thermoware container.

Treatment 3 (T-3) involved placement of cotton-plug protected straws at 5°C in LN2 vapour for 15 minutes in Thermoware contaiiner.

Treatment 4 (T-4) involved placement of straws directly from 30°C to 10°C water, followed by its cooling to 5°C in 15 mts. in freezing chamber of the refrigerator.

Treatment 5 (T-5) same as T-4 except that the straws were equilibrated (after cooling to 5°C) in refrigerator at 5°C for 30 minutes.

Treatment 6 (T-6)/(S-1) involved cooling of straw from 30°C to 5°C in two hrs. in freezing chamber of the Refrigerator (Sahni and Mohan, 1988).

Treatment 7 (T-7) same as in treatment 6 but additionally the straws were equilibrated at 5°C in refrigerator for 30 minutes.

Treatment 8 (T-8)/(S-2) involved cooling of straws from 30°C to 5°C in two hours in freezing chamber of the Refrigerator followed by two hours of equilibration at 5°C in Refrigerator.

Out of all the 8 treatments, treatment number 1 to 5 were taken as test-freezing treatments (T-1 to T-5), while treatments 6 and 8 were taken as standard freezing treatments (S-1 and S-2). The test-freezing treatments 1, 3 and 4 were selected from the results of earlier experiments (Mathur, 1989). They were retested with 30 minutes equlibration period and compared with the two standard freezing methods.

After above treatments, the straws (One per treatment) were evaluated at prefreeze stage for motility, percent dead sperm, percent abnormal sperm and percent normal acrosomes. The remaining straws were frozen as per Jondet *et.al.* (1980)

Thawing was done at 37°C for 30 seconds. After thawing, one straw per treatment was used for post-thaw evaluation of motility, dead sperm, abnormal sperm and percent normal acrosomes; one straw per treatment was incubated at 37°C for 1 hr. and then evaluated for motility and percent normal acrosomes and one straw (per treatment) was stored (in thawing water) at 5°C for 24 hrs for post-aging motility evaluation.

All the statistical analysis were carried out on micro-32 computer of the Institute.

Results

The differences between bull and between treatments for PTM were highly signi-

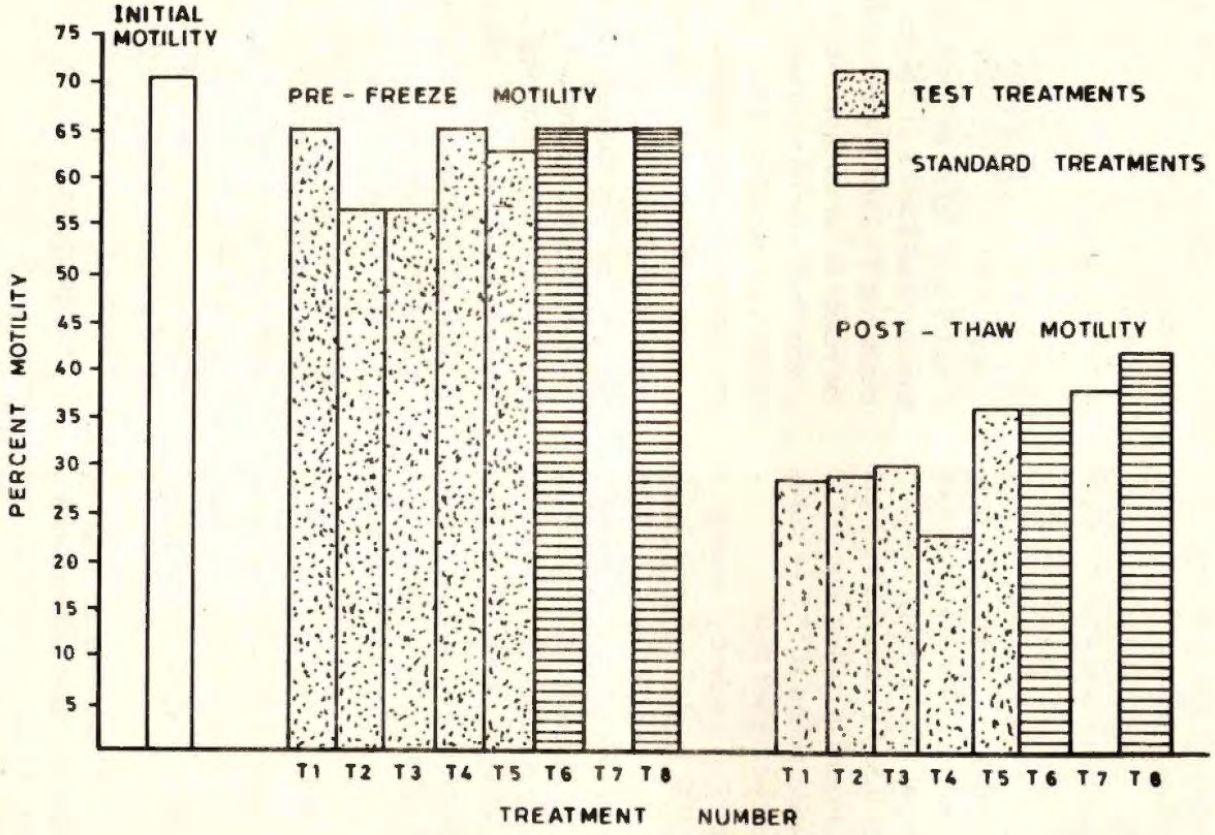

Fig. 1 : Percent Motility Before and After Freezing for Different Treatments.

ficant (P> 0.01) Among treatments, the ranking was in the following sequence with the average percent PTM values mentioned in brackets: T-8 (40.00), T-7 (36.00) T-5 (34.20) T-3 (28.73) T-2 (28.00) T-1 (27.83) and T-4 (21.96). Comparison of means through critical difference revealed no significant difference between two standards (T-6/S-1 and T-8/S-2) and between T-1, T-2, T-3, T-5 and S-1. (Table 1)

To predict the expected PTM of the two standard (S-1 and S-2) methods by the above five test-freezing methods, the correlation coefficient (r) between Five test-freezing methods (T-1 to T-5) and two standard methods (S-1 and S-2) for post-thaw motility was calculated (Table-2) and depicted in Scattograph (Fig.2). The correlation of T-1, T-3, & T-4 with both the standards (S-1 and S-2) were highly significant ($p > 0.01$). Among the three test-freezing methods, the correlation of T-1 with S-1 ($r = 0.73$) and T-3 with S-2 ($r = 0.60$) was highest. The correlation of T-4 method with both the standards was second highest ($r = 0.72$ with S-1 and 0.58 with S-2).

Discussion

As the correlation of the three test-freezing treatments, T-1, T-3 and T-4 with both the standards (S-1 & S-2) is high and these three methods take 30-45 minutes from semen collection to availability of PTM evaluation result, these three can be recommended as rapid test-freezing methods for cattle semen.

A ready reckoner of predicted PTM values of the two standard methods by the observed PTM values of the three recommended test-freezing methods (T-1, T-3 and T-4) has been prepared after calculation of regression equation from PTM of the three test-freezing methods (X value) and corresponding PTM values of the two standard methods (Y value) for 30 ejaculates (X - 30) (Table 3) Thus, 6 regression equations and 6 sets of predicted values (3 test-freezing methods for two standards) are available (table 3) for the hypothetical PTM value (X) from the respective test-freezing methods

There was a slight difference in the predicted values by the three test-freezing methods for both the standards. Thus, in general, approximate PTM values can be predicted by any of the three methods for semen frozen by any of the two standard methods. However in case of semen frozen by other methods, the predicted values need to be restandardized, but little alteration is expected.

Among the three recommended test-freeze methods, T-4 is easier, does not require any extra appliances and with second highest r value for both the standard methods. Hence the three test freezing methods (T-1, T-3, T-4) in general and T-4 method in particular are recommended for routine use. Regression line graph can also be directly used for predicting PTM of the two standard methods from the observed T-4 test freeze method. (Fig 3)

The test-freezing methods have two main advantages of (i) rejecting or accepting a particular ejaculate for freezing and (ii) deciding the final dilution rate of the sample.

By following the minimum acceptable PTM standard of 25% (Goffaux, 1964) and taking 30 million sperm per dose and 35% post-thaw motility (to have a standard of 10 million progressively motile sperm per dose), the following dilution rate is suggested.

Test freeze value by T-4 method	Suggested sperm (Million) concentration per dose of insemination	
	For S-1	For S-2
5	Sample be rejected	36
10	44	32
15	38	29
20	33	27
25	29	25
30	26	23
35	24	22
40	21	21
45	20	19
50	18	18
55	17	17
60	16	16
65	15	16

For the desired advantages, the following protocol be adopted :-

The neat semen immediately after collection and initial evaluation, is diluted at 1:5 rate at 30°C. This diluted semen is maintained at lower temperatures (preferably at 10°C to 20°C) till the test-freezing result is available. If the expected PTM is less than 25%, then such semen should be rejected. In case of acceptable samples, the dilution rate of the initially diluted semen is increased to desired level (as above), by addition of dilutor maintained at the same temperature. The filling of straws and subsequent freezing process can then be initiated.

This system has additional advantages such as: (1) It can result in lowering the number of unacceptable ejaculates with PTM between 25 to 35%, due to adjustment of their final dilution rate and (2) It can result in an increase in the number of total doses produced for the semen samples which are expected to have more than 35% post-thaw motility (PTM).

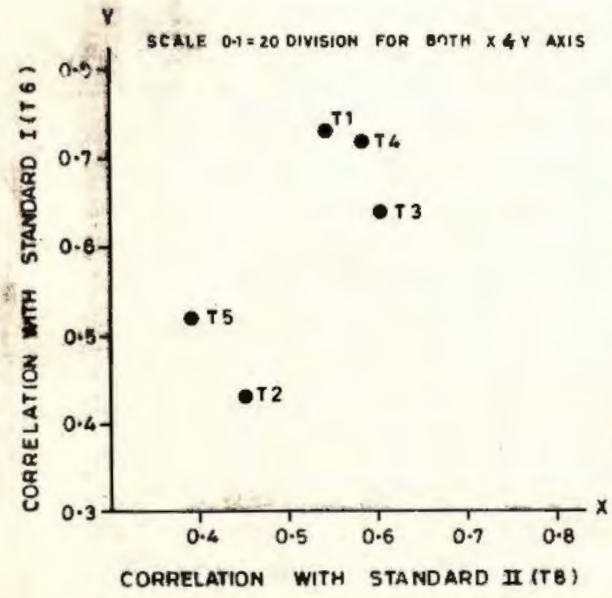

Fig. 2- Correlation Of Test Freezing Treatments (Tito T 5) With Standard Freezing Treatments (T 6 & T 8) For Post-Thaw Motility.

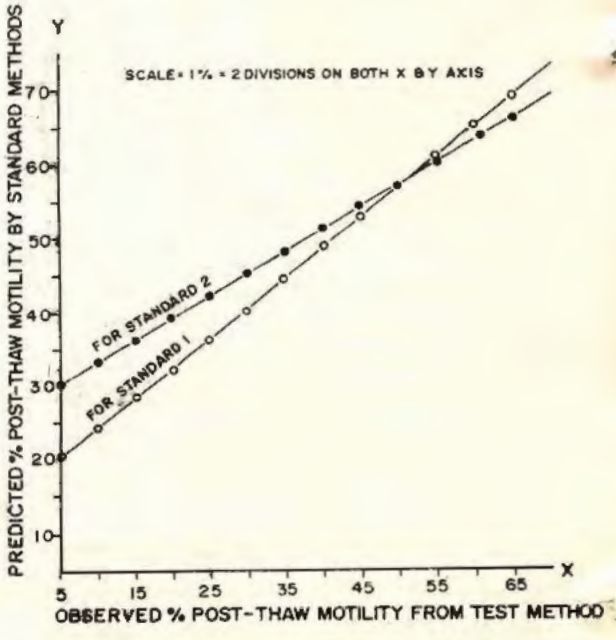

Fig 3 - REGRESSION LINE FOR OBSERVED (X) & PREDICTED (Y) POST-THAW MOTILITY BY T_4 TEST-FREEZE METHOD

Table : 1 Mean values for different semen quality parameters after giving different treatments for cooling and equilibration time at different stages of processing/evaluation.

Semen quality parameter and stage of processing/evaluation	Overall average for different treatments							
	T 1	T 2	T 3	T 4	T 5	T 6	T 7	T 8
1. Percent motility at different stages	a	b	b	a	a	a	a	a
a) Prefreeze	65.16 ± 1.42	55.83 ± 2.28	55.66 ± 2.73	64.66 ± 2.18	62.00 ± 1.89	65.16 ± 1.66	65.00 ± 1.76	64.50 ± 1.86
b) Post-thaw	cd 27.83 ± 2.74	cd 28.00 ± 2.29	cd 28.73 ± 2.67	d 21.96 ± 2.40	abc 34.20 ± 3.14	abc 34.06 ± 2.68	ab 36.00 ± 2.46	a 40.00 ± 2.57
c) Post-incubation	defg 10.93 ± 1.96	def 14.03 ± 2.68	bcde 15.16 ± 2.56	fg 8.03 ± 1.57	bcd 15.83 ± 2.44	abc 19.36 ± 2.57	ab 19.66 ± 2.74	a 25.93 ± 3.01
d) Post-ageing	cdef 15.23 ± 2.36	bcde 14.33 ± 1.90	bcde 15.20 ± 2.40	f 10.20 ± 1.86	bc 20.06 ± 3.21	bcd 18.96 ± 2.55	ab 22.63 ± 2.78	a 27.36 ± 2.98
2. Percent dead sperm at different stages.	bc	a	a	bc	b	cd	bc	bc
a) Prefreeze	31.13 ± 2.55	38.56 ± 2.58	38.83 ± 3.05	30.30 ± 2.64	32.43 ± 2.72	26.16 ± 2.33	26.93 ± 2.38	30.10 ± 2.34
b) Post-thaw	75.26 ± 2.73	74.06 ± 2.22	74.80 ± 2.28	81.06 ± 2.08	71.66 ± 3.06	68.00 ± 2.75	66.30 ± 2.05	59.33 ± 2.93
3. Percent dead sperm at different stages.	b	ab	ab	a	b	b	ab	
a) Prefreeze	12.16 ± 0.62	13.33 ± 0.69	12.66 ± 0.63	13.90 ± 0.62	14.00 ± 0.64	12.20 ± 0.54	12.24 ± 0.54	13.13 ± 0.62
b) Post-thaw	ab 15.23 ± 0.59	ab 16.00 ± 0.67	ab 15.48 ± 0.63	a 16.80 ± 0.68	a 16.46 ± 0.62	ab 14.70 ± 0.53	ab 14.83 ± 0.54	ab 15.20 ± 0.67
4. Percent normal acrosomes at different stages.	abc	abc	d	d	abcd	ab	a	abc
a) Prefreeze	72.96 ± 2.06	75.26 ± 2.13	69.00 ± 1.95	68.36 ± 2.13	73.10 ± 2.46	76.26 ± 1.95	76.86 ± 2.16	74.60 ± 1.39
b) Post-thaw	b 43.83 ± 2.80	a 50.40 ± 2.42	b 44.03 ± 2.50	c 37.20 ± 2.84	b 42.53 ± 3.03	a 51.23 ± 2.23	a 51.73 ± 2.41	a 51.63 ± 2.46
c) Post-incubation	dc 18.23 ± 1.91	bc 26.43 ± 2.51	cd 21.10 ± 1.80	c 16.96 ± 1.84	cd 21.56 ± 1.99	bc 25.40 ± 2.13	ab 28.06 ± 2.31	a 31.53 ± 2.49

Note - Figures with same superscript indicate non-significant difference between them.

Table 2 - Correlation between Test-freezing and standard freezing treatments for post-thaw motility (PTM).

Standard Freezing Treatment	Test-Freezing Treatments				
	T-1	T-2	T-3	T-4	T-5
S-1	0.73^{xx}	0.43^{x}	0.64^{xx}	0.72^{xx}	0.52^{xx}
S-2	0.54^{xx}	0.45^{x}	0.60^{xx}	0.58^{xx}	0.39^{x}

x - Value significant at 5% level.
xx - Value significant at 1% level.

Table : 3 - Predicted values for the two standards (S-1 and S-2) by the selection test-freezing methods (T-1, T-3 and T-4).

Observed PTM (%) by test method (x) (Hypothetical values)	Predicted Values (Y)					
	For standard 1 by			For standard 2 by		
	T-1	T-3	T-4	T-1	T-3	T-4
5	18	19	20	28	26	29
10	21	22	24	31	29	33
15	25	25	28	33	32	36
20	28	28	32	36	35	39
25	32	32	36	39	38	42
30	36	35	40	41	41	45
35	39	38	44	44	44	48
40	43	41	49	46	46	51
45	46	44	53	49	49	54
50	50	48	57	51	52	57
55	54	51	61	54	55	60
60	57	54	65	56	58	64
65	61	57	69	59	61	67

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IJAR:12:1:13-14:1991

Effect Of Foot And Mouth Disease Vaccination On Semen Quality In Bulls*

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Exotic and crossbred bulls are regularly vaccinated to prevent diseases like Foot and Mouth (FMD), Rinderpest (RP), Black Quarter (B.Q.) and Haemorrhagic Septicaemia (H.S.) It is well known that there is an elevation of body temperature during post-vaccination period and also the temperature of testes which causes derangement in spermatogenesis. Very little information is available regarding quality of semen in Ongole, Jersey and Jersey X Ongole crosses during post-vaccination period. Hence the present investigation was undertaken to study the effect of FMD vaccination in these breeds.

Two bulls each of Ongole, Jersey and Jersey X Ongole breed, aged between 4-5 years available at the Indo-Swiss Project, Visakhapatnam, were selected and the investigation was carried out on the effect of FMD vaccination over a period of five months. Semen characteristics were studied one month prior to (30 ejaculates) and during 4 months following FMD vaccination (156 ejaculates). Temperature of bulls was recorded before and after vaccination.

The present investigation revealed that the bulls of different breeds reacted differently to the post vaccination stress with regard to semen characteristics. While there was an increase in reaction time, volume of semen and total sperm abnormalities, there was a decrease in initial sperm motility, mean sperm concentration, live sperm count and per cent of cold shock resistant sperms during post-vaccination period (Table 1)

In Jersey and Ongole breed, the reaction time returned to pre-vaccination value 20 days earlier i.e., by 60th day as compared to Jersey X Ongole breed (80th day). No adverse effect on the volume of semen ejaculates was found in all the breeds studied, similar to the findings of Saxena and Tripathi (1977) in FMD vaccinated Jersey bulls.

A drop in the initial sperm motility during post-vaccination period was seen in all the breeds. In Jersey and Jersey X Ongole bulls, the initial sperm motility was restored to prevaccination level by 40th day and in Ongole bulls by 60th day. Radhakrishnan *et.al.* (1975) recorded recovery by 40th day postvaccination in Jersey X Sindhi crossbred bulls.

The mean sperm concentration decreased in Jersey and Ongole breeds by 20th day and in Jersey X Ongole by 40th day post-vaccination period. Similar effect was noticed by Venkataswami and Rao (1970) and Radhakrishnan *et.al.* (1970). But Saxena and Tripathi (1977) reported an increase in sperm concentration while Narasimhan

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et.al. (1970) reported no change in the sperm concentration after rinderpest (RP) vaccination.

The percentage of live sperm count declined by 20th day post-vaccination, in all the breeds. It reached prevaccination level by 40th day in Ongole; 60th day in Jersey X Ongole and 80th day in Jersey bulls. Similar decrease was noticed by Venkataswami and Rao (1970) and Radhakrishnan *et.al.* (1975).

The percentage of cold shock resistant sperms reduced almost to 50% of the prevaccination levels during post-vaccination period upto 40th day in all the breeds. Thereafter there was a gradual increase till 100th day post vaccination. Venkataswami *et.al.* (1972) and Radhakrishnan *et.al.* (1975) reported similar findings after viral vaccinations.

The percentage of total sperm abnormalities in Ongole bulls reached prevaccination value by 40th day and in Jersey and Jersey X Ongole bulls by 60th day, with an increase in the percent abnormalities by 20th day postvaccination in all the breeds.

The effect of vaccination stress was found to be moderate in Jersey and Jersey X Ongole, but less in Ongole breed. The variation in the period of improvement in semen quality in different breeds might be attributed to individual and breed variations, as opined by Saxena and Tripathi (1977) and Gahlot and Kohli (1981).

Table 1 : Pre and Post-vaccination semen characteristics in different breeds of cattle

S No.	Semen characteristics	Prevaccination period			Post Vaccination Period											
					20 days			40 days			60 days			80 days		
		J	O	JXO	J	O	JXO	J	O	JXO	J	O	JXO	J	O	JXO
1.	Reaction time (minutes)	2.0	2.0	2.8	3.5	3.5	3.5	4.0	3.5	4.0	2.5	2.0	4.5	2.5	2.0	3.0
2.	Volume (ml)	7.6	6.8	3.5	8.6	8.0	4.0	8.0	8.0	4.7	8.0	8.0	5.5	8.0	7.0	5.5
3.	Initial sperm motility (%)	75	75	60	70	60	50	85	60	70	80	80	70	80	80	75
4.	Sperm concentration (millions/ml)	1052	1060	875	940	800	875	1040	890	800	1000	1040	840	1100	1040	870
5.	Live sperm count (%)	85	86	84	75	80	80	76	87	80	80	85	84	85	85	83
6.	Cold shock (%)	20.0	15.25	17.25	11.75	8.25	9.25	11.0	9.0	9.5	17.0	13.25	14	18.0	14.25	16.5
7.	Total sperm abnormalities (%)	10.25	13.0	17.5	13.0	14.0	22.0	11.0	13.0	19.0	8.5	9.0	16.0	8.75	8.0	14.0

J = Jersey; JXO = Jersey X Ongole; O = Ongole

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IJAR:12:1:15-16:1991

Pathomorphological Study In Testicular Degeneration Associated With Stress In HF Bull.

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ABSTRACT

A rare case of testicular degeneration (TD) in a HF bull associated with foot and mouth disease (FMD) and foot root, over grown hooves in all legs and interdigital fibroma in one leg causing severe stress is reported. The histopathological lesion of severe degeneration, fibrosis and calcification is described.

* * *

Testicular degeneration forms 75 to 80% of testicular pathology (Lagerlof, 1934). It adversly affects the AI programmes. Many etiological factors have been associated with TD, including stress and diseases. Histopathological lesions of TD in a HF bull which suffered earlier from FMD and later foot rot and overgrown hooves are presented in this study.

Material And Methods

A Holstein Friesian bull from an organised farm in Gujarat with previous history of FMD was suffering from foot rot with no response to treatment and had an inter-digital fibroma which was operated. It had over grown hooves in all four legs and gave very poor quality semen. It was subjected to surgical removal of both the testis to study histopathological lesions. The tissues preserved in Bouin's fluid were processed and sections of 4-5 micron thickness were cut and stained with H & E as routine; Van Gieson for connective tissues and Van Kossa for calcification as special stains as per the methods described by Luna (1968).

Results and Discussion

Ever since the bull suffered from foot rot, it was giving low concentrated (400 x 10/ml) watery semen with less motile sperms and high percentage of abnormal sperms (64%). Head abnormalities were mainly noticed with tailless sperms. Elhordoy and Cavestany (1986) also reported high percentage of abnormal spermatozoa including acrosome defects in TD. Our findings are similar to those of Gustafsson and Galloway (1988), except coiled tails which were not observed in this study. On surgical removal, the testis were grossly reduced in size, brown in colour and were soft at surface and firm in the centre (Roberts, 1986). The cut surface of the testis did not bulge out due to fibrosis.

Histopathologically, large number of tubules revealed complete necrosis of spermatogonial cells resulting in formation of tissue debris with vacuolation, pyknosis and giant cells in the lumen (Fig. 1). Rao (1982) also found giant cells in TD with no tail abnormalities. In some tubules arrest of spermatogenesis at spermatid level was noticed. Sertoli cells and cells of Leydig were however not affected as reported in rats by

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Fig. 1 : Seminiferous tubules showing degeration, necrosis, tissue debris and giant cells.

Fig. 2 : Extensive fibrosis around the tubules, reducing their size and darkly stained areas of calcification.

Corrier *et.al.* (1985). Some of the tubules showed normal spermatogenesis. The intertubular fibrosis and thickening of basement membrane resulting in reduction in the size of seminiferous tubules was confirmed by red staining with Van Gieson stain (Fig. 2). The intense blue colored fibrosed area in H&E stain was found to be calcification on taking black colour by Van Kossa stain (Roberts, 1986). Ahmed *et.al.* (1988) observed similar lesions except calcification in buffalo bulls. The architecture of epididymis remained intact but its lumen contained clumps of abnormal spermatozoa.

Testicular degeneration (TD) is the most frequent cause of reduced fertility in male animals. The pattern and signs of TD do not vary with the etiology and the degenerative process is not uniform in all the tubules (Mc Entee, 1970). Amongst the large number of causes, stress and disease form important factors in TD. Foot rot is the common cause of TD in rams (Roberts, 1986). In the present case, the foot rot was preceded by FMD and this stress combined with that due to inter digital fibroma, and overgrown hooves appeared to have deleterious effect on the testis, resulting in severe testicular degeneration.

Acknowledgements

Authors are thankful to Senior scientist, ADRL; GM, Biotechnology; and the Managing Diretor, NDDB for providing facilities for this study.

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IJAR:12:1:17-18:1991

Age At First Calving In Sahiwal Cross-bred Cows With Three Levels of Exotic Inheritance

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ABSTRACT

In a study of 133 cross-bred cows divided into three groups of exotic inheritance, results indicated that, Jersey X Sahiwal half-breds had better reproductive performance regarding age at first calving in comparison to 5/8 and 3/4 cross-breds of Jersey X Sahiwal. The effect of genetic group and farm on age at first calving was highly significant.

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Age at first calving is an important economic trait and offers valuable information about the reproductive efficiency as it directly influences life time milk production in dairy animals. Reduction of age at first calving minimises cost of raising and maintenance of heifers to productive life. The present investigation was therefore undertaken to evaluate the effect of different genetic and non-genetic factors on age at first calving.

Materials and Methods

Data on age at first calving of 133 Sahiwal cross-bred cows with three levels of exotic inheritance, at cattle Breeding Farm, Nagpur Veterinary College, Nagpur and Agricultural College Dairy Farm, Nagpur extending over a period from 1971 to 1986 were used for the present study. The entire period of study (1971 to 1986) was divided into 3 periods, viz period 1 (1971-1976), period 2 (1977-1981) and period 3 (1982-1986). The data was analysed to study the effect of level of exotic inheritance, the period and farm in Sahiwal Cross-bred Cows, on their age at first calving by applying least square of variance design.

Results and Discussions

The overall average age at first calving was estimated to be 1180.12 ± 35.36, 1286.16 ± 63.21 and 1219.44 ± 63.03 days for 1/2, 5/8 and 3/4 bred crosses of Jersey X Sahiwal respectively. These results are in agreement with findings of Dev and Gill (1977), who reported average age at first calving as 35.1, 36.7 and 36.6 months in 1/2, 5/8 and 3/4 Friesian X Sahiwal Crosses. These results are also in agreement with Gill (1979) and Singh and Bhat (1986) who reported average age at first calving as 1067, 1083, 1098 days and 1097.5, 1105.9, 1129.9 days respectively in 1/2 5/8 and 3/4 bred crosses of Sahiwal X Friesian Cows.

The analysis of variance for age at first calving is given in Table 1.

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Table 1 : Least square analysis of variance for age at first calving.

Source of Variation	d.f.	Mean Squares
Genetic groups	2	669532.25**
Periods	2	23398.82N.S.
Farms	1	1189356.52**
Genetic group X Period	4	175488.49*
Genetic group X Farm	2	118540.20N.S.
Period X Farm	2	35210.40N.S.
Residual	119	61729.87

** P < 0.01, * P < 0.05, N.S. Non-Significant.

Difference among genetic groups were highly significant (P < 0.01) indicating that 1/2 and 3/4 bred crosses had significantly lower means of age at first calving than 5/8 cross-breds. Similar results were reported by Dev and Gill (1977).

Period differences were observed to be non-significant. This could be attributed to very little changes in environmental and managemental conditions over all the three periods so that no cross-bred group responded significantly to higher or lower side of age at first calving (Table 1).

Farm differences were found to be highly significant (P < 0.01) indicating further that, the cattle breeding farm. Nagpur Veterinary College had significantly lower age at first calving than Agriculture College Nagpur Dairy Farm. This could be attributable to better managemental and feeding practices adopted at the former Cattle Breeding Farm.

Genetic group X period intereaction was observed to be significant (P < 0.05). Other genetic group X Farm and period X farm intereactions were non-significant.

It may be concluded that 1/2 bred crosses of Jersey with Sahiwal were superior to all other groups in respect of age at first calving.

Acknowledgements

The authors are grateful to the Associate Deans of Nagpur Veterinary College and College of Agriculture, Nagpur for providing facilities to carry out these investigations.

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IJAR:12:1:19-22:1991

Use Of Intravaginal Electrical Resistance Patterns And Milk Progesterone Profiles As Monitors Of Reproductive Status In Cows

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ABSTRACT

Vaginal electrical resistance values were highest (88-108, 85-112) in pregnant animals followed by acyclic animals 78 ± 3.6,82 ± 4.4). The values were significantly low for proestrus and oestrous period, and as such this can be a useful indicator of oestrus and pregnancy. The values of vaginal electrical resistance were lowest in animals affected with uterine infection and follicular cysts. Measurements of vaginal electrical resistance at 20 cm. depth were more reliable than at 25 cm. depth. Vaginal electrical resistance and milk progesterone values showed a curvilinear relationship over a 21 day cycle and the correlation between these during the 4 days prior to and oestrus was of the order of 0.786 and 0. 702 for RV 20 and RV 25 respectively.

* * *

Numerous studies have established a cyclic pattern in the electrical resistance of anterior vagina (RV) that could be related to the stage of the oestrous cycle in cows with the highest and lowest RV values occurring during dioestrus and oestrus respectively (Alzinbudas and Dovilgitis, 1962; Leidl and Stolla, 1976; Aboul-Ela *et.al.* 1982). Using patterns of RV as a means of identifying the optimum time for breeding in cows not seen in oestrus, Foote *et.al.* (1979) obtained satisfactory conception rates. Heckman *et.al.* (1979) also showed that certain reproductive disorders such as metritis and follicular cysts were associated with persistantly low RV readings.

The present investigation was conducted to test the accuracy of a newly designed electrical resistance meter in monitoring cyclical changes associated with ovulation and its value in detection of some reproductive disorders in cows. Because of the uncertainties of visual observation of oestrus, milk progesterone analysis was included in the study.

Materials and Methods

Fortysix post-partum and 18 pregnant Holstein-Friesian cows in the University of Manitoba (Canada) milking herd were used in the study. The cows were checked twice daily for standing oestrus. Intravaginal electrical resistance (RV) was measured with "Ovascan" (Animark, Inc, USA) on alternate days for 45 days in non-pregnant cows and on two occasions at an interval of 7 days in the pregnant cows. The probe of the ovascan was inserted inside the vagina through the parted labia and the readings at a depth of 20 Cm. (RV 20) and 25 Cm or 2 Cm. posterior to cervix (RV 25) were

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recorded. Milk samples were collected in plastic sachets containing potassium dichromate tablets on the same day and preserved at+4°C until assay.

The progesterone content of milk was determined by a nonextraction RIA procedure essentially similar to that described by Heap *et.al* (1973). The samples were analysed in duplicate using 0.1 ml. aliquots of 10 to 40-fold diluted milk samples depending on the concentration of progesterone expected in milk. A highly specific antibody for progesterone was used. The mean sensitivity of the assay was 120 pg/ml. The inter-and intra-assay coefficients of variation were 12.9 and 11.6% respectively.

Statistical analysis were made as per Snedecor and Cochran (1980).

Results and Discussion

Electrical resistance (RV) of vaginal tract :

Individual cow differences in RV were high. Nevertheless, the RV declined significantly ($P < 0.01$) with the onset of oestrus to a nadir on the day of oestrus, while highest values were recorded on days 11-12 in cyclic cows (Table 1) The results agreed with previous reports (Leidl and Stolla, 1976; Aboul-Ela *et.al.* 1982). The readings taken at a depth of 25 cm (RV 25) inside the vagina paralleled those taken at 20 cm (RV 20), but were higher on all occasions and fluctuated more widely during dioestrus (C.V. % of 15.5 Vs 13.6) probably due to smaller and more variable area of contact between the electrodes of the probe and the surface of the vaginal tissue and the mucus lining it.

The RV was consistentiy high in acyclic cows. RV values for pregnant cows were highest and ranged from 88 - 108 (RV 20) and 90 - 112 (RV 25). For 3 cows which had confirmed uterine infection, the RV was continually low irrespective of the stage of the oestrous cycle. Likewise, for 2 cows with follicular cysts, the RV was consistently low. In one cow with a suspected debilitating disease, the mean RV was very high (Table 1).

Temporal relationship between RV and MP :

Milk progesterone (MP) was lowest on the day of oestrus and highest at other stages displaying striking parallelism between RV and MP at various stages of the cycle. However, the MP increased more slowly than did RV following oestrus, while the decline in these two values before onset of oestrus was uniform. This trend is as expected since the corpus luteum secretes little progesterone in the cow until about 5 days after oestrus.

The correlations between MP and RV (25) or RV (20) values averaged over cows during a 21-day cycle were 0.421 and 0.482 ($P < 0.01$) respectively, while those for the 4 days immediately preceding ovulation, when major changes occur, were 0.702 and 0.786 ($P < 0.01$) respectively revealing a curvilinear relationship over a 21-day cycle. This may be due to large changes in RV which took place near and during the oestrus period when progesterone levels were relatively low. Similar observations were made by Aboul-Ela *et.al.* (1982).

In acyclic cows, consistently high RV and low (basal) MP values were seen indicating that progesterone itself may not directly affect the electrical properties of the vaginal tract. Schams *et.al.* (1977) observed parallelism in the increased oestradiol production, oestrous signs and decrease in RV, the nadir of the latter always coinciding with the timing of preovulatory LH peak. In pregnant cows, MP and RV were parallely

high. For those cows harbouring uterine infection, the MP profiles reflected cyclic pattern while the RV was continually low, which might result from inflammatory changes. On the other hand, the cows with follicular cysts displayed a low RV and low MP profile due to persistent oestrus. Heckman *et.al.* (1979) observed similar persistently low RV in several cows with uterine infection and follicular cysts.

It is concluded that the ovascan has a definite potential value in detection of oestrus and may allow indirect conclusions about hormonal changes associated with spontaneous ovulation. It also helps as a tool in detection of uterine infection and follicular cysts. However, single absolute values are not sufficient for determination of oestrus or other disorders owing to individual variation in RV and therefore, repeated measurements are necessary.

Acknowledgement

The award of a visiting fellowship of the Canadian International Development Agency and the Natural Sciences and Engineering Research Council, Canada is gratefully acknowledged.

Table 1 : Pattern of intravaginal electrical resistance and milk progesterone profiles of cows of various reproductive status and disease conditions.

Reproductive status of cows	Intravaginal electrical resistance (Ohm)		Milk progesterone
	RV (20)	RV (25)	(ng/ml)
Acyclic :	78 ± 3.6	82 ± 4.4	2.4 ± 0.4
Cyclic :			
0 (day of oestrus)	46 ± 4.3	49 ± 4.8	3.3 ± 0.8
1 - 2 days	55 ± 3.5	60 ± 4.6	5.6 ± 1.2
3 - 4 "	63 ± 4.3	75 ± 5.2	8.6 ± 1.6
5 - 6 "	72 ± 5.8	82 ± 5.6	16.8 ± 1.8
7 - 8 "	73 ± 4.6	87 ± 5.9	22.5 ± 2.2
9 - 10 "	76 ± 4.8	89 ± 6.4	32.5 ± 3.4
11 - 12 "	78 ± 5.5	93 ± 6.8	34.2 ± 3.6
13 - 14 "	76 ± 4.0	86 ± 6.2	28.5 ± 3.2
15 - 16 "	85 ± 5.6	88 ± 5.9	28.2 ± 2.9
17 - 18 "	82 ± 5.6	84 ± 5.2	18.0 ± 2.3
19 - 20 "	65 ± 5.8	66 ± 4.0	4.7 ± 0.8
Pregnant :			
22- 30 days	92 ± 5.2	92 ± 5.8	20.6 ± 2.4
31 - 45 "	88 ± 6.6	85 ± 7.2	40.7 ± 3.6
91 - 120 "	102 ± 7.4	105 ± 7.8	34.6 ± 3.6
121 - 150 "	108 ± 7.2	112 ± 8.4	32.3 ± 2.8
151 - 180 "	104 ± 6.8	106 ± 8.0	36.9 ± 3.0
Uterine infection :	58 ± 2.8	66 ± 3.8	18.2 ± 3.4
Follicular cysts :	55 ± 3.3	62 ± 4.2	4.8 ± 2.0
Debility :	135 ± 4.5	150 ± 5.6	3.0 ± 0.5

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IJAR:12:1:22-27:1991

Application Of Enzygnost (R) Milk Progesterone Test Kit For Detection Of Early Pregnancy In Cows And Buffaloes

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ABSTRACT

Milk samples from 139 crossbred cows were tested for progesterone both qualitatively and quantitatively between day 18 to 24 (group 1) and day 25 to 90 (group 2) post A.I. Milk samples were also tested from 35 buffaloes (group 3) between day 18 to 24 post-service. Pregnancy/non pregnancy was confirmed between day 45 to 50 after A.I. and Enzygnost results compared for accuracy rate. For qualitative estimation of progesterone, the kit was found 90.62% and 76.56% accurate for detecting non-pregnancy and pregnancy in group 1 cows and 100% and 91.67% in group 2 cows, respectively. In buffaloes, the accuracy rates were 81.82% and 71.43%. Quantitative estimation of progesterone revealed that when the values were more than 4 ng/ml milk, 77.27% and 81.48% cows and 56.52% buffaloes were pregnant. When the values were less than 2 ng/ml, only 6.90% cows in group 1; none in group 2 and 25% buffaloes were found pregnant.

* * *

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Accurate and early pregnancy diagnosis (P.D.) is the crux of any scheme for the prevention of infertility. Laing and Heap (1971) were the first to suggest that progesterone concentration in milk might provide a means of early P.D. in lactating dairy cows, which could be conducted with the help of radio immunoassay (RIA) technique. Nevertheless, determination of progesterone by RIA technique requires a costly and sophisticated central laboratory with special equipments, trained personnel, handling of hazardous radio isotopes and long response time (2 to 10 days). The measurement of progesterone in milk by means of an enzyme linked immunosorbent assay (ELISA) was first described by Nakao and Kawata (1980). This technique has got certain advantages over RIA viz., hazards of radiation is avoided, no need of any sophisticated laboratory and instruments, simple and quick to perform, cost involved is low and on farm testing is possible. The present investigation was therefore, conducted to study the applicability of an amplified enzyme immunoassay kit (Enzygnost (R) Hoechst) for qualitative and quantitative estimation of progesterone in milk of cows and buffaloes for detecting early pregnany/non pregnancy.

Materials and Methods

Animals used during the present investigation comprised of crossbred cows of Birsa Agricultural University Farms, Ranchi and also crossbred cows and buffaloes belonging to livestock owners in and around Ranchi. Whole milk samples were obtained from the afternoon milking of 139 cows and 35 buffaloes in three groups. Under Group 1 (n=107) and Group 2 (n=32), samples were collected from cows between Day 18-24 and Day 25-90 post-A.I., respectively. Group 3 comprised of 35 buffaloes whose milk samples were collected between Day 18-24 post service. All the cows and buffaloes were confirmed for their pregnancy/non-pregnancy status on gynaeco-clinical examination 45 to 50 days post-AI and percent agreement of the findings with those of ELISA results was calculated.

Qualitative estimation of progesterone

Progesterone in milk was detected as per the procedure described in the technical bulletin supplied along with the kit and visual grading of the end point colour was recorded by at least two observers independently. Development of deep pink colour was graded as +++, while pale colour was denoted as +. When the colour was in between these two zones, it was denoted as ++. Finalisation of the results of each sample was done considering the results of the two observers. Samples developing pale colour were grouped as ELISA positive i.e. high progesterone, whereas development of deep pink colour was considered as ELISA negative i.e. low progesterone. The samples were categorised as ELISA doubtful when the terminal colour was in between the two groups. Later, the ELISA results were compared with the gynaeco-clinical findings in order to determine the rate of agreement between the two methods.

Quantitative estimation of progesterone

On qualitative estimation, the fluid obtained after addition of stopping solution was diluted with 2 ml of 0.3 M H_2SO_4 and absorbance was measured at 492 mm using Sicospec-100 (BPL-INDIA) colorimeter and quantity of progesterone was calculated

and expressed as ng/ml of milk. The cows were regrouped on the basis of progesterone values obtained in their milk samples viz., less than 2 ng/ml, more than 4 ng/ml and between 2-4 ng/ml to find out the agreement percent between quantity of progesterone and gynaeco-clinical results.

Results

Qualitative estimation of progesterone : Out of 174 samples 109, 46 and 19 were positive, negative and doubtful for pregnancy respectively, on the basis of colour development (Table-1). It is evident (Table-2) that in cross-bred cows, between day 18 - 24 (Group 1) the agreement between ELISA and gynaeco-clinical palpation was 76.56% for positive and 90.62% for negative cases. It increased to 91.67% and 100% for positive and negative diagnosis between day 25 - 90 post AI (Group 2). In buffaloes (Group 3), the agreement was 71.43% and 81.82% for positive and negative detection of pregnancy. Nevertheless, the differences within the group were statistically not significant (Table 2)

Quantitative estimation of progesterone : Subsequent to regrouping of animals on the basis of their progesterone values into three categories, it was observed that when the values of progesterone was < 2 ng/ml, only 6.90, nil and 25% animals were pregnant in Group 1, 2, and 3, respectively (Table 3). On the contrary, when these values were > 4 ng/ml, 77.27, 81.48 and 56.52% animals were pregnant in the three groups in that order.

Discussion

It was observed that diagnosis with Enzygnost (R) was 90.62% accurate for negative and 76.56% accurate for positive cases of pregnancy in Group 1 cows. Davies and Fletcher (1987) reported 88.90% accuracy for negative cases by a commercially available kit Ovucheck (R) which agrees with the present findings. These workers opined that the ELISA test kit was easy to perform, accurate for the differentiation of high and low progesterone levels in milk and gave results in 45 minutes. Elmore (1986) reported 100% accuracy for negative and 75% for positive pregnancy diagnosis using a rapid progesterone assay kit. Takeuchi *et.al.* (1987) also used an ELISA kit for early P.D. on days 22 to 24 post A.I. and reported 100% accuracy for negative and 84% for positive pregnancy diagnosis. However Wimpy *et.al.* (1986) reported an overall accuracy of 81% for negative and 71% for positive pregnancy diagnosis and concluded that the modified method was a valuable technique for rapid monitoring of milk progesterone.

The accuracy rate for negative P.D. between day 20 to 24 post AI has always been recorded higher as compared to positive pregnancy diagnosis during the same period. Wimpy *et.al.* (1986) described three reasons for this variation viz., embryonic mortality, AI during luteal phase and cycle length variation. Chapman and Casida (1937) reported that only 60% of clinically normal cows have oestrous cycle of 17 to 24 days duration. Naturally, it would influence the effectiveness of progesterone test to identify pregnant animals on day 21 post A.I. which is reported to vary between 10 to 28% (Ayalon, 1978; Bulman and Laming, 1979; Reimers *et.al.*,1980 and Claus *et.al.*, 1983). Therefore, in both the aberrant cycling cows and those with embryonic mortality, milk samples on day 21 could be

expected to be high in progesterone, and the cow negative to subsequent P.D. Inadvertant breeding of cows during luteal phase of oestrous cycle is reported to occur in 5 to 54% inseminations (Appleyard and Cook, 1979; Bulman and Lamming, 1979; Gunzler *et.al.*, 1979). Recently Wimpy *et.al.* (1986) suggested that presence of high somatic cells may give high progesterone values of non pregnant cows with lower P.D. accuracy. In some cases, the variation in positive P.D. results might also be due to luteal cyst or retained corpora lutea elevating the progesterone level (Elmore, 1986 and Takeuchi *et.al.*, 1987). On the contrary, negative diagnosis (low milk progesterone level on day 21 but subsequently pregnant) might be due to extremely low milk fat (Wimpy *et.al.* 1986). Ginther *et.al.* (1976) reported that fat content could affect the concentration of progesterone in milk.

In buffaloes (Group 3), the Enzygnost (R) was 81.82% accurate for negative and 71.43% accurate for positive P.D. with milk samples collected between day 18 to 24 after service. Enzygnost (R) was comparatively less accurate for detection of positive pregnancy in buffaloes than cows (71.43% vs 76.56%) and also non-pregnancy (81.82% vs 90.62%) during same stage, post AI. However, the differences were statistically not significant. It appears therefore, that Enzygnost (R) milk progesterone test kit which is primarily marketed for use in cattle may also be used in buffaloes with reasonable accuracy. It was observed in a recent study that a test kit (Ovucheck, bovine plasma) marketed for cattle can also be used for detection of plasma progesterone in equine, canine and swine, with acceptable accuracy even for detection of low concentrations found during follicular phase in these species (Eckersal and Harvey, 1987).

Quantitative estimation of progesterone in the milk samples was done with Enzygnost (R), according to the manufacturer's instructions and final concentration of progesterone obtained with the help of a standard curve. It was observed that when the values were < 2 ng/ml, majority of the animals were non pregnant, whereas with values > 4 ng/ml, majority were pregnant, in all the three groups. The results obtained on negative diagnosis of pregnancy is in accordance with those of Wiel *et.al.* (1982). In their study, milk progesterone level of ≤ 2 ng/ml was considered as non pregnant and ≥ 5 ng/ml as pregnant. They further recorded that the accuracy of EIA was 95% for negative and 52.60% for positive P.D. Ropstad and Refsdal (1985) considered 6 ng/ml progesterone level as demarcating line and obtained 97.80% and 88.60% accuracy for negative and positive diagnosis of pregnancy, respectively. Takeuchi *et.al.* (1987) considered < 2.0 ng/ml of milk progesterone by EIA on day 22 to 24 post AI as non pregnant and found that the demarcation was 100% accurate for negative and 84% accurate for positive P.D. On the contrary, Stan (1984) reported an average milk progesterone concentration upto 5.5 ± 2.0 ng/ml as diagnostic for non pregnancy and 16.8 ± 6.4 ng/ml for pregnancy.

In cows of Group 2, Enzygnost (R) was 100% accurate for negative cases with < 2 ng/ml progesterone value and 85.18% accurate for positive P.D. (> 4 ng/ml.) Accuracy of Enzygnost (R) thus appeared to increase during 25 to 90 days stage in comparison to 18 to 24 day stage, though non-significant. These findings are in accordance with

those of Heap *et.al.* (1976), who observed a success rate of 85.70 to 100% for negative and 77.50 to 85.80% for positive P.D. on days 24, 28 or 42 post A.I.

Diagnosis with Enzygnost (R) in buffaloes (Group 3) was 75% accurate for negative (PG value < 2 ng/ml) and 56.52% accurate for positive cases of pregnancy (PG value > 4 ng/ml) on day 18 to 24 post-service. It appeared that Enzygnost (R) was more accurate for the diagnosis of non pregnancy in cows as compared to buffaloes, although the differences were non-significant. The lower efficiency for detection of pregnancy in buffaloes might be due to high fat percentage affecting PG value in milk (Ginther *et.al* 1976 and Wimpy *et.al.* 1986)

It is concluded that Enzygnost (R) progesterone kit can also be used for detection of pregnancy in buffaloes with fair degree of accuracy.

Acknowledgements

The authors thank M/S Hoechst, U.K. for free supply of Enzygnost (R) test kit. They also express their sincere gratitude to Dr. H.R. Mishra the then Dean, Veterinary Faculty and presently Vice Chancellor, BAU, Ranchi for providing necessary facilities and encouragement for this work. Grateful thanks are due to the Director, Animal Husbandry, Bihar, for granting study leave to the senior author. The help rendered by Drs. R.S. Pandey and R.N. Singh, In-charge of Dairy farms at Veterinary and Agriculture Colleges is gratefully acknowledged.

Table 1 : Results of ELISA test on milk samples in different groups

Group	Sampling day post AI/Service	No. of samples	ELISA positive	ELISA Negative	ELISA doubtful
1	18-24	107	64	32	11
2	25-90	32	24	3	5
3	18-24	35	21	11	3

Table 2 : Percent agreement between Enzygnost (R) and gynaeco-clinical findings in three groups of animals

Group	Enzygnost (R) results	No. of animals	Gynaeco-clinical findings Pregnant	%	Non Pregnant	%	Chisquare
1	Positive	64	49	76.56	15	23.44	1.923^{NS}
	Negative	32	3	9.38	29	90.62	
	Doubtful	11	6	54.54	5	45.45	
2	Positive	24	22	91.67	2	8.33	0.421^{NS}
	Negative	3	-	-	3	100.00	
	Doubtful	5	2	40.00	3	60.00	
3	Positive	21	15	71.43	6	28.57	0.046^{NS}
	Negative	11	2	18.18	9	81.82	
	Doubtful	3	1	33.33	2	66.67	

NS - Non significant

Table 3 : Level of progesterone in milk in relation with pregnancy in different groups of animals.

Cow in milk	No.	P	%	No.	P	%	No.	P	%
< 2 ng/ml	29	2	6.90	3	0	Nil	4	1	25.00
2-4 ng/ml	12	5	41.67	2	1	50.00	8	2	25.00
> 4 ng/ml	66	51	77.27	27	23	81.48	23	13	56.52

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IJAR:12:1:28-29:1991

Studies On Serum Protein, Cholesterol And Certain Enzymes In Relation To Reproductive Status In Bovine Females.

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ABSTRACT

Reproductive failures such as anoestrum, repeat breeding and pathological conditions of the genital tract suggest that nutritional deficiencies, hormonal imbalance and deranged enzymatic activity affect the normal reproductive behaviour of the animal, causing serious morphological and physiological alterations (Roberts, 1971). Low conception rates have been associated with hypoglycemia due to energy deficiency. Similarily, high quality protein improves embryonic loss and conception rates. Hypoprotenemia and hypoglycemia disturbs hepatic function which is reflected as imbalance or disbalance of liver enzymes such as AST (SGOT) or ALT (Rakha and Igboeli, 1971). The present investigation was therefore undertaken to estimate the blood serum proteins, cholesterol, GOT and GPT concentrations in normal cycling and non-cycling bovine females to correlate these serum constituents between different groups of animals.

Materials and Methods

Fifty-six apparently healthy animals presented at the Central Clinics of Orissa Veterinary College constituted the material for study. Cross-bred heifers and cows after clinical investigation were grouped thus :

Group A : Cyclic cross-bred heifers and cows which were further subdivided into pregnant and non pregnant.

Group B : Non cyclic heifers having attained 18 months of age with normal reproductive tract but not exhibiting oestrus and non - cyclic cows who have passed 90 days post partum without exhibiting oestrus.

20 ml. blood was collected from each animal aseptically and serum separated adopting conventional method. Serum was then kept in the deep freeze at - 20°C until further estimation. It was analysed in Ames Blood Analyser model 6601 for Total Protein by Biuret method; Cholesterol by Liberman -Burchard method as per Henry (1968); SGOT by Colorimetric method as per Dharan Murali (1977) and SGPT by Reitman and Frankel method (1957). The statistical analysis was done as per Snedecor and Cochran (1967).

Results and Discussion

Blood protein level was found to be higher in pregnant animals than in non cycling animals, which was also observed by Pareek and Deen (1985). Protein level was significantly higher ($P < 0.05$) between cycling and non cycling heifers. Similarily, highly significant ($P < 0.01$) difference in protein level was found between non cycling heifers and cows, which can be attributed to the lack of adequate protein intake and the increased requirement of protein upto

puberty for optimum manifestation of reproductive cycles, after which a state of balance is maintained.

The serum cholesterol level exhibited a high significant ($P < 0.01$) difference between cycling and non cycling cows and between cycling heifers and cows which is as per the findings of Purohit and Kohli (1977) but differs with that of Pareek and Deen (1985). The higher cholesterol level in the cycling heifers and cows vis-a-vis the non cycling ones is indicative of more secretion of steroids during oestrus due to increased ovarian activity. The significantly higher level of cholesterol in pregnant heifers is suggestive of increased steroidogenesis.

The levels of serum glutamic oxaloacetic transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT) in the cycling heifers and cows were comparatively higher and statistically significant ($P < 0.01$), than the non cycling ones, which is in agreement with the findings of Stallcup *et.al.*, (1967). A high significant difference ($P < 0.01$) was marked between cycling heifers and cows in respect of SGOT and SGPT and between pregnant and non pregnant cows in SGPT level. As the levels of both these enzymes are indicative of increased physiological activity and pathological condition of the tissue, it is obvious that a significant relationship in the level of these enzymes exists with body weight, environment, physiological conditions and rhythmic reproductive function. The significantly higher level of these enzymes in cycling animals found in the present investigation, is therefore suggestive of increased activity of reproductive tissues.

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IJAR:12:1:30-32:1991

Serum Calcium And Inorganic Phosphorus Levels At First Oestrus And Conception In Kankrej Heifers

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ABSTRACT

Significantly ($P < 0.05$) higher values of calcium and phosphorus were recorded in the groups of heifers conceived at an earlier age, while significantly ($P < 0.01$) higher inorganic phosphorus values were estimated at conception in the heifers which were offered green fodder than those without it.

* * *

There is a paucity of literature on these informations in Kankrej cattle. The present investigation was conducted to observe the serum calcium and phosphorus levels at first oestrus and conception in Kankrej heifers of various age groups raised on two feeding schedules - with and without green fodder.

Materials and Methods

The present study was conducted on 56 Kankrej heifers maintained at the University Livestock Research Station, Sardar Krushinagar, during August 1988 to April 1990. These heifers were divided into 7 groups (A1 to A7) with 8 heifers in each, according to their initial age in months viz 3-6 (A1), 6-9 (A2), 9-12 (A3), 12-15 (A4), 15-18 (A5), 18-21 (A6) and 21-24 (A7) months. Further, each age group was divided into two subgroups according to their initial body weight. A subgroup of 4 heifers was offered 5 kg lucerne green fodder (FS1), while no green fodder (FS2) was offered to another subgroup till all the heifers conceived. The concentrate mixture was fed according to protein requirement (Sen *et.al.* 1978) and dry fodder was offered *ad libitum* to all heifers. Oestrus detection was done alternately by two young bulls and the heifers were mated by natural service. Blood serum samples were collected at each oestrus for the estimation of serum calcium (Trinder, 1960) and inorganic phosphorus (Varley, 1980) as described by Span Diagnostics Pvt. Ltd. Udhana (Surat), India. The data were statistically analysed (Snedecor and Cochran, 1967).

Results and Discussion

At First Oestrus : The overall average serum calcium (Ca^{++}) and inorganic phosphorus (Pi) levels at first oestrus were 8.10 ± 0.19 and 6.06 ± 0.14 mg%, respectively. The difference in serum Ca^{++} between age groups was non-significant. The average serum Ca^{++} level was 8.10 ± 0.26 and 8.11 ± 0.28 mg% in FS1 and FS2 groups, respectively. The serum Ca^{++} level in the heifers did not differ with feeding schedule.

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The average serum Pi level at first oestrus in A1 group was 6.83 ± 0.24 mg% and it was non-significant and highest among all age groups. For remaining age groups, it ranged from 5.32 ± 0.31 to 6.70 ± 0.13 mg%. The average serum Pi levels at first oestrus in FS1 group (6.19 ± 0.19 mg%) and in FS2 group (5.93 ± 0.21 mg%) did not differ significantly.

At Conception : The overall average serum Ca^{++} and Pi levels at conception were 8.49 ± 0.12 and 6.11 ± 0.18 mg%, respectively. The average serum Ca^{++} level at conception was 9.48 ± 0.25 mg% in A1 group which was significantly ($P < 0.05$) higher among all the age groups, while in remaining groups it ranged between 8.02 ± 0.15 to 8.63 ± 0.26 mg%. The results indicated that the advancing age resulted in concomitant decrease in serum Ca^{++} level at first oestrus and conception. The average serum Ca^{++} level between FS1 (8.68 ± 0.13 mg%) and FS2 (8.28 ± 0.21 mg%) did not differ significantly.

The average serum Pi level at conception ranged from 4.92 ± 0.45 in A6 group to 6.96 ± 0.26 mg% in A2 group. The age group was found to have significant ($P < 0.05$) influence on serum Pi level at conception. The heifers which were offered green fodder (FS1) had significantly ($P < 0.01$) higher Pi level (6.49 ± 0.20 mg%) as compared to the group which was not offered green fodder (5.67 ± 0.27 mg%).

The average serum Ca^{++} levels in the present study at first oestrus and conception were comparatively lower than those reported by Rao *et.al.* (1981) and Aminuddin *et.al.* (1984). However, it compared well with the findings of Kulkarni *et.al.* (1984). The reported values of Pi by Murtuza *et.al.* (1979) and Aminuddin *et.al.* (1984) in Haryana and Rathi cycling heifers were relatively lower than those reported in the present study. However, the findings of Rao *et.al.* (1981) and Kulkarni *et.al.* (1984) in cycling Ongole and Gir cows were in close agreement with the present observations.

In the present report, the heifers with higher levels of serum Ca^{++} and Pi reached the age of puberty and conception earlier. Mithuji *et.al.* (1966) also reported relatively higher values of serum Ca^{++} and Pi level in younger Kankrej heifers.

Acknowledgements

The authors are thankful to the ICAR, New Delhi for awarding the Senior Fellowship and financial assistance to the Principal investigator for conducting the research work. The co-operation extended by the Research Scientist, Livestock Research Station, Sardar Krushinagar is also duly acknowledged.

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IJAR:12:1:32-35:1991

Serum Calcium, Inorganic Phosphorus And Serum Calcium-Phosphorus Ratio In Anoestrous Rural Crossbred Heifers

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ABSTRACT

Studies on estimation of serum calcium, inorganic phosphorus levels and serum calcium-phosphorus ratio were carried out on 40 crossbred (Jersey X Nondescript local) anoestrous heifers maintained in villages. Serum calcium (8.13 ± 0.22 mg%) and inorganic phosphorus (3.06 ± 0.14 mg%) were significantly lower in anoestrous heifers suffering from heavy helminthic infestation, very poor management and feeding. The serum calcium phosphorus ratio was higher (2.75 ± 0.06) in anoestrous heifers in comparison to normal cyclic heifers (1.95 ± 0.019). Deworming, feeding with balanced concentrate mixture supplemented with trace elements for a period of 20 days resulted in significant increase of serum calcium and inorganic phosphorus levels in the anoestrous heifers showing first oestrous with improvement in the respective values and serum calcium phosphorus ratio.

* * *

Minerals like calcium and phosphorus play an intermediate role in the action of hormones and enzymes at subcellular levels in an integrated fashion in the initiation of oestrous in young growing heifers. Work on the effect of malnutrition in association with helminthic infestation due to poor animal husbandry practices, on the levels of serum calcium, inorganic phosphorus and the resultant serum calcium-phosphorus ratio responsible for exhibition of oestrous in crossbred heifers is lacking. The present study was therefore undertaken.

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Materials and Methods

Forty crossbred (Jersey X Nondescript local) heifers under village level conditions of West Bengal, including 10 normal cyclic heifers exhibiting first oestrous within the age of 18 to 24 months, not coming to first oestrous within the age of 36 months were included in the present studies. Prior to estimation of serum calcium and inorganic phosphorus levels, faecal samples of each animal were examined as per Soulsby (1982) for 3 consecutive days to assess the extent of parasitic infestation. 20 ml. of blood was collected from each animal and serum samples were separated as per usual technique. Serum calcium and inorganic phosphorus levels were estimated as per Clark and Collip (1928) and Fiske and Row (1925). The following remedial measures were undertaken for 30 anoestrous heifers for a period of 20 days :-

Deworming : All the animals were given Levamisole Hcl B. P (Vet) 30% w/w @ 150 ml. per 100 kg. body weight per animal after dissolving 10 gms. of the same in 600 ml. of drinking water. Seven days later, Hexachloroethane B. Vet. C 85% w/w @ 10 gms. per 50 kg. body weight in 2 divided doses at an interval of 48 hours was administered.

Improvement of nutritional status : Each animal after deworming was given better feeding with 2 kg. of concentrate mixture per day in the form of 'Epic' (a balanced cattle feed manufactured by West Bengal Poultry and Dairy Corporation, Kalyani) and 200 gms. of germinated gram per day. Sufficient paddy straw and green grasses along with clean drinking water was also provided. Additional feed supplementation was also given orally for 20 days using "Vets Trace Minerals (Cattle)" (M/S Vets Farma Pvt. Ltd., Jalandhar) containing 6 trace elements @ 10 gms. per animal. The anoestrous heifers which came into first oestrous after adopting the aforesaid remedial measures for a period of 20 days were again subjected to faecal examination and estimation of serum calcium and inorganic phosphorus levels for comparison. The serum calcium - phosphorus ratio in each group of animals was calculated from the values obtained separately for serum calcium and inorganic phosphorus levels. Data was subjected to statistical analysis as per Snedecor and Cochran (1967).

Results and Discussion

The mean values for serum calcium and inorganic phosphorus levels in normal cyclic heifers were higher than those obtained in anoestrous heifers, whereas, the anoestrous heifers which came into first oestrous after deworming and improvement of nutritional status showed increased values approximating with those recorded in normal cyclic heifers (Table 1). Mean value of serum calcium - phosphorus ratio was higher in the anoestrous heifers compared to that in normal cyclic heifers and also the anoestrous heifers showing first oestrous after deworming and better feeding.

Analysis of variance (Table 2) revealed that the concentrations of serum calcium and inorganic phosphorus, and, serum calcium-phosphorus ratio - all had significant differences among 3 groups ($P < 0.01$). It was also observed by critical difference test (Table 1) that the levels of serum calcium, inorganic phosphorus and the calcium-phosphorus ratio - all varied significantly between the normal cyclic and

Table 1 : Mean Values with Standard Errors of serum calcium (mg%), inorganic phosphorus (mg%) and calcium-phosphorus ratio in different groups of crossbred heifers

Blood constituent	Cyclic heifers	Anoestrous heifers	Anoestrous heifers which came into first oestrous after better management and feeding
Serum calcium	10.62^a	8.13^b	10.03^a
	± 0.29 (10)	± 0.22 (40)	± 0.22 (10)
Range	9.00-12.20	6.20-11.00	9.10-11.20
Serum inorganic phosphorus	5.45^a	3.06^b	4.16^a
	± 0.16 (10)	± 0.14 (40)	± 0.27 (10)
Range	4.66-6.10	1.80-5.20	3.03-5.21
Serum calcium-phosphorus ratio	1.95^a	2.75^b	2.48^a
	± 0.019 (10)	± 0.06 (40)	± 0.11 (10)
Range	1.86-2.10	1.92-3.57	2.02-3.03

Figures in the parenthesis indicate the number of observations. Means having same superscripts do not differ significantly ($P < 0.01$)

Table 2 : Analysis of variance of serum calcium, inorganic phosphorus concentrations and serum calcium-phosphorus ratio in different groups of crossbred heifers

Blood constituent	Source of variance	d.f	Mean Square (MS)
Serum calcium	Between groups	2	32.8095**
	Within groups	57	1.6924
Serum inorganic phosphorus	Between groups	2	29.1545**
	Within groups	57	0.783
Serum calcium-phosphorus	Between groups	2	2.633**
	Within groups	57	0.1351

** - Significant at 1% level

anoestrous heifers; between anoestrous heifers and those showing first oestrous after deworming and better feeding, whereas, between the normal cyclic heifers and anoestrous heifers which showed first oestrous after deworming and improvement of nutritional status, it was not significant. The present findings corroborate with the reports of Sharma *et.al.* (1984) in respect of serum calcium level and Chetty and Rao (1986) regarding serum inorganic phosphorus level. The present finding in respect of higher serum calcium-phosphorus ratio in anoestrous heifers is also in agreement with the findings of Chetty and Rao (1986) under rural conditions of Andhra Pradesh. Carnahan (1974) reported that the ratio of serum calcium-phosphorus should be between 1.5 : 1 and 2.5 : 1 for efficient reproduction.

The low levels of serum calcium and inorganic phosphorus in the anoestrous heifers under village conditions might be due to intake of calcium and phosphorus deficient feeds combined with heavy helminthic infestation. All the anoestrous heifers studied, had heavy infestation of Strongyles,

Fasciola *Sp.* and Amphistomes in combination, while, in normal cyclic heifers, helminthic infestation was insignificant due to regular deworming practice adopted by the livestock owners. Reduced serum calcium and inorganic phosphorus levels in cattle due to parasitic infestation were reported by Tozzi and Genchi (1980) and Kaufman and Pfister (1986). Laing (1979) and Sane *et.al.* (1982) reviewed that stomach and intestinal worm infestation or in some areas fascioliasis in cows might be responsible for interfering with assimilation of food resulting in reduced ovarian activity with anoestrous gonads.

The present findings support the view that low calcium and inorganic phosphorus levels with resultant improper serum calcium-phosphorus ratio might be responsible for anoestrous status in crossbred heifers under poor livestock managemental practices.

Acknowledgements

The authors are thankful to the Dean, Faculty of Vety & Anim. Sci. and Dean, Post-graduate Studies, BCKV for providing all facilities. They are also thankful to M/S Vets Farma Pvt.Ltd., Jalandhar - 144 001 for providing their product used in the present studies.

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IJAR:12:1:36-38:1991

Studies On Serum Enzymes, Inorganic Constituents And Haemoglobin In Parturient Complications In Cattle

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ABSTRACT

A significant increase in the value for serum Glutamic Oxaloacetic Transaminase (SGOT) during dystocia and Lactic Dehydrogenase (LDH) during retention of after birth and dystocia, while a significant decrease in the value of Alkaline Phosphatase (AKP) were recorded during dystocia and early lactation.

* * *

The present investigations of some of the blood serum enzymes, inorganic constituents and haemoglobin values in cattle were undertaken to study the change if any, in various gynaecological disorders.

Materials and Methods

The present investigations were carried out in 24 cows divided into 4 groups. Each group comprising of 6 animals. Group I included normal parturient cows, while diseased group II and III included cows with retained placenta and dystocia, group IV included cows in early lactation. The study was extended in 12 cows that were inseminated during estrus. Their blood samples were taken at the time of insemination; one month after insemination and 2 months after insemination. After 2 months, pregnancy was gynaeco-clinically confirmed and the group divided into pregnant and non-pregnant groups.

Serum alkaline phosphatase (AKP) was estimated essentially as per Oser (1971) by the modified procedure of Fiske and Subba Row (1925). Lactic dehydrogenase (LDH) was determined by Wroblewski and La Due procedure and essentially as per Beigmeyer (1965). Glutamic-oxaloacetic transaminase (SGOT) was determined essentially as per Bergmeyer (1965) by Reitman and Frankal procedure (1956). Glutamic pyruvate transaminase (SGOT) was determined essentially as per Bergmeyer (1965) by Reitman and Frankal procedure (1956).

Mineral estimation : Serum calcium was determined by Clark-Collip modification of the Kramer Tisdal method (1925). Serum inorganic phosphorus was determined by Fiske Subba Row method (1925). Haemoglobin was estimated by Sahli's haemoglobinometer as detailed in Schalms haematology. Statistical analysis was done as per Snedecor (1956).

Results and Discussion

The values of AKP (Bu/100 ml) were estimated as 2.80 ± 0.14 (Control group), 3.61 ± 0.20 in retained after birth cows,

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2.72 ± 0.11 in cows with dystocia and 2.32 ± 0.22 in early lactating cows.

In retained after birth cows, the estimated values were significantly higher ($P < 0.01$) than the control group. The level of AKP observed was within the ranges as reported by Vihan *et.al.* (1973) in zebu cows, and Dutta and Dugwekar (1983) in buffaloes.

The estimated values in cows suffering from dystocia were marginally lower and non-significant than those in the control group. Likewise, the estimated values in early lactating cows were also slightly lower and non-significant than in the control group.

SGOT values (F units/100 ml) were estimated as 47.13 ± 1.74 (control group), 41.04 ± 1.89 in retained after birth cows, 54.24 ± 1.42 in cows with dystocia and 45.01 ± 1.89 in early lactating cows.

The estimated value in the control group was within the ranges as reported by Cornelius *et.al.* (1959). In cows with retained afterbirth, the values were significantly lower ($P < 0.05$) than in the control group.

The estimated values in cows with dystocia were significantly higher ($P < 0.01$) than in the control group.

The recorded values in early lactating cows did not differ much as compared to the control.

SGPT values (F unit/ml) were estimated as 21.50 ± 1.44 (control group); 21.49 ± 1.18 in retained afterbirth cows, 22.1 ± 1.19 in cows with dystocia and 18.94 ± 0.84 in early lactating cows. These values did not differ significantly.

The LDH values (M unit/ml) were estimated as 393.98 ± 17.30 (control group); 511.54 ± 9.45 in retained afterbirth cows; 530.57 ± 31.66 in cows with dystocia and 398.57 ± 6.77 in early lactating cows. In cows with retained afterbirth, the values were significantly higher ($P < 0.01$) than in control group. The level of LDH observed was within the ranges recorded by Dutta and Dugwekar (1983).

The estimated values in cows with dystocia were significantly higher ($P < 0.01$) than in the control group and in agreement with the findings of Kulkarni *et.al.* (1983) in women.

The values in early lactating cows did not differ much when compared with the control group.

Calcium values (mg/100 ml) were estimated as 10.41 ± 0.12 (control group), 9.23 ± 0.14 in retained after birth cows; 8.75 ± 0.48 in cows with dystocia and 11.41 ± 0.19 in the early lactating cows.

The estimated values in the control group were in agreement with the findings of Shukla *et.al.* (1983).

The estimated values in the retained after birth cows were significantly lower ($P < 0.01$) than the values in the control group and in near agreement with the values reported by Tariq Ahmed *et.al.* (1984).

The estimated values in cows with dystocia were significantly lower ($P < 0.05$) as compared to the control group.

The estimated values in early lactating cows were significantly higher ($P < 0.01$) than the values in the control group and in

near agreement with the values reported by Terril *et.al.* (1946).

Inorganic phosphorus (mg/100 ml) was estimated as 5.855 ± 0.22 (control group); 4.03 ± 0.33 in retained after birth cows; 5.08 ± 0.198 in cows with dystocia and 6.98 ± 0.08 in early lactating cows.

It is concluded that there is alteration in serum enzyme values, especially in cows with dystocia and retention of foetal membranes, associated with disturbances in calcium phosphorus ratio, which was 2 in normal animals as against 2.3 in cows with retention of placenta and 1.7 in cows with dystocia.

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IJAR:12:1:39-41:1991

Serum Progesterone Levels In Cross Bred Heifers Subjected To Oestrus Synchronisation With 4 And 9 Day Norgestomet Ear Implants*

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ABSTRACT

Twenty cross-bred heifers were randomly distributed to H_1, H_2 and control groups consisting of 7, 7 and 6 animals respectively. H_1 and H_2 groups received norgestomet (3 mg) ear implant in addition to 3 mg norgestomet and 5 mg oestradiol valerate I.M. injection. The implants remained in place for 4 and 9 days in H_1 and H_2 groups. The controls were given placebo treatment. Serum progesterone levels determined by Radio Immuno Assay (RIA) on the day before and at implantation, at oestrus, at 48 and 56 hours post implant withdrawal were found to differ significantly in H_1 group. The mean concentration declined sharply from 3.46 ± 2.26 ng/ml. before implant to 1.41 ± 0.64 ng/ml at implant removal in animals that subsequently conceived. The decline was not sharp in cases that failed to conceive (4.32 ± 1.38 to 3.20 ± 1.15 ng/ml). Further, when animals were bred, the hormone concentration at 48 hours post withdrawal was 0.59 ± 0.14 and 1.78 ± 0.60 ng/ml respectively in cases which subsequently conceived and those which failed to conceive.

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In cattle industry, oestrus synchronisation has become a beneficial tool as it facilitates A.I. Controlled breeding has been accomplished by artificial manipulation of ovarian activity with exogenous compounds. Short term progestogen (about 10 days) treatments combined with an estrogen at the start of treatment to induce premature regression of corpus luteum has resulted in ovulation control followed by normal fertility (Roche, 1974).

Syncro-mate-B is an estrous cycle control treatment that alters gonadotrophin release and consequently, endogenous progesterone secretion and when the exogenous hormone source is removed the animal will respond with follicular development, ovulation and estrus (Barnes *et.al.*, 1981).

The present experiment was designed to evaluate the effect of short term progestogen (norgestomet) treatment on luteolysis and its influence on serum progesterone concentration.

Materials and Methods

Twenty cross-bred heifers, 2-4 years age and 170-270 kg body weight were

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* Paper is a part of the M.V.Sc. thesis of the first author appoved by the Tamil Nadu Agricultural University, Coimbatore-3, presented at the National Workshop on Animal Biotechnology held at Madras Veterinary College, 26-28 July 1990.

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randomly allotted to H_1, H_2 and control groups consisting of 7, 7 and 6 animals respectively. H_1 and H_2 groups received 3 mg norgestomet ear implant (SMB) and an I.M. injection of 5 mg oestradiol valerate and 3 mg norgestomet at the time of implantation. The implant remained in place for 4 and 9 days in H_1 and H_2 groups. The controls received placebo treatment corresponding to the day of norgestomet implantation in the treatment groups. All animals were bred naturally at 48 hours post implant withdrawal. Serum progesterone concentrations were determined by standard RIA technique on the day before implant insertion, at implant withdrawal, at oestrus and at 48 and 56 hours post implant withdrawal. The results were calculated using a standard curve obtained with 5 pg to 10 ng/100 ul of standards prepared in PBS. The data were analysed statistically as per Snedecor and Cochran (1961).

Results and Discussion

Heifers treated for 4 days showed 2.97 ± 0.40 ng/ml concentration of mean serum progesterone before the application of SMB implant and the concentration declined during treatment and reached the level of 0.74 ± 0.09 ng/ml at oestrus (Table 1). The difference was statistically significant ($P < 0.05$). After 48 hours post implant withdrawal, levels rose which indicated the resumption of luteal functioning and at 56 hours, the level reached above that at implant withdrawal.

In 9 day treated heifers, decline in mean serum progesterone concentration was from 3.95 ± 1.06 to 1.29 ± 0.41 ng/ml before and at oestrus. The difference was not statistically significant ($P > 0.05$). The higher levels after 48 hours suggested that ovulation has occurred and luteal function ensued. The mean serum progesterone concentration variation before implantation, at withdrawal, and at oestrus indicated that luteal regression was uninterrupted during the treatment in both 4 and 9 days treatment groups (Table 1). Barnes *et.al.* (1981) reported that treated females had significantly reduced levels of plasma progesterone during implantation period. They opined that norgestomet suppressed luteal activity and peak gonadotropin release during the treatment. Kazmer *et.al.* (1981) found that in untreated dairy heifers, the progesterone levels reached maximum concentration during luteal phase and declined to less than 2 ng/ml before oestrus.

In the present study, controls showed a highly significant increase in progesterone concentration after 9 days period from day 1. These results indicate the influence of norgestomet on luteolysis.

The mean concentration of serum progesterone declined sharply from 3.46 ± 2.26 to 1.41 ± 0.64 ng/ml at implant removal in animals that subsequently became pregnant, whereas the decline was not sharp in the heifers that failed to conceive (4.32 ± 1.48 to 3.20 ± 1.15 ng/ml). At 48 hours post implant withdrawal, when animals were bred, progesterone concentration was 0.59 ± 0.14 and 1.78 ± 0.60 ng/ml. in heifers that subsequently became pregnant and that failed to conceive (Table 2).

The explanation for the results obtained is difficult due to small sample size. However, concentration of progesterone

more than 1.00 ng/ml at 48 hours post withdrawal of implant my be contributory to non-conception in the heifers, since normal value of progesterone concentration was reported to be 0.44 ± 0.17 ng/ml at oestrus (Cole and Cupps, 1977). In contrast, King *et.al.* (1986) reported that heifers that showed a serum progesterone concentration less than 1.00 ng/ml had a lower conception rate than similarly treated heifers having 1 to 3 ng/ml. Kazmer *et.al.* (1981) observed that, though SMB treatment was effective in inducing luteolysis, intervals from implant removal until oestrus and from implant removal until peak gonadotropin release were highly variable among the treated animals. These observations support the variable results obtained in this study. Further work with larger sample size is essential to elucidate differences in the results.

Table 1 : Influence of Norgestomet implants on mean serum progesterone (ng/ml) in cross bred heifers.

Treatment groups	Duration of implant	Before implantation	At implant withdrawal	At oestrus	At 48 hours postimplant withdrawal	At 56 hours postimplant withdrawal
H_1 (n=7)	4 days	2.97 ± 0.40^{c} (3.27 ± 0.23)*	1.52 ± 0.19^{ab} (6.89 ± 0.37)	0.74 ± 0.09^{a}	0.73 ± 0.08^{a}	1.85 ± 0.13^{b}
H_2 (n=7)	9 days	3.95 ± 1.06 (3.02 ± 0.87)	2.43 ± 0.69 (6.32 ± 0.49)	1.29 ± 0.41 (0.89 ± 0.72)	1.27 ± 0.41 (1.02 ± 0.32)	1.53 ± 0.44 (1.43 ± 0.46)

Mean ± S.E. bearing atleast one common superscript in groups do not differ significantly ($P > 0.05$)

* Figures in parenthesis indicate control values

Table 2 : Influence of mean progesterone (ng/ml) concentration before implantation on conception in 9 day norgestomet treated crossbred heifers

Groups	Before implantation	At implant withdrawal	At oestrus	At 48 hours post implant withdrawal	At 56 hours post implant withdrawal
Pregnant	3.46 ± 2.26	1.41 ± 0.64	0.62 ± 0.14	0.59 ± 0.14	0.94 ± 0.16
Non-pregnant	4.32 ± 1.38	3.20 ± 1.15	1.80 ± 0.70	1.78 ± 0.60	1.97 ± 0.69

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IJAR:12:1:42-46:1991

Nonsurgical Embryo Transfer In Crossbred And Non Descript Cows

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ABSTRACT

Superovulation, non-surgical embryo recovery and non-surgical embryo transfer were performed on 43 crossbred donor cows and 54 crossbred (CB) and non descript (ND) recipient cows. All the donors were superovulated by giving total doses of 50, 40, and 28 mg follicle stimulating hormone (FSH) in eight doses for four days. Embryos were successfully collected from 79.7% of donor cows. Ovulatory response, total embryo and transferable embryo recovery was higher in 28 mg FSH group than 50 and 40 mg FSH groups ($P < 0.05$). 28 mg FSH was the optimum dose for both total and transferable embryos. Pregnancy rate following embryo transfer in CB and ND recipients was 44.44% and 36.11% ($P < 0.05$) respectively. Overall pregnancy rate was 38.88%. Excellent quality blastocyst gave higher pregnancy rate (80%) than fair quality blastocyst and morula. Feb-April was favourable season for higher pregnancy rate (54.5%) in CB, whereas, May-June was best season for ND (40%) cows.

* * *

Superovulation of cows and subsequent collection of embryos is greatly facilitated by reliable prediction of the number of ovulations and the times at which they can be expected.

Most non surgical (NS) embryo transfer (ET) investigations to date have utilized the crossbreed or pure exotic breeds of cattle. India has a vast cattle population, but 80% of them are Non-Descript (ND) and unproductive. If recipient animals with normal fertility and no reproductive disability are selected, genetically superior offsprings can be produced by ET. Base line data on production performance of ND cattle shows that, estrus is shorter, less intense and occurs late in relation to estrogen stimulus. ND cow has a smaller preovulatory LH surge and shorter interval from estrus to ovulation than the crossbred (CB). The corpus luteum (CL) is small and progesterone concentration much lower (Bhat and Mukandan, 1979; Randel, 1984.)

The present trial was therefore under taken to assess the efficacy and viability of embryo recovery and transfer utilizing genetically superior CB cows as donors and unproductive genetically inferior ND cows as recipients.

Materials and Methods

43 mature parous clinically healthy crossbred (Holstein X Sahiwal) cows were used as donors and 54 crossbred (n= 18) and nondescript (n=36) cows as embryo recipients. They were stallfed and housed in open yard. All the females were gynaeco-

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clinically (GC) examined for ruling out possible reproductive problems. Prior to superovulation treatment and embryo transfer, at least two estrus periods were observed.

Each animal received 2 doses of prostaglandin (PGF2 : Estrumate ICI), 11 days apart. Superovulation was induced from day 9 to 12 of estrus, with FSH-P (Schering Co. USA) I.M. injection twice a day for four days in descending doses. Donors received total doses of 50 mg (n=16), 40 mg (n=9) and 28 mg (n=18). Non-surgical embryo recovery and non-surgical embryo transfer was performed as per Totey *et.al.* (1988)

Data were subjected to one way analysis of variance, chi square and student t test.

Results and Discussions

All the cows were observed in standing estrus 36 to 48 h after PGF2 α injection. Comparison of responses after various treatments showed that both the ovaries responded equally. 81.2%, 77.7% and 83.33% of the donors responded to the superovulatory treatment using 50, 40 and 28 mg FSH-P respectively. The number of ovulations, recovery of total and transferable embryos were more in 28 mg FSH group (7.53 ± 3.22, 4.73 ± 3.03 and 3.06 ± 3.05 respectively) than 50 mg (6.30 ± 2.25, 2.76 ± 3.32 and 0.92 ± 1.80 respectively) and 40 mg FSH (5.0 ± 2.94, 3.14 ± 2.41 and 2.14 ± 2.11 respectively). However, there was no significant difference in all the three parameters ($P > 0.05$) (Table 1). Striking observation in the 50 mg group was high incidence of unovulated follicles, low embryo recovery rate and high proportion of degenerated and unfertilized embryos. The absence of a significant effect of FSH dose on the number of embryos collected was expected since the responses to superovulatory doses of FSH are often variable (Munro, 1986). Ovarian response to superovulation was low as the dose increased, but it later improved with dose reduced to 28 mg.

Irrespective of the small number of animals and non significant difference obtained, yet, 28 mg FSH-P appeared to be optimum dose for both the number of embryos and transferable embryos in crossbred cows. Most of the data obtained needs further confirmation, particularly under tropical conditions.

Recipients used during the experiments were either CB (n=18) or ND local "Desi" cows (n=36) with low milk yield potential. Pregnancy rate following embryo transfer was more in CB cows (44.44%) than ND cows (36.11%). However, there was no significant difference (Table 2) in pregnancy rate ($P < 0.05$). Overall pregnancy rate was 38.88%. ND cows differ physiologically and endocrinologically from that of *Bos taurus* or crosses of *Bos taurus* X *Bos indicus* female. Estrus is much shorter in ND cows than CB cows. Estrus detection is easy in CB than ND cows. CL detection by GC palpation is difficult in ND than CB cows. Progesterone content was also lowest in CL of ND cows. Pregnancy rate is therefore lower in ND than CB cows. However, the literature is equally unclear on the relationships between progesterone level in recipients at or near the time of embryo transfer and subsequent embryo survival. (Sreenan and Diskin, 1989). Recent study reported low pregnancy rate (20%) with progesterone level less than 2.0 ng/ml which

Table 1 : Ovarian reaction and embryo quality after administration of FSH-P in divided doses.

	Treatment		
	50 mg FSH-P	40 mg FSH-P	28 mg FSH-P
Number of donors	16	9	18
Donors Responded	13	7	15
Mean No. of ovulations	6.30 ± 2.25	5.0 ± 2.94	7.53 ± 3.22
Mean No. of Total Embryos	2.76 ± 3.32	3.14 ± 2.41	4.73 ± 3.03
Mean No. of Viable Embryos	0.92 ± 1.80	2.14 ± 2.11	3.06 ± 3.05

Table 2 : No. of pregnancies following non-surgical transfer of embryos in crossbred and non descript recipients.

	No. of Transfers	No. Pregnant	%
Crossbred	18	8	44.44
Nondescript	36	13	36.11
Over all	54	21	38.88

Table 3 : Effect of season of pregnancies following embryo transfer in crossbred and nondescript recipient cows.

	CROSS BRED			NONDESCRIPT		
	No. Transfers	No. Pregnant	%	No. Transfers	No. Pregnant	%
Nov-Jan	2	1	50.00	-	-	-
Feb-Apr	11	6	54.54	6	2	33.33
May-July	3	1	33.30	20	8	40.00
Aug-Oct	2	0	0.0	19	3	30.00
	18	8	44.44	36	13	36.11

increased to 74% for recipients that had a higher progesterone level of 2.0-2.5 ng/ml in blood serum (Ramsen *et.al.* 1984). However, we have recorded maintenance of pregnancy in recipients that had a progesterone concentration as low as 0.30 ng/ml serum on day of ET.

Many researchers have employed direct progesterone supplementation or the use of luteotropic substances like HCG to increase endogenous progesterone. Due to the lower level of progesterone in ND cows, we gave progesterone support to 20 ND recipients from day 7 onwards to day 35, keeping 16 as control. 50% pregnancy rate was achieved in progesterone supported animals (Table 5), than the rest (18.75%). Christie *et.al.* (1979) observed no effect on embryo survival on supplementing progesterone @ 100 mg daily from day 13-35. On the contrary, De Los santos-Valadez *et.al.* (1982) reported increase in pregnancy rate following progesterone or HCG supplement.

It was also found that pregnancy rates are affected by seasons. In CB recipients, higher pregnancy rate (Table 3) was found during Nov-Jan (50%) and Feb-April (54.54%) than during May-June (33.3%) and Aug-Oct (0 %). Highest pregnancy rate was recorded during May-July (40.0%) in ND cows than Feb-April (33.3%) and Aug-Oct (30.0%). Putney *et.al.* (1988) found that pregnancy rate in Holsteins during stressful

months of the year ranged from 15.6% to 20.7% when the maximum temperature ranged between 31.7 to 34.9°C, whereas Randel (1984) reported highest pregnancies during July-Oct in Brahman cows.

Developmental stage of embryos may also affect subsequent pregnancy rate. Higher pregnancy rate was observed by transferring blastocyst than Morula. Quality of embryo also affected the pragnency rate. Excellent quality blastocyst resulted in 80% pregnancy rate in both CB and ND cows (Table 4), whereas fair quality blastocyst proved to yield lower pregnancy rate in CB (14.28%) and ND cows (36.0%). Higher pregnancy rate obtained from the more developed embryos may be due to the fact that abnormal embryos are easily diagnosed in them (Halley *et.al.* 1979).

The potential benefit of embryo transfer at the field level can be very well exploited utilising non descript cows as recipients as these are abundantly available in the country.

Acknowledgements

Supported by the grant from Department of Biotechnology under Science and Technology Mission Project On Embryo Transfer Technology. Grateful thanks to Shri Inderjeet and Radhey Shyam for technical help. Thanks to Shri Ramesh for typing this manuscript.

Table 4 : Effect of development stage of embryo on pregnancy following non-surgical transfers.

	CROSS BRED	NON DESCRIPT
MORULA		
No. Transfer	6	6
No. Pregnant	3	—
%. Pregnant	50	—
EXCELLENT BLASTOCYST		
No. Transfer	5	5
No. Pregnant	4	4
%. Pregnant	80	80
FAIR BLASTOCYST		
No. Transfer	7	25
No. Pregnant	1	9
%. Pregnant	14.28	36.0

Table 5 : Effect of progesterone supplement following embryo transfer in non descript cows.

	No. Transfers	No. Pregnant	%
Progesterone support	20	10	50
No. Progesterone	16	3	18.75

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IJAR:12:1:46-48:1991

Thermally Induced Zona Rent For Embryo Micromanipulations

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In assisted fertilization and embryo micromanipulation work, induction of zona rent or opening is a prerequisite, since zona is an attributed barrier for such works. Recently, considerable achievements were reported to induce zona rent which include zona drilling with acidified Tyrod's solution (Gorden and Talansky, 1980); zona dissection by mechanical opening (Malter and Coahan, 1989; Odawara and Lapota, 1989); zona microsurgery using nitrogen laser (Beetam *et.al.* 1990); zona penetration (Berg *et.al.* 1986; Ng *et.al.* 1989) and sperm injection into Ooplasm (Tadani, 1980). These innovative techniques often require expensive sophistication in embryo micromanipulatory set up and are far from the reach of a novice in a clinical setting (Keefer, 1990), where these techniques have to be put into practical use to solve certain infertility problems.

A simple procedure which does not require additional laboratory apparatus other than embryo cryopreservation and incubation facilities to induce zona rent, adoptable to a field ET unit was developed at this centre. Essentially the technique of thermally induced zona rent is a combination of conventional embryo cryopreservation (Wilmut and Rowson, 1973) and quick thawing procedures.

Materials and Methods

Follicular oocytes were collected from slaughter-house bovine ovaries and washed several times in heparinized (0.1%) Dulbecco's phosphate buffered saline medium at 30°C to remove corona cells. Additionally, embryos were non surgically recovered from three superovulated donor cows (2000 IU, PMSG/cow, Folligon, Intervet, Holland) adopting routine superovulatory and non surgical embryo recovery procedure. Embryos graded excellent (n=9) and ova (n=21) were then serially washed through 3.3, 6.7 and 10% glycerol in PBS and loaded individually into 0.25 cc AI straws (IMV France). The straws were transferred into the freezing chamber of a microprocessor based embryo freezer (L856, Lec Instruments, Australia), cooled to - 33°C. After 30 minutes at - 33°C, the straws were plunged into liquid nitrogen to freeze embryos and ova.

To achieve thermal induction of zona rent, the straws containing frozen embryos and ova were thawed at 37°C for 15 seconds by immersing them in a water bath. After thawing, cryoprotectant glycerol was removed from embryos and ova by serially washing through decreasing concentrations of glycerol in PBS and finally in PBS containing no glycerol. At this stage embryos and ova were individually examined under phase-contrast microscope (100X, Optiphot, Nikon, Japan) to record the incidence of zona rent and to carryout further micromanipulation works.

Results and Discussion

Seven embryos (77.8%) and sixteen ova (76.1%) exhibited zona rent while one embryo (11.1%) and two ova (9.5%) exhibited extensive zona rent and were discarded. Wittingham and Adams (1976) were the first to observe zona fracture in cryopreserved rabbit embryos, while Rall and Mayer (1989) attributed this to thawing of bovine ova and suggested slow thawing to reduce zona fracture. Interestingly, Rall and Meyer (1989) further reported presence of normal embryos with missing or badly damaged zona after thawing and reasoned this to harmless passage of fracture plane through zona without damaging blastomeres. It is observed in this study that the thermally induced zona rent is not damaging either embryonic mass or ooplasm in most occasions, possibly due to enlarged perivitalline space caused by the cryoprotectant glycerol induced shrinkage of embryonic mass and ooplasm with result fracture plane passing hamlessly through zona - an observation in confirmity with that of Rall and Meyer (1989).

Since embryos and ova are more sensitive to acidified Tyrod's solution and the possibility of damage by zona drilling with such acidified solutions is enormous (Keefer, 1990), mechanical zona drilling requires sophistication in equipments and is expensive, zona dissection requires prior conditioning in hyperosmotic sucrose solution (Malter and Cohan, 1989), sperm transfer and sperm injection require pie-

rcing of zona and additional time consuming delicate micromanipulatory manoeuvres (Tadani, 1980), the technique of thermal induction of zona rent has scope for practical application specially in assisted fertilization and micromanipulation works.

Acknowledgement

The author wishes to acknowledge Dr. M.P.G. Kurup, National Dairy Development Board for facilities and encouragement.

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IJAR:12:1:48-50:1991

Seasonality And Diurnal Variations In Parturition In Murrah Buffaloes.

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ABSTRACT

A data on 677 calvings of Murrah buffaloes was analysed. Season had significant effect on the birth of calves. 49.9% of births took place in rainy season. Significantly maximum calvings (39.3%) occurred during day time (6 to 18 hrs).

* * *

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Care at the time of parturition plays significant role in the life of dam and calf. Any neglect may result in impairment of reproductive efficiency. A round the clock watch of the herd is fatiguing and requires additional man power. The job becomes easier if the usual time of parturition is known. This paper presents some information about it in Murrah buffaloes.

Materials and Methods

The data comprised of 677 calvings (1986 to 1988) at Central Institute for Reasearch on Buffaloes, Hisar. Calvings were arranged in year-wise and season-wise sequence. Spring (February-March); summer (April-June), rainy (July-September); autumn (October-November) and winter (December-January). The data on the time of parturition was arranged in a sequence of four, 6 hourly intervals thus : A (0.00 to 6.00 hrs), B (6.00 to 12.00 hours), C (12.00 to 18.00 hrs) and D (18.00 to 24.00 hrs). These observations were analysed using paired T test in all possible combinations.

Results and Discussions

A highly significant effect of season of the year on the calving pattern in Murrah buffaloes was observed. Maximum number of calvings (49.9%) took place in rainy season, followed by autumn (24.1%), winter (12.4%), spring (7.5%) and summer season (6.1%) respectively (Table 1). The trend indicated strong seasonality of calving in Murrah buffaloes. These results compare favourably with the expected trends since buffalo behaves like a seasonally polyoestrous animal with reproductive performance markedly suppressed during summer months due to heat stress and high ambient temperature suppressing heat symptoms or decrease in the duration of oestrus or both (Stott and Williams, 1962; Kelly and Hurst, 1963). It has been proved that buffaloes can successfully be bred by improving/altering the management practices during hot months also (Anon, 1968; Roy *et.al.* 1968; Pandey 1970). In the present study majority of buffaloes attained a plateau in reproductive performance during rainy season.

Seasonality of calving pattern in Indian subcontinent has also been reported by Kohli and Malik (1960); Babu (1962), Singh and Desai (1962), Goswami and Nair (1963), Rao and Patel (1972), Kodagali *et.al.* (1973) and Agrawal *et.al.* (1985).

There is a marked variation in sex ratios between seasons with male female (M : F) ratio varying from 0.58 in summer to 1.25 during rainy season. Sex ratio during different years ranged between 0.92 and 1.24 (Table 1). Marked season wise variations in sex ratio were also observed by Sethi and Sharma (1983). Govindaiah *et.al.* (1985) reported sex ratio of 49 : 51 in Surti buffaloes.

Maximum calvings (39.3%) took place in second 6 hours of the day (period B) followed by 31.6, 24.0 and 5.1 per cent, in first (A), third (C) and fourth (D) 6 hour periods, respectively. Periods A and B had significantly higher rate of calvings ($P < 0.05$); compared to period D. Period C, however, did not differ significantly with any of the remaining periods. Besides, first twelve hours of the day had significantly more calvings ($P < 0.01$), which agrees with the findings of Deshpande and Jankiraman (1985). Similarly, significantly more number of calvings ($P < 0.01$) took place during day hours as compared to night hours which differs with

the findings of Deshpande and Jankiraman (1985) who observed equal distribution in Surti buffaloes. This may be due to breed differences. It is therefore clear that maximum attention should be paid to down calvers from midnight (O hr.) to noon (12 hrs) period.

Acknowledgement

The authors are thankful to the Director of the Institute (CIRB) for the facilities provided for this research work.

Table 1 : Season wise distribution of calvings and sex ratio in Murrah Buffaloes.

Season	1986			1987			1988			Overall
	M	F	M/F	M	F	M/F	M	F	M/F	M/F
Spring	3 (3.6)	0 (0)	- -	15 (10.1)	15 (12.5)	1.0 -	6 (5.4)	12 (9.8)	0.5 -	0.89 -
Summer	6 (7.2)	7 (7.8)	0.86 -	6 (3.9)	9 (7.5)	0.67 -	3 (2.7)	10 (8.9)	0.30 -	0.58 -
Rainy	47 (56.6)	46 (51.1)	1.02 -	85 (57.1)	48 (40.0)	1.77 -	56 (50.0)	56 (4.5)	1.0 -	1.25 -
Autumn	22 (26.5)	27 (30.0)	0.31 -	27 (18.1)	25 (20.8)	1.08 -	32 (28.6)	30 (24.4)	1.07 -	0.99 -
Winter	5 (6.0)	10 (11.1)	0.50 -	16 (10.8)	23 (29.7)	0.69 -	15 (13.4)	15 (12.2)	1.0 -	0.75 -
Overall	83	90	0.92	149	120	1.24	112	123	0.91	1.03

N.B. Figures in parenthesis indicate percentage.

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IJAR:12:1:51-55:1991

Study Of Serum Calcium And Phosphorus During Placental Expulsion In Surti Buffalo.

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ABSTRACT

Blood serum calcium and inorganic phosphorus were estimated during early post-partum (PP) period in Surti buffalo in relation to placental expulsion time. The animals of group-1 (expulsion time < 4 hrs.) showed normal levels of serum calcium and corresponding phosphorus levels, maintaining their ratio more than two (Av. 2.37 : 1 Ca : P) throughout the period upto placental expulsion. Compared to this, animals of group-2 (expulsion time > 5 hrs) showed considerably lower level of calcium with significantly low Ca : P ratio (Av. 1.50 : 1) Feeding lime water to these animals during later part of gestation significantly increased the calcium level during early (upto 2 hrs.) post partum period. Phosphorus concentration did not show any significant variation (Av. 2.50 : 1) The placental expulsion time (Av. 4.07 ± 0.51 hrs) reduced significantly ($P < 0.01$)

* * *

Delay in placental expulsion may lead to reproductive problems and economic losses in dairy industry. The role of macro minerals in cases of retained placenta as well as normal parturient animals have been well documented (Carson *et.al.* 1978; Garbacik and Balon 1978; Shukla *et.al.* 1983; Ahmed *et.al.* 1984; Quayam 1985; Singh 1988; Vadnere and Singh, 1989), but no specific literature is available regarding the status of macro minerals in relation to placental expulsion in Surti buffalo. Hence, the present studies were undertaken.

Materials and Methods

Randomly selected eight multiparous Surti buffaloes of Reproductive Biology Research Unit were taken for this study. All these animals were healthy with normal gestation length and parturition. Colostrum was drawn within 30 minutes of foetal expulsion.

Experiment-1 : Eight buffaloes comprised two groups of 4 each on the basis of time taken for placental expulsion : Group-1 less than 5 hrs and Group-2 more than 5 hrs. Blood samples were drawn from these animals at hourly intervals starting immediately after foetal expulsion (0 hr), till the complete expulsion of placenta. Last three collections were specifically made at three phases of placental expulsion : *Phase I (PE-I)* at the appearance of the placenta in vagina; *Phase-II (PE-II)* immediately after complete expulsion of placenta and *Phase III (PE-III)* one hour after complete expulsion of placenta. *Experiment-2:* The animals of experiment 1 with longer placental

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expulsion time (group 2) were considered to study the effect of calcium feeding on placental expulsion time in next successive pregnancy. This was done on the basis of observed tendancy that Surti buffaloes expel placenta near about the same time as in their previous calving. Thus, the results of group 2 animals of Experiment 1 served as control for Experiment 2. They were treated and formed group-3. Calcium feeding was undertaken in the form of calcium lactate and lime water to these animals.

Calcium Lactate : 10 mg commercially available calcium lactate was given in the concentrate mixture at a weekly interval right from 8th month of gestation till calving.

Lime Water : Ordinary white washing lime 100 g was dissolved in one bucket full of water. It was allowed to settle and the supernatant lime water was given to the animals at weekly interval right from 8th month of gestation till calving.

Blood was collected as per the earlier schedule. Blood serum was separated and analysed for calcium (Clark and Collips, 1925) and inorganic phosphorus (Fiske and Subbarao, 1925) concentrations.

Statistical analysis : Firstly variations due to stages were checked and in second step variations due to groups and it's interactions with stages were checked (Steel and Torrie, 1960). Only the first and last three stages have been considered for second step analysis to maintain statistical homogenity of the data.

Results

The study indicated that the level of calcium was considerably within normal limits in group-1 animals. It ranged between 11.57 ± 0.16 to 13.40 ± 0.61 mg/100 ml., with an average of 12.51 ± 0.31 mg/100 ml. The level increased at one hour PP and decreased in the next hour but for last three stages it showed an increasing trend (Table 1). Stage variation for calcium was statistically significant ($P < 0.01$). Phosphorus concentration did not show any specific trend and remained more or less constant without much variation, maintaining an average Ca : P ratio of 2.37 : 1 (Table 1).

In case of group-2 animals, the variation of serum calcium and phosphorus for the stages was nonspecific and nonsignificant (Table 1). However, calcium levels were significantly low ($P < 0.05$) than that of group-1, whereas, phosphorus levels were slightly higher than group-1 (5.85 ± 0.19 vs 5.31 ± 0.12 mg/100 ml) animals, affecting the Ca : P ratio (Av. 1.50 : 1).

After calcium treatment, the serum calcium level in treated animals increased significantly ($P < 0.05$) with a slight decrease in phosphorus level. The Ca : P ratio was 2.50 : 1 (Table 1). In these animals, the calcium level increased and remained high upto 2hr. PP and then decreased till the last stage. Phosphorus level remained oscillating upto 2hrs. post calving, but showed a decreasing trend thereafter. The Ca : P ratio remained constant Group 3, (Table 1).

Pooled analysis revealed group variation to be highly significant for both calcium and phosphorus ($P < 0.01$) while interaction of group x stages was significant ($P < 0.05$) for calcium only.

Discussion

Average time for placental expulsion in Surti buffalo is 5 hr. and 6 mts. (Anon, 1983), yet certain physiologically normal and healthy buffaloes take more than 8 to

10 hrs. and others which take hardly 2 to 3 hrs. to expel the placenta.

There was a considerable decrease in calcium level immediately after calving in buffaloes of both the groups. It decreased further significantly in group-2 animals. This decrease can be attributed to calcium uptake by mammary gland tissue for milk synthesis (Symonds *et.al.* 1966, Ahmed *et.al.* 1984, Choudhury *et.al.* 1987).

Blood serum calcium in group-2 animals declined significantly and remained low for certain hours post - calving. However, phosphorus concentration did not show any remarkable change (Table 1), due to which Ca : P ratio in these animals remained very low (Av. 1.50). Calcium is known to effect the contractile activity of uterine muscles (Batra and Bengtsson, 1978). Hence, moderate hypocalcimic condition might have affected placental expulsion in group 2 buffaloes.

Ca : P ratio is more important rather than their individual concentrations (Herrick, 1977 and Quayam, 1985). This ratio is disturbed to low in retained placenta cases (Martinov, 1964). It was observed that at some or other stages of early post-partum, calcium level in all animals of group 2 reached to normal (10.5 to 12 mg/100 ml), but their Ca : P ratio never came above 2, except one animal in which it was above two at 6 and 7 hours post-partum, but again declined significantly to 1.44 in next stage (Table 1). These results indicate that Ca : P ratio plays an important role in the physiology of placental expulsion.

A significant rise in calcium level was recorded in both lime water and calcium lactate treated cases (Table 1). There was a slight reduction in phosphorus level, probably due to its utilization and drain through milk (Moodie *et. al.* 1955, Choudhury, *et.al.* 1987). However, the normal Ca : P ratio was not disturbed. The average ratio (2.50 : 1) was maintained throughout the study (Table 1). Similar ratio was recorded by Quayam (1985) in Murrah buffaloes. The main achievement in treated group was significant reduction in the placental expulsion time (4.07 ± 0.51 as against 8.06 ± 1.08 hrs.) Nevertheless, this situation also gets support of results reporting low levels of calcium and phosphorus associated with retained placenta (Matrynov, 1964).

Specific trend observed in calcium concentration for animals of group 1 and 3 (treated group) and its fluctuations in group 2 leads to variations due to group and its interaction with stages.

Dairy animals exhibit great outflux of body calcium in colostrum and milk. Their blood calcium level therefore, is likely to fall around parturition. The precipitous fall in blood calcium is usually avoided through the strong parathyroid activity during this period (Simenson, 1970). However, certain dairy animals are predisposed to low grade parathyroid failure and disturbed calcium status especially around parturition due to which they maintain low blood calcium level and Ca : P ratio. Such animals seem to be prone to delayed expulsion of placenta. This hypothesis is proved with the improvement observed in placental expulsion time after giving calcium treatment in late gestation.

From the study, it can be concluded that higher calcium concentration with Ca : P ratio > 2 during first 2 hrs. post partum, helps in earlier placental expulsion in Surti buffalo.

Table 1 : Level of Calcium (mg%), phosphorus (mg%) and their ratio for stages of three groups with average placental expulsion time (Mean ± SE)

Group	Placental explusion time		Character	Stages						Mean
	Hrs.	Mts.		0 hr.	1 hr.	2 hr.	PE I	PE II	PE III	
I			Ca	11.57	12.07	11.87	13.00	13.15	13.40	12.51
	3	29		0.16	0.64	0.62	0.76	0.51	0.61	0.31
	± 0	28	P	5.15	5.60	5.42	5.67	4.97	5.05	5.31
				0.20	0.35	0.15	0.35	0.37	0.31	0.12
			Ratio	2.26	2.16	2.18	2.30	2.68	2.69	2.37
II			Ca	10.67	7.73	8.01	8.57	8.07	8.15	8.53
	8	06		0.19	1.02	0.89	0.95	0.84	0.83	0.44
	± 1	08	P	5.27	5.77	5.90	5.65	5.80	6.72	5.85
				0.67	0.48	0.55	0.38	0.44	0.88	0.19
			Ratio	2.11	1.32	1.37	1.54	1.42	1.25	1.50
III			Ca	12.34	12.75	12.25	10.59	10.17	8.94	11.17
	4	07		0.38	0.40	0.43	0.48	0.48	0.61	0.61
	± 0	51	P	4.99	4.73	4.77	4.26	4.13	3.86	4.45
				0.26	0.30	0.13	0.13	0.12	0.21	0.17
			Ratio	2.48	2.72	2.56	2.48	2.46	2.31	2.50

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IJAR:12:1:55-57:1991

Application Of Prostaglandin $F_2 \alpha$ ($PGF_2 \alpha$) In The Treatment Of Sub-Oestrus In Buffaloes

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ABSTRACT

In a herd of Murrah buffaloes in which sub-oestrus occured in 28.9 % of animals during the breeding season, 40 sub-oestrus buffaloes with a palpable corpus luteum (CL) were given a single I.M. injection of 25mg Prostin $F_2 \alpha$ (Upjohn). Following treatment, 31 (77.5 %) animals exhibited oestrus by 69.3 ± 5.6 hr and were served by fertile bulls. The first service conception rate was 54.8 % and compared favourably with normal, cyclic animals (59.1 %). The results indicate that $PGF_2 \alpha$ can be employed for the treatment of sub-oestrus and improvement of breeding efficiency in buffaloes.

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Prostaglandin $F_2 \alpha$ and its analogues have been employed for the treatment of unobserved oestrus (Seguin et al, 1978) and sub-oestrus in cattle (Cooper et al, 1976; Eddy, 1977) and buffaloes (Rao and Rao, 1979; Singh et al., 1979; Khurana et al., 1981; Chauhan et al. 1982). In these studies with sub-oestrus buffaloes the conception rates (CR) with A.I. at induced oestrus were invariably lower than in normal cycling animals. This study was, therefore, undertaken to evaluate the efficacy of $PGF_2 \alpha$ as a treatment for sub-oestrus in buffaloes and ascertain fertility following natural service at the subsequent induced oestrus.

Materials and Methods

Forty, parous, sub-oestrus Murrah buffaloes belonging to an organised farm were employed during the normal breeding season (October - December). They were kept in a loose housing system and fed collectively with sufficient feed and fodder. Animals were confirmed to be sub-oestrus, when they did not accept the raddled fertile bulls maintained in the herd throughout the day

and night, and on gynaeco-clinical examination they revealed palpable CL. All sub-oestrus animals were given a single. I.M. injection of 25 mg Prostin $F_2 \propto$ (Upjohn). Mean interval from last calving to treatment was 153.6 ± 19.23 days.

Following treatment, the animals were left with raddled fertile bulls and were examined at 06.00 and 18.00 hr for signs of acceptance up to 10 days after treatment. Pregnancy was confirmed gynaeco-clinically between 45-60 days after natural service. The C.R. following treatment, was compared with another 225 normal cycling buffaloes of the same herd which were served naturally during the same breeding season serving as controls.

The result were analysed by Chi-Square test.

Results

In the present study, the incidence of sub-oestrus during the breeding season was 28.9%, as only 40 out of 138 buffaloes which were examined had palpable CL. The remaining animals had smooth or inactive ovaries and were classed as anoestrous.

The efficacy of $PGF_2 \propto$ in the induction of behavioural oestrus is apparent from our results that of the 40 treated animals, 31 (77.5 %) exhibited oestrus with a mean interval of 69.3 ± 5.6 hr (range 26 to 144 hr). A large proportion of the animals (17/31, 54.8 %) exhibited oestrus between 49 to 72 hr, while another 7/31 (22.6 %) exhibited oestrus between 73 to 96 hr, and only 4/31 (12.9 %) exhibited oestrus between 97 to 144 hr after treatment. A total of 9/40 (22.5 %) animals failed to exhibit oestrus within 10 days of treatment.

The first service conception rates (no. palpated pregnant / no. bred) for the treated and control animals were 17/31 (54.8 %) and 133/225 (59.1 %), respectively, and the difference was not significant ($x^2 = 1.6$)

Discussion

Sub-oestrus is a major cause of low reproductive efficiency of buffaloes and the incidence varies considerably in different herds (Mac Gregor, 1941; Pant and Roy, 1972). An incidence of 28.9% observed by us is in agreement with earlier reports (Hafez, 1954; Rao and Rao, 1979).

The present results are in confirmity with earlier reports (Rao and Rao, 1979; Singh et al, 1979; Khurana et al, 1981; Chauhan et al, 1982) and indicate that $PGF_2 \propto$ is an effective treatment for sub-oestrus in buffaloes, as in cattle (Cooper et al, 1976; Eddy, 1977). Our results on the incidence of oestrus (77.5%) after treatment are similar to a study in which 12/16 (75%) sub-oestrus buffaloes exhibited oestrus following similar treatment (Singh et al, 1979). However, the failure of 9 animals to respond is of interest. These animals may have either failed to respond to treatment, or had silent heat or in some, the CL may not have been assessed accurately. An incidental finding in our other study (unpublished) indicates that the intensity of oestrus following $PGF_2 \propto$ is positively correlated with the size of CL. It is possible that the majority of animals which do not respond to treatment had sub-oestrus following luteolysis.

Present results indicate clearly that fertility of $PGF_2 \propto$ - treated - animals compared favourably with that of controls. However, others have reported lower conception rates

following A.I at the $PGF_2 \alpha$ induced oestrus (Rao and Rao, 1979; Singh et al, 1979; Khurana et al, 1981; Chauhan et al 1982). While the main cause of this discrepancy may be the difference between A.I. and natural service, other factors viz. nutrition and season, may also be relevant. Others have shown marked variation in CRs of synchronized cattle maintained at high and low planes of nutrition (Fulka et al, 1978)

The results confirm the potential of $PGF_2 \alpha$ for the treatment of sub-oestrus and consequent improvement of breeding efficiency in buffaloes. Further studies are warranted to assess the reason (s) for failure of certain animals to respond, and whether the two injection schedule or timed insemination would have any beneficial effect on the breeding efficiency.

Acknowledgement

We are grateful to Mr. S.H. Langford of Upjohn International for the generous gift of Prostin $F_2 \alpha$.

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IJAR:12:1:58-63:1991

Estrus Behaviour And Biochemical Profile Studies During First Oestrous Cycle Of Surti and Marwari Goats.

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ABSTRACT

The estrous behaviour and biochemical profiles of first oestrus cycle in Surti and Marwari goats were studied. Oestrous cycle length and duration of estrus in these breeds was found to be variable. Both the breeds exhibited similar intensities of the estrus symptoms on the day of estrus. Biochemical profiles studied during phases of short and normal estrous cycles fluctuated within normal range, except for blood serum total and free cholesterol.

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Indian goats reach puberty at an average age of twelve months. The behaviour of pubertal goats is not uniform (Jindal, 1984). The present studies were undertaken with an objective of studying the physical and biochemical behaviour of Surti and Marwari goats during their first oestrous cycle.

Materials and Methods

Studies were conducted on clinically healthy 18 Surti and 52 Marwari goats (nannies) of 9 to 12 months of age, without any history of oestrous cycle and breeding and maintained under stallfed conditions. Body weight was recorded at weekly intervals. Right from six months of age, they were checked for estrous behaviour and signs of estrus such as bleeting, switching of tail and cervical discharge noted each morning and evening. Apron fitted buck was placed with nannies one hour each in morning and evening to study the response of does and bucks at the time of estrus. The day on which the buck showed mounting behaviour and the nanny showed vaginal discharge, bleeting and switching of tail, was considered as the first day of estrus cycle. Physical behaviour of buck and nanny was recorded daily giving specific score for each parameter, till the onset of next oestrus. Blood samples were collected from these goats on Day 1, 5, 9, 13, and 17 of estrous cycle. Serum was harvested and analysed for calcium, phosphorus, copper, protein, alkaline phosphatase, peroxidase, total and free choesterol by employing standard techniques of Clark and Collips (1925), Fiske and Subbarow (1925), Eden and Green (1940), Ventura and King (1951), Lowry et al (1951), King and Armatroug (1934), Machly (1954), and Schoenheimer and Sperry (1934) respectively. The whole blood was immediately analysed for blood sugar and blood urea nitrogen (BUN) as per the techniques of Folin and Wu (1920) and

Project financed by PL-480 USDA Grant No. FC-IN-643

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Hawk et.al. (1954). The data collected were analysed as per Steel and Torrie (1960).

Results and Discussion

1. *Physical behaviour of goats during first estrous cycle* : The length of first oestrus cycle (days) and duration of estrus (hours) exhibited three categories of oestrous cycles :- (1) Normal estrous cycle - 19 to 21 days (2) Short estrous cycle-less than 10 days and (3) long estrous cycle - more than 21 days. Out of 18 pubertal Surti goats, 10 exhibited short cycle, 3 normal cycle and 6 longer cycles (Table-1). In contrast to this, out of 52 pubertal Marwari goats, 13 exhibited shorter cycle, 29 normal cycle and 10 longer cycles. This indicates that Marwari goats at their first oestrous cycle exhibit larger percentage of normal cycles than Surti goats. The estrus duration ranged between 34.8 to 54.67 hours in Surti goats, whereas in Marwari goats, it was between 33.16 to 49.7 hours. The length of estrus duration was not correlated with that of estrous cycle (Table-1).

Behavioural symptoms such as smelling, mounting and agressiveness of buck, bleeting and tail switching were maximum on the day of estrus, both for short and normal cycling Surti and Marwari goats behaviour (Tables 2, 3). These observations were recorded upto day 4 of estrous cycle in some goats of both breeds. Thin cervical discharge and vulvar swelling were not constant features on day 1 of estrus in both the breeds. Cervical discharge was thin-thick or scanty in short and longer cycling goats. Heat symptoms were totally absent on day 8 of cycle till the onset of next estrus (Tables 2, 3).

The studies of Singh and Senger (1979) on the length of oestrous cycle of Jamanapari, Beetal, Barbari and Black Bengal goats have indicated that they exhibit 10 to 14 % short cycles (< 10 days), 50% normal cycles (10 to 20 days) and 31 to 41% long cycles (> 28 days). The normal oestrous cycle length in Angora goats is 19 to 21 days (Van Ransburg, 1971). In the present studies, Surti goats exhibited more number of shorter cycles without affecting the C.R. in the next cycle.

The wide range of estrus duration observed in the present studies is also reported by Khan (1980) in Jamanpari goats (24 to 48 hrs.) and Sahni and Roy (1967) in Barbari goats (12 to 60 hours). Duration of estrus in nulliparous goats is longer than multiparous goats (Prashad, 1969).

In present studies, the vulvar swelling and vaginal discharge are not the consistant signs of estrus in goats. However, Bonfort and Thier (1963) indicated that the best time for breeding goats is when they exhibit cheesy white mucous discharge.

2. *Blood Biochemical Profiles* :

The blood biochemical profiles exhibit fluctuations within normal physiological range, when analysed at different stages of estrous cycle (Tables 4, 5). As such, the trend followed by different biochemical constituents is similar at various stages of estrus cycle in short and normal cycling Surti and Marwari goats, except for blood serum total and free cholesterol which declined significantly on day 9 of normal cycle of these goats. However, the levels of these metabolites do not show such declining trend on same day of short cycle for both the breeds. This indicates the fact that serum cholesterol is better utilized for luteal

Table 1 : Variations in 1st estrous cycle length and estrus duration in short, normal and long cycling Surti and Marwari goats (Mean ± SE)

Breed	Short Cycle (< 10 days)		Normal Cycle (19-21 days)		Longer Cycle (> 21 days)	
	Estrous cycle length (Days)	Estrus Duration (hrs)	Estrous cycle length (Days)	Estrus Duration (hrs)	Estrous cycle length (Days)	Estrus Duration (hrs)
Surti	9.2 ± 0.76	34.8 ± 7.09	19.67 ± 0.41	54.67 ± 20.67	42.63 ± 7.52	42.0 ± 8.70
n	10	10	3	3	6	6
%	52.63	52.63	15.79	15.79	31.38	31.38
Marwari	9.23 ± 1.07	36.23 ± 7.29	20.03 ± 0.17	33.16 ± 2.95	31.6 ± 3.02	49.7 ± 6.39
n	13	13	29	29	10	10
%	25.0	25.0	55.77	55.77	19.25	19.25

Table 2 : Percent physical behaviour of Surti goats during estrous cycle and estrus period

Item	Days of Estrous cycle									
	Day-1		Day-5		Day-9		Day-13		Day-17	
	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.
Mounting	100	100	100	-	-	-	-	-	-	-
Bleeting	100	100	22.22	-	-	-	-	-	-	-
Tail switching	88	100	33.33	75.0	-	-	-	-	-	-
Smelling by buck	100	100	22.22	75.0	-	-	-	-	-	-
Cervical Discharge										
Thick	33.33	66.66	-	-	-	-	-	-	-	-
Thin	55.55	33.33	-	-	-	-	-	-	-	-
Scanty	11.00	-	-	-	-	-	-	-	-	-
Absent	-	-	100	100	100	100	100	100	100	100
Buck Reaction										
Quick	77.77	100	-	-	-	-	-	-	-	-
Sluggish	22.22	-	11.11	-	-	-	-	-	-	-
Absent	-	-	88.88	100	100	100	100	100	100	100
Vulval Swelling										
Intense	66.66	100	-	-	-	-	-	-	-	-
Less intense	33.33	-	11.11	-	-	-	-	-	-	-
Absent	-	-	88.88	-	100	100	100	100	100	100

S.C. - Short cycling, N.C. - Normal cycling

activities on day 9 of estrous cycle in normal cycling goats. However, luteal phase being shorter in short cycling goats, specific fall in free and total cholesterol was not obse-

rved. The studies on blood levels of progesterone (unpublished data) have exhibited peak progesterone levels on day 9 of normal oestrous cycle. Similar blood biochemical

Table 3 : Percent physical behaviour of Marwari goats during estrous cycle and estrus period.

Item	Day-1		Day-5		Day-9		Day-13		Day-17	
	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.
Mounting	100	100	23.7	58.62	-	-	-	-	-	-
Bleeting	100	100	23.7	35.17	-	-	-	-	-	-
Tail switching	100	100	23.7	55.17	-	-	-	-	-	-
Smelling by buck	100	100	15.38	55.17	-	-	-	-	-	-
Cervical discharge										
Thick	69.23	58.52		3.44	-	-	-	-	-	-
Thin	30.76	41.37	7.6	27.68	-	-	-	-	-	-
Scanty				6.89	-	-	-	-	-	-
Absent			92.33	62.06	100	100	100	100	100	100
Buck Reaction										
Quick	86.25	86.25	50.00	3.89				-	-	-
Sluggish	13.75	13.79	50.00	37.93				-	-	-
Absent				58.62	100	100	100	100	100	100
Vulval Swelling										
Intense	69.23	68.96		3.89					-	-
Less Intense	30.76	31.03	7.60	75.86					-	-
Absent			92.30	17.29	100	100	100	100	100	100

S.C. - Short cycling, N.C. - Normal cycling

Table 4 : Blood Biochemical profiles (Mean ± SE) of short and normal cycling Surti goats

Item	Days of Estrous cycle									
	Day-1		Day 5		Day-9		Day-13		Day-17	
	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.
Serum Calcium	12.81	10.83	11.59	11.08	14.39	11.44	-	13.07	-	11.37
(mg%)	1.02	1.75	1.22	1.37	1.12	1.41	-	1.48	-	1.10
Serum Phosphorus	7.08	7.20	7.55	7.81	5.85	7.61	-	7.53	-	6.49
(mg%)	0.51	0.70	0.78	1.27	0.54	1.27	-	1.11	-	0.59
Serum Copper	192.75	121.56	192.75	82.69	138.94	142.31		237.94		133.31
(mcg%)	37.09	17.37	20.02	13.97	45.45	21.32		20.28		27.38
Blood Glucose	49.57	65.72	56.45	74.10	70.20	52.61		48.09		51.46
(mg%)	7.47	6.59	4.21	15.01	18.20	18.04		9.82		11.45
Blood Urea										
Nitrogen	19.61	17.00	21.89	18.68	16.43	16.91		22.64		20.41
(mg%)	1.95	0.58	2.60	4.02	4.68	3.45	-	4.80		5.19
Total serum protein	5.94	6.68	6.48	5.87	5.81	6.65		6.92		6.46
(g%)	0.34	0.44	0.44	0.30	0.40	0.86		0.46	-	0.66
Serum Alkaline										
Phosphatase	20.1	16.18	20.25	16.10	22.48	21.88		16.63	-	18.73
(KAU%)	1.94	5.80	3.24	3.87	1.84	3.99		1.80		1.97
Serum Peroxidase	1.65	1.38	1.68	1.52	1.38	1.27		1.54		1.60
(OD/10mt/ml)	0.27	0.09	0.18	0.17	0.10	0.16		0.18	-	0.38
Serum Total										
Cholesterol	143.58	143.04	140.61	112.28	138.80	92.13		155.16	-	165.17
(mg%)	20.52	29.36	15.06	8.78	30.28	10.62		27.67	-	29.34
Serum Free										
Cholesterol	16.63	17.46	16.00	15.39	11.39	5.58		20.73		20.76
(mg%)	3.52	6.64	4.28	8.44	4.20	1.91		6.81	-	9.38

S.C. Short Cycling, N.C. - Normal Cycling.

profile studies have not been reported for goat estrous cycle. However, similar trend of blood biochemical constituents was recorded in Surti buffaloes by Mehta and Janakiraman (1988). These two studies though conducted in different species have several parallel observations in them.

Acknowledgements

The authors are thankful to the authorities of PL-480 USDA, New Delhi for providing financial assistance to the project on goat reproduction. The authors are also thankful to Dr. V.M. Jhala, Dean, College of Veterinary Science and Animal Husbandry, Anand for providing facilities.

Table 5 : Blood Biochemical profiles (Mean ± SE) of short and normal cycling Marwari goats

Item	Days of Estrous cycle									
	Day-1		Day-5		Day-9		Day-13		Day-17	
	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.	S.C.	N.C.
Serum Calcium	11.86	9.80	10.58	10.03	9.07	10.62	-	11.65	-	10.57
(mg%)	0.72	0.96	1.10	0.68	1.15	0.69		0.86		0.83
Serum Phosphorus	9.56	9.37	9.20	8.61	8.99	9.45		8.40	-	7.71
(mg%)	1.25	0.79	0.76	0.70	1.35	0.69		0.72		0.46
Serum Copper	202.91	214.87	163.43	173.50	200.70	186.35	-	197.22	-	158.04
(mcg%)	21.20	26.12	31.50	29.75	31.50	32.65		18.57		22.21
Blood Glucose	44.4	61.81	49.12	64.35	46.00	55.14	-	49.68	-	54.85
(mg%)	6.11	6.61	5.61	6.53	4.53	4.44		5.80		4.22
Blood Urea										
Nirtrogen	19.56	14.68	13.99	14.73	13.20	17.97	-	20.25	-	14.23
(mg%)	4.22	1.72	1.82	1.53	2.85	1.71		2.86		2.30
Total serum protein	8.09	8.11	8.13	8.07	7.24	8.02	-	8.27		7.94
(g%)	0.55	0.51	0.56	0.47	0.58	0.56		0.60		0.57
Serum Alkaline										
Phosphatase	20.4	20.48	18.61	22.38	22.26	20.95	-	20.68	-	21.08
(KAU%)	1.74	1.57	1.93	1.60	2.26	1.30		1.76		1.02
Serum Peroxidase	1.89	2.31	1.77	2.08	2.03	1.86	-	1.81	-	2.11
(OD/10mt/ml)	0.24	0.34	0.24	0.28	0.24	0.21		0.24		0.31
Serum Cholesterol	142.60	139.09	158.47	124.05	144.66	107.97	-	152.23	-	164.13
(mg%)	18.40	23.22	17.53	15.93	22.86	14.32		15.14		13.76
Serum Free										
Cholesterol	12.69	12.85	14.89	9.24	11.57	8.47	-	13.01	-	12.06
(mg%)	4.37	3.37	4.32	2.49	4.32	1.83		2.56		2.43

S.C. - Short Cycling; N.C. - Normal Cycling.

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IJAR:12:1:63-67:1991

Evaluation Of Rectal - Abdominal Palpation Technique And Hormonal Diagnosis Of Pregnancy In Small Ruminants*

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ABSTRACT

Two methods of pregnancy diagnosis (PD) were compared in 82 sheep and goats. Accuracy of rectal - abdominal (RA) palpation in PD ranged from 91 - 92%. Accuracy of predicting pregnancy based on progesterone test was 100% Accuracy of predicting single or multiple pregnancies by palpation was quite low. Twins (19.20 ng/ml) and triplets (29.9 ng/ml) had higher levels of

* Paper presented at the 8th National Symposium on "Applied Reproduction in Farm Animals" held at GAU-Anand Campus, Gujarat, Nov. 10-12, 1989.

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progesterone compared to singles (9.2 ng/ml) in ewes. This was not observed in goats. RA palpation technique is inexpensive, simple and fairly accurate in the hands of experienced operator.

• • •

A simple and reliable technique for diagnosing pregnancy and detection of multiple pregnancies in small ruminants is of paramount importance to field veterinarians. Several methods of pregnancy diagnosis have been reported in small ruminants (Hulet, 1972; Watt *et al.*, 1984; Mcphee and Tiberghien, 1987). Limitations preclude their acceptance under field conditions. Reliability of Rectal - abdominal palpation technique and progesterone test for diagnosing pregnancy in small ruminants, was studied and the findings presented herein.

Materials and Methods

Eighty-two sheep and goats of various breeds (Uda, Yankasa, Balami and Borno-red), ages and body weights were included in this study. Breeding history of these animals was not known. The animals comprised of two groups :-

Group-1 : 25 animals of Maiduguri abattoir brought for slaughter

Group-2 : 62 mature ewes and does belonging to the Livestock Farm, University of Maiduguri.

(i) *Rectal-abdominal palpation technique* : The technique described by Hulet (1972) was used to examine pregnancy or non-pregnancy (Fig.1). The technique involves

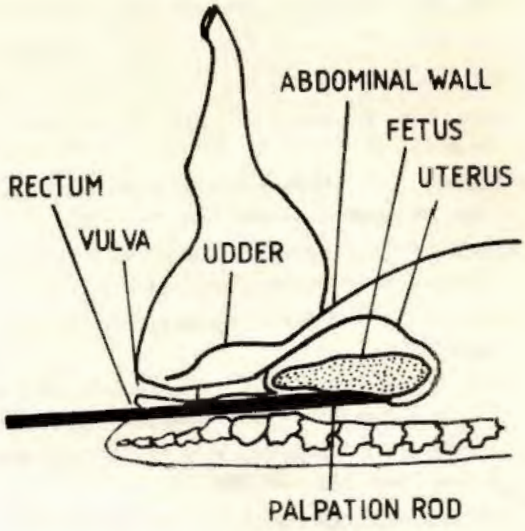

Fig. 1 : Longitudinal Section illustrating Rectal-Abdominal Palpation Technique in the Ewe. (Hulet, 1972)

use of a glass or steel rod (50 cm long and 1.5 cm diameter) inserted in rectum. A soap enema is given 5 minutes before examination to evacuate the rectum. The ewe or doe is turned on her back. The probe is lubricated with paraffin oil and carefully inserted approximately 30 cm inside rectum. Left palm is placed on the abdominal wall and the rod is moved to and fro in a horizontal plane with the right hand. If the rod is palpable as it moves slowly with no obstruction to its passage across the abdomen from side to side, the ewe is considered non-pregnant. If a palpable mass is detected with the free hand through the abdominal wall on one or both sides, the ewe is pregnant and the number of fetuses assessed according to the size and position of masses, whereever possible. Group-1 animals were examined antemortem (A.M.) and post-mortem (P.M.). The rectum and uterus were

critically examined for injury or damage following examination. Group-2 animals were examined by this technique and blood samples collected for progesterone assay. These farm animals were followed till lambing or kidding.

(ii) *Progesterone assay* :Two blood samples were obtained from each animal at 7-8 days interval. Serum was stored at -20°C until processed for progesterone levels at NAPRI, Shika, Zaria, Nigeria, by solid phase non-extractions RIA technique (IEA/FAO RIA Progestrone kit, Vienna). Serum progesterone levels of > 1 ng/ml and < 1 ng/ml on two occasions were considered indicative of pregnancy and non-pregnancy in both the species.

Results of palpation technique were compared with P.M. findings and progesterone levels to calculate accuracy of the method.

Results and Discussion

Relative accuracy of prediction of pregnancy based on rectal - abdominal palpation ranged from 91 - 92 % for the two groups of animals studied (Table 1). These findings are in close agreement with those reported earlier in ewes (Hulet, 1972; Plant, 1980) and goats (Gonzalez and Madrid, 1979). Turner and Hindson (1975) recorded a virtual 100% accuracy of pregnancy diagnosis. They further reported that inaccuracies can result due to involuting uterus where history of abortion or parturition is not known. In group-1, 48% animals had bruises or/and abrasions in the rectum. Similar observations were made by Tyrrell and Plant (1979). Nothing abnormal was detected following examination in group-2. Complications decrease with experience.

Accuracy of predicting pregnancy in ewes based on serum progesterone level was 100% (Table 1). Similar success rate in predicting pregnancy in sheep has been reported earlier (Gadsby *et al.*,1972; Tyrrell *et al.*,1980; Mcphee and Tiberghien, 1987). These results suggest that determination of progesterone levels in ewes offer pregnancy diagnosis of comparable accuracy.

Accuracy of predicting single or multiple pregnancy by RA palpation technique was quite low with 67% (single) and 33.3% (multiple) errors (Table 2) and therefore not reliable for this purpose. However, Hulet (1973), Gonzalez and Madrid (1979) and Fauske (1986) reported higher (80-95%) accuracy.

Progesterone levels increased with the number of fetuses in the pregnant ewes. These results are in close agreement with earlier reports (Gadsby *et al.*, 1972; Weigl *et al.*, 1975). Prediction of number of fetuses in goats seems difficult, but in ewe the placental production of progesterone increases in the second half of pregnancy which is related to the number of fetuses (Thimonier *et al.*, 1977).

Acknowledgements

The authors thank Dr E.O. Oyedipe, Deptt. of Animal Reproduction & A.I., NAPRI, Shirka, Zaria, Nigeria for providing RIA facilities.

Table 1 : Accuracy of rectal-abdominal palpation technique and progesterone test for diagnosing pregnancy in small ruminants.

Group	Method	Total no. of animals	Pregnant	Non Pregnant	No. of errors	Accuracy %	Complication
I	Rectal abdominal palpation	25	7	16	2	92	48% animals had bruses and abrasions 8% perforations.
	Postmortem	25	9	16	0		
II	Rectal abdominal palpation	57	25	27	5	91.2	nothing abnormal detected
	Progesterone test	57	30	27	0	100.0	

Table- 2 : Accuracy of predicting single or multiple pregnancy by rectal abdominal palpation technique.

Group	No.of ewes identified correctly			
	Single	Multiple	Number of errors	Percentage error
I	1 (3)	4 (8)	6	67.0
II	7 (11)	10 (13)	7	33.3

Figures in parentheses represent the number of animals predicted for single or multiple pregnancy.

Table 3 : Relationship between progesterone profile and litter size in small ruminants.

Species	Progesterone profile ng/ml serum	Litter size
Ovine	9.20	Single
	19.20	Twins
	29.95	Triplets
Caprine	6.00	Single
	6.75	Twins
	9.02	Triplets

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IJAR:12:1:67-69:1991

Chemical Biological And Consistency Of Mammary Secretion Tests For Pregnancy-Diagnosis In Goats

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ABSTRACT

Chemical (Cuboni) test was performed from 45th to 60th days post breeding in goats with 70% accuracy in diagnosing pregnancy. Lower accuracy (50%) obtained for nonpregnant status needs further investigations. Biological (A.Z.) test was performed in goats from 30th to 40th day of gestation with 80% accuracy for detection of pregnant status and 100% accuracy of non-pregnant status. Consistency of mammary secretion test was performed from 30th to 110th day post breeding at an interval of 10 days. This test yielded better results on day 70 and onwards post breeding, diagnosing pregnancy (81.60%) and non pregnancy (88.88%) in goats.

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Chemical test was first described by Cuboni (1973) for pregnancy diagnosis in mare. Sundersanan and Raja (1973) reported higher efficacy of Cuboni test for diagnosing pregnancy in goats. They extracted oestrogen from pregnant goat urine and injected it to female albino rats. Proliferation of uterine endometrium in rat indicated pregnancy.

Biological test was first used by Aschiem and Zondek (1927) for detection of pregnancy in mare. Sundersanan and Raja (1973) reported higher efficiency of A.Z. test on day 30 of gestation in goats.

Consistency of mammary secretion (Honey like) test was used by Heckler (1942), Webb (1942) and Plant (1980) for

effective detection of pregnancy in sheep from third month of gestation onwards.

Materials and Methods

Chemical (Cuboni) test : was performed as per the procedure described by Cuboni (1937). 15 ml of urine sample was taken and to it 3 ml of conc. HCl was added. The mixture was heated in rapidly boiling water for 10 minutes. It was cooled and 19 ml of benzol (Benzyl alcohol) was added to it. This was thoroughly mixed and allowed to stand so that benzol layer got separated. The benzol layer (Supernatant) was collected using separating funnel and to it 10 ml. Conc. H_2SO_4 was added till the appearance of effervescence. Thereafter the tubes containing the mixture were cooled and again kept in water bath at 80°C for five minutes. On cooling the tubes, appearance of dark oily green fluorescent colour to the lower sulphuric acid layer indicated pregnancy, whereas brownish yellow colour was indicative of non-pregnancy.

16 Osmanabadi and cross-bred goats were used as experimental animals for the chemical test, which was performed 45 to 60 days post-breeding.

Biological (A.Z.) test : was performed as per the procedure described by Ascheim and Zondek (1927). In all, 12 female immature albino mice ageing 3 weeks were used for this test, of which six were kept as control, and six albino mice were used for injecting the serum collected from six experimental goats was injected in each of the experimental albino mice @ 0.5 ml of serum subcut daily for four days.

Experimental as well as control mice were sacrificed 24 hours after the last injection, and their genitalia observed with the help of magnifying lens. Enlargement of uterine cornua 2 to 3 times the normal size and appearance of corpora haemorrhagica on the ovaries was considered as sign of pregnancy. Absence of such changes indicated non-pregnancy.

Consistency of Mammary Secretion test : was performed as per the technique of Hecklet (1942) and Webb (1942) on 22 Osmanabadi and cross-bred goats from day 30 to 110, postbreeding at ten day intervals. Mammary secretion was obtained in a test tube by stripping the teats of each goat. This secretion was rubbed on palm and when it was felt sticky and honey-like, the goat was considered as pregnant.

Results and Discussion

Chemical (Cuboni) test : The per cent accuracy in diagnosing pregnant status was 70% whereas that for non-pregnancy status was 50%. Pregnancy was confirmed on the basis of abdominal ballotment (at 90 days gestation) and actual kidding. The lower efficacy of this test in detecting non pregnancy status needs further investigations. Present findings are in close agreement with those recorded by Sundersanan and Raja (1973) in goats.

Biological test (A.Z.) test : The percent accuracy for detection of pregnant status recorded was 80 % and that of non pregnant status 100 %. These findings are in agreement with the reports of Sundersanan and Raja (1973) in goats. Further studies are necessary to establish this test.

Consistency of Mammary secretion test : The accuracy percentage for diagnosing pregnancy by this test was : 00.00, 16.66, 41.60, 75.00, 72.00, 81.80, 81.80, 81.80 and 81.80% on day 30, 40, 50, 60, 70, 80,

90, 100 and 110 days of gestation respectively. The corresponding figures for diagnosing non-pregnancy by this test were : 100.00, 88.88, 77.77, 77.77, 88.88, 88.88, 88.88, 88.88, and 88.88% respectively on 30, 40, 50, 60, 70, 80, 90, 100 and 110 days post breeding. Present findings are lower than those reported by Heckler (1942) in ewes, but are in agreement with those reported by Webb (1942) and Plant (1980) in ewes and differ from Richardson (1972) who could not differentiate pregnancy on the basis of mammary secretion.

The chemical as well as biological tests are mainly based on presence of oestrogen or FSH like substance in the urine or serum of pregnant goats. Louis and Kenneth (1966) reported the synthesis of oestrogen by mammalian placenta. Richardson (1972) also reported higher oestrogen in plasma during last 6 weeks of pregnancy in sheep. McArthur and Geary (1986) and Agarwal *et al.*(1988) have used RIA technique for measurement of oestrone sulphate as an aid for pregnancy diagnosis in goats. All these observations are helpful in drawing some conclusions regarding the efficacy of chemical as well as biological test for detection of pregnancy in goats.

In the present study, the honey like mammary secretion test yielded better results from 70 days of gestation onwards for detection of both pregnancy and non-pregnancy in goats. The test is efficient, easy to perform, less time consuming, cheap and applicable in field.

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IJAR:12:1:70-71:1991

Studies On Parturition In Goats

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The information about the process of parturition in caprine is scanty. Hence, this study was undertaken to critically study the events during kidding in Beetal, Black-Bengal goats and their crosses. Twenty one goats of Beetal, Black-Bengal breed and their crosses in advanced stages of pregnancy were selected for the study. Of these, ten were uniparous and elevan multiparous. Criteria described by Tiwari *et al.* (1969), Rao *et.al.* (1980) and Kuriakose *et.al.* (1983) were followed.

The common observations near parturition were : kicking at belly, frequent defaecation and micturition, tail raising, restlessness, lying down and getting up and grunting. However, relaxation of sacrosciatic ligaments, sinking of croup muscles, oedema, redness of labiae and engorgement of udder were most prominent signs studied. These symptoms of approaching parturition are in agreement with Kuriakose *et.al* (1983). Duration of the 1st stage recorded was marginally longer in multipara compared to unipara, but the difference was not significant (Table-1). However, the duration of this stage in their crosses was less in multipara than in unipara. The findings regarding the symptoms and duration of the second stage agree with that of Kurkiakose *et.al.* (1983) and Bhattacharya *et.al.*(1983). During this stage, the expulsion of foetus was initiated with the amniotic membranes wrapped around forelegs in some animals. However, in most cases amniotic sac containing fluid was hanging at the vulva after the foetus had been expelled. The foetuses were presented in anterior longitudinal dorsosacral position with both forelimbs extended and head lying on the knee joints. Second stage was divided into five sub-stages (Table-1). Total time required for second stage of parturition was more in multipara than unipara. The duration of third stage was variable in individual animal and breed. In case of twins, the timing was less as compared to singleton. Moreover, the uniparous Black Bengal breed took less time for expulsion of membranes than other goats. Total time taken for the whole process of parturition was similar in uniparous and multiparous Beetal and crossbred goats. However, marginally higher duration was observed in multiparous than uniparous Black Bengal breed. It is therefore concluded that the time taken for the three individual stages as well as complete process of parturition, varies with the breed and inidividual within the breed.

* Forms a part of M.V.Sc. Thesis, submitted to the Hayrana Agricultural University (1986) by the first author.

Table 1 : Duration of different stages of parturition (in minutes) in goats (Mean ± S.E.)

Item	Uniparous			Multiparous		
	Beetal	Black Bengal	Crosses	Beetal	Black Bengal	Crosses
Number of animals	4	2	4	3	5	3
Stage of parturition						
I Labour pains, upto appearance of water bag.	57.55 ± 2.38	52.00 ± 8.51	50.25 ± 3.37	65.00 ± 8.50	62.80 ± 13.11	26.66 ± 7.67
II (i) Appearance of water bag and 1st fore-limb	-	-	-	-	-	-
(ii) 1st & 2nd fore-limb	1.43 ± 0.28	2.00 ± 0.70	1.12 ± 0.27	2.58 ± 1.02	1.14 ± 0.41	1.09 ± 0.28
(iii) 2nd fore-limb & muzzle	2.47 ± 0.66	2.50 ± 1.06	2.25 ± 0.81	0.86 ± 0.23	0.81 ± 0.14	0.73 ± 0.11
(iv) Muzzle and head	2.77 ± 1.22	0.75 ± 0.17	3.25 ± 1.95	1.22 ± 0.36	0.60 ± 0.15	0.87 ± 0.16
(v) Expulsion of head and whole fetus	2.12 ± 0.27	1.75 ± 0.17	1.12 ± 0.10	1.08 ± 0.39	1.13 ± 0.25	1.12 ± 0.27
Total duration of Stage-II	8.79 ± 1.88	7.00 ± 2.12	7.74 ± 2.07	11.00 ± 1.70	12.49 ± 3.60	8.66 ± 0.27
III Expulsion of foetal membranes	107.50 ± 21.31	46.00 ± 7.09	104.50 ± 21.95	75.66 ± 27.66	107.20 ± 14.62	125.33 ± 8.39
Total time taken for complete process of parturition	173.54 ± 23.90	105.00 ± 17.53	162.49 ± 22.44	151.66 ± 32.21	182.49 ± 28.61	160.66 ± 8.12
Total time for stage II and stage III	116.29 ± 22.48	53.00 ± 9.21	112.24 ± 23.20	86.66 ± 25.99	119.69 ± 17.00	134.00 ± 8.65

	First Kid	Second Kid	Remaining Kids
In multiparous Beetal :	5.74 ± 0.83	4.26 ± 0	1 ± 0
Black Bengal :	3.68 ± 0.24	4.46 ± 1.36	4.35 ± 2.56
Crosses :	3.81 ± 0	2.66 ± 0.72	2.19 ± 0.47

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IJAR:12:1:72-75:1991

Macroscopic Changes In Ovaries Of Black Bengal Goats After Parturition

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ABSTRACT

Macroscopic changes in ovaries with CL of 30 primipara Black Bengal Goats were studied at and after parturition at an interval of 7 days post partum. Decrease in weight of the ovaries with CL from the day of parturition to day 14 post-partum was highly significant as a result of diminution in ovarian size. There was gradual decrease in the ovarian size and weight from the day of parturition upto day 14 post-partum, after which the decrease was not significant. Rate of decrease in the size of the pregnancy CL from the day of parturition to day 28 post-partum, was quicker. A number of small to large ovarian follicles were found at any stage. Just after expulsion of placenta, small and medium sized follicles were seen, whereas, small to large sized follicles were visible from day 7 to day 28 post-partum. At day 21 and day 28 post-partum, big sized collapsed follicles with haemorrhagic spots were noticed, indicating ovulation confirmed on histological examination.

* * *

A thorough knowledge of the gonadal status following parturition is essential for future reproductive efficiency. Biometry of goat genitalia collected from slaughter house were studied by Singh *et al* (1974) and Rahaman *et al* (1977). But systematic information on macro changes in the ovaries of Black Bengal goat after parturition is lacking. Present studies were therefore undertaken.

Materials and Methods

Thirty prepubertal Black Goats (Capra hircus) of uniform age and weight reared under identical conditions of housing, feeding, care and management were included in the present study. Pubertal goats of 8 to 9 months ago were not covered during the first to third estrus. The length of estrum was calculated by observing 3 successive estrus at an interval of 20 to 21 days recorded as varying from 36 to 48 hours, as per Harison (1948) and Roberts (1971). All the goats were covered during the fourth estrum by healthy and sexually mature buck. The goats did not come to estrus after mating and became pregnant. These 30 pregnant goats were divided into 5 groups of 6 each. All these goats showed no clinical and behavioural abnormalities after parturition.

The ovaries from goats in each group were collected by usual surgical technique of mid ventral approach under Lumbo-sacral segment spinal anaesthesia (Klide, 1971) as well as local linear block, following all pre and post surgical care. The ovaries were separated from extraneous tissues and subjected to macroscopic studies such as weight, size and visible structures, as quickly

* Part of the Thesis submitted by Senior author to BCKV, Mohanpur-741 246 for the award of Ph.D. Degree, 1987.

as possible, in an air conditioned laboratory. The weight of the ovaries was recorded. The length, width and thickness of the ovaries were taken as per Singh *et al* (1974). The ovaries were than halved lengthwise and right through the middle of the CL and point of protrusion when present, and the greatest length and breadth of the CL were measured as per Luktuke and Rao (1962). The presence of superficially visible ovarian follicle, number and size was recorded. Large sized collapsed ovarian follicles with haemorrhagic spots giving indication of ovulation, were subjected to historical examination following usual standard techniques. The data obtained in the present study was subjected to statistical analysis as per Snedecor and Cochran (1967).

Results and Discussions

The overall result obtained in the present study of ovaries with CL in Black Bengal Goats after parturition (Table - 1 & 2), showed that there was gradual decrease in the weight and size (length (L) x width (W) x thickness (T)) of the ovaries from the day of parturition upto day 14 post-partum, due to regression in size (length (L) x breadth (B)) of the CL and thereafter the decrease in ovarian weight and size and CL size was not significant. The average size of the ovary with CL, just after expulsion of placenta was 1.25 ± 0.07 cm. (L) x 0.77 ± 0.04 cm. (W) x 1.03 ± 0.04 cm. (T), which decreased to 0.96 ± 0.05 cm. (L) x 0.50 ± 0.01 cm. (W) x 0.70 ± 0.01 cm.(T) on day 14 post-partum, whereas it was 1.06 ± 0.06 cm. (L) x 0.62 ± 0.02 cm. (W) x 0.83 ± 0.01 cm. (T) on day 7 post-partum. The average size of the pregnancy CL in goat obtained just after expulsion of placenta was 0.71 ± 0.06 cm.(L) x 0.53 ± 0.05 cm.(B) which decreased to 0.20 ± 0.00 cm.(L) x 0.16 ± 0.01 cm.(B) at day 28 post-partum followed by 0.48 ± 0.02 cm.(L) x 0.40 ± 0.02 cm.(B) at 7th day, 0.32 ± 0.08 cm.(L) x 0.27 ± 0.01 cm.(B) at day 14 and 0.26 ± 0.03 cm. (L) x 0.23 ± 0.03 cm.(B) at day 21 after parturition. This decrease in the size of the CL after parturition reflected on the weight of the goat ovary. The weight of the ovary with CL varied according to the state of the CL (Table-1). Significant decrease in weight of the ovary with CL took place from the day of parturition to day 14 post-partum and from day 14 to day 28 post-partum, the decrease in weight was not significant. The average weight of the ovaries with CL on the day of partutition was 1.13 ± 0.02 gm. which decreased to 0.77 ± 0.008 gm. at day 14 post-partum, followed by 0.92 ± 0.03 gm. at day 7 after parturition. This variation in the size and weight of the ovaries at different days after parturition was closely related to the progressively regressing CL. The present investigation (Table - 2) showed that the rate of decrease in CL size from parturition to day 28 post-partum was rapid than that of cyclic day 12 CL in goat as reported by Harison (1948). This rapid regression in the size of CL verum after parturition may be a physiological process in goats.

The size of Corpus albicans (CA) at day 28 post-partum was 0.20 ± 0.0 cm. (L) x 0.16 ± 0.01 cm. (B) with the highest degree of fibro-collagenisation and reticulin architectural condensation, evident on histological examination (Fig. 1). The time required for complete resorption of corpora albicantia could not be ascertained since the present study did not extend beyond day 28 post-partum.

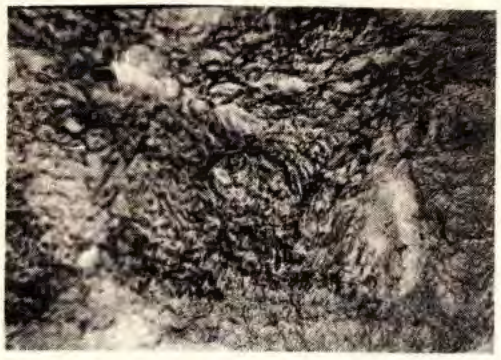

Fig 1 x 100. CL at Day 21 to Day 28 post-partum in goat showing highest degree of fibro-collagenisation. V.G. Stain.

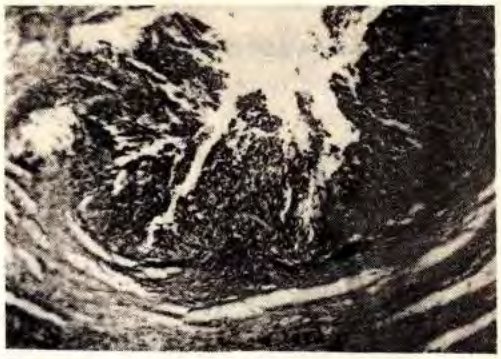

Fig 2 x 100. Ruptured graafian follicle at Day 21 to Day 28 post-partum in goat indicating ovulation with early luteinisation. H.E. Stain.

Macroscopic study indicated that at parturition and just after expulsion of placenta, small (0.5 - 1.0 mm) and medium sized (2 - 5 mm) ovarian follicles were seen. But, small (0.5 -1.0 mm) to large sized (6 - 10 mm) ovarian follicles were visible at any stage from day 7 to day 28 post-partum. 5 ovaries of 3 goats at day 21 post-partum and one ovary of 2 goats at day 28 post-partum showed the presence of medium (5 mm) to large (6 - 7 mm) sized collapsed follicles with haemorrhagic spots indicating ovulation, subsequently confirmed on histological examination (Fig 2). These findings showed that follicular activity increased after parturition and terminated in ovulation at day 21 and day 28 post-partum in the goat. Due to lack of similar work in the available literature comparison could not be done. However these are allied to the findings of Harison (1948) and Pretorius (1971) in normal cycling and anoestrous goats.

Acknowledgements

The authors are grateful to the Dean, Faculty of Veterinary & Animal Sciences and Dean, Post-graduate Studies, BCKV, Mohanpur for according necessary permission and providing facilities.

Table 1 : Average measurement of ovaries with CL at different stages after parturition in goats

Stages of ovary with CL	No.of observations	Av. wt. of ovary with CL (gm)	Average size of the ovary with CL (cm) Length	Width	Thickness
At parturition just after expulsion of placenta	8	1.13 ± 0.02 (0.98 - 1.21)	1.25 ± 0.07 (1.00 - 1.65)	0.77 ± 0.04 (0.65 - 1.00)	1.03 ± 0.04 (0.85 - 1.20)
7th day after parturition	10	0.92 ± 0.03 (0.81 - 1.12)	1.06 ± 0.06 (0.94 - 1.50)	0.62 ± 0.02 (0.55 - 0.73)	0.83 ± 0.01 (0.75 - 0.91)
14th day after parturition	10	0.77 ± 0.008 (0.73 - 0.82)	0.96 ± 0.05 (0.80 - 1.30)	0.50 ± 0.01 (0.40 - 0.56)	0.70 ± 0.01 (0.60 - 0.80)
21st day after parturition	6	0.74 ± 0.01 (0.70 - 0.79)	0.95 ± 0.05 (0.85 - 1.25)	0.46 ± 0.01 (0.43 - 0.50)	0.69 ± 0.01 (0.65 - 0.75)
28th day after parturition	6	0.73 ± 0.01 (0.71 - 0.76)	0.94 ± 0.02 (0.80 - 1.35)	0.44 ± 0.02 (0.40 - 0.53)	0.66 ± 0.01 (0.58 - 0.74)

Figures in the parenthesis indicate range

Table 2 : Average size of the CL at different stages after parturition in goats

Stages of CL	No.of observations	Average size of CL (cm) Length	Breadth
At parturition just after expulsion of placenta	9	0.71 ± 0.06 (0.50 - 1.10)	0.53 ± 0.05 (0.40 - 0.80)
7th day after parturition	13	0.48 ± 0.02 (0.40 - 0.60)	0.40 ± 0.02 (0.30 - 0.50)
14th day after parturition	14	0.32 ± 0.08 (0.20 - 0.40)	0.27 ± 0.03 (0.20 - 0.40)
21st day after parturition	6	0.26 ± 0.03 (0.20 - 0.40)	0.23 ± 0.03 (0.20 - 0.40)
28th day after parturition	6	0.20 ± 0.00 (0.20)	0.16 ± 0.01 (0.10 - 0.20)

Figures in the parenthesis indicate range.

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ERRATA

The follwing errors in IJAR Vol. 11 No. 2, December 1990 may please be corrected. Inconvenience caused is regretted.

No.	Item	Error	Correction
1	Contents Sr. No. 24	"Semen Progesterone Profiles"	"Serum Progesterone Profiles"

IJAR:12:1:76-77:1991

Detection of Induced Ovulation By Laparoscopy In Ewe Lambs

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Laproscopy has been used for detection of ovulation, pregnancy and aspiration of oocytes in sheep (Snyder and Dukelow, 1974; Wani and Sahni, 1988). At repeated superovulations in goats, bettter results have been obtained in those who were not previously laparotomied (Wani and Gelderrmann, 1987). Thus, it is essential to know whether a donor has responded to a given treatment or not, to avoid laparotomy for embryo collections and increase chances of donors use next time. The present study was under-taken to assess the efficacy of prediction of ovulation rate in superovulated ewe lamb using laparoscopy.

Materials and Methods

Twenty two crossbred ewe lambs were grouped together and superovulated as per Wani *et al* (1989). Heat detection was done by parading a ram twice daily. Those in heat were laparoscopied 5-6 days after mating (DO = onset of oestrus/mating) as per Wani (1982). The number of functional corpora lutea (CL) and unovulated follicles from right and left ovaries were counted. The observations at laparoscsopy were compared with actual observations at midventral laparotomy as per Wani (1984a, 1984b). The accuracy of predicting ovulation at laparoscopy was worked out by employing statistical procedures described by Snedecor and Cochram, (1967).

Table 1 : Prediction of ovulation rate and unovulated follicles in Ewe lambs.

Animal No.	Ovulation rate						Unovulated follicles					
	Observed at laparoscopy			Confirmed at laparotomy			Observed at laparoscopy			Confirmed at laparotomy		
	R.O.	L.O.	Total	R.O.	L.O.	Total	R.O.	L.O.	Total	R.O.	L.O.	Total
1.	3	4	7	Laparotomy not done			1	2	3	Laparotomy not done		
2.	1	1	2	1	1	2	2	1	3	2	2	4
3.	1	3	4	1	3	4	3	3	6	3	4	7
4.	0	1	1	0	1	1	1	3	4	2	4	6
5.	0	2	2	0	2	2	1	0	1	1	1	2
6.	2	3	5	2	0	2	0	3	3	1	0	1
7.	1	2	3	5	1	6	1	2	3	4	2	6
8.	1	2	3	0	4	4	2	2	4	6	5	11
9.	2	4	6	Laparotomy not done			4	3	7	Laparotomy not done		

R.O. - Right Ovary. L.O - Left Ovary

* Abstract presented as poster in the International Conference on Frontiers in Reproduction Physiology, November 8-10, 1990.

1. Professor/Chief Scientist and Head. 2. Assistant Professor/Junior Scientist (Surgery).

Result and Discussions

Out of 22 animals, 9(41%) showed oestrus. All had ovulated as observed at laparoscopy. Seven out of 9 animals (78%) were laparotomied to confirm laparoscopy results. All animals predicted to have ovulated were confirmed (Table 1). These observations are similar to those reported earlier (Kelly and Allison, 1976; Blockey *et al*, 1979; Phillippo *et al*, 1988.)

Ovulation rates were correctly predicted in 57% animals (Table 1). The overall accuracy of prediction of ovulations (No. of CL) was 95% (Table 2). The prediction of unovulated follicles at laparoscopy was 75% (Table 2). However, these observations could not be compared due to lack of similar reports.

Table 2 : Summary of observations in superovulated ewe lambs.

Parameter	Predicted at laparoscopy				Confirmed at laparotomy			
	R.O.	L.O.	Total	Rate	R.O	L.O	Total	Rate
No.of Animals	7	7	7		7	7	7	
No.of CL (Ovulation)	6	14	20	2.9	9	12	21	3.0
No.of unovulated follicles	13	15	28	4.0	19	18	37	5.2
Total	19	29	48	6.9	28	30	58	8.2

C.L. Corpora Lutea R.O. - Right Ovary L.O. - Left Ovary

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IJAR:12:1:78-80:1991

Production Of Elite Jamunapari Kids By Embryo Transfer Technology

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ABSTRACT

FSH-P (Schering Corp., U.S.A.) in descending divided doses for 4 days at 12 h interval was used to supervulate 5 elite Jamunapari donor goats. The embryos were collected surgically from donor goats 72 h post-onset of oestrus. Two to three embryos (4-C to 12-C stage) per doe were transferred ipsilateral to corpus luteum (CL) in 14 Jakhrana does in which oestrus was synchronized with carboprost tromethamine (PG analogue from Upjohn, UK). Out of 14 recipients, 6 returned to oestrus within 21 days of transfer, oestrus was delayed for more than a month in 2 and remaining 6 were confirmed as pregnant at 60 days and delivered 9 normal kids (4 male, 5 female). Donors on appearance of post operative oestrus were again bred to obtain more elite kids. Three more kids were obtained by natural breeding, increasing the number of kids born from 5 elite Jamunapari does to 12 (kidding rate-240%). Kidding rate in Jamunapari goats under natural breeding is 60%. The kidding rate in elite Jamunapari goats increrased 4 times by using embryo transfer technique. This is an effort to multiply elite goats at faster rate using ET technique.

* * *

Embryo transfer technology (ETT) has been widely used for rapid multiplication of exceptionally high yielding cattle and sheep and other food and fiber producing animals in most developed countries. There are reports of successful embryo transfer in several farm animal species from India also (Agrawal *et.al.*, 1979; Zanwar and Deshpande, 1984; Totey *et.al*, 1988; Mishra *et.al*, 1989). Donors and recipients of same breed are used in most of the embryo transfer work carried out within the country. Information on elite animal production through ETT is meagre. Jamunapari, an important Indian dairy goat breed which is in danger of extinction, needs immediate attention for rapid proliferation. In the present experiment, an effort has been made to increase the number of off springs produced from elite Jamunapari goats (donors) using low milk producing Jakhrana goats as surrogate mothers.

Materials and Methods

Experimental Animals : 5 elite Jamunapari goats as donors and 14 low milk producing Jakhrana goats as recipients were used in the present experiment. They belonged to the Experimental Farm of the Institute.

Superovulation : FSH-P (15 mg, Schering Corp., USA) in descending divided doses for 4 consecutive days at 12 h interval was administered to superovulate the donor goats. Oestrus in recipients was synchronized with Carboprost tromethamine (A PG analogue from Upjohn, UK). On appearance of oestrus the donors were hand mated using superior sires, whereas recipients during oestrus were left empty.

Laparotomy: 24 h fasting goats were subjected to laparotomy under sedation induced by I/V injection of triflupromazine hydrochloride (Siquil, 40 mg/ml). Intraval sodium (10 mg/kg body wt) and Xylocaine 2% were used as general and local anaesthetics respectively. The genital organs were exposed by midline incision (3"-4") made ventral to pelvic cavity and slightly anterior to the mammary gland. The observations on the ovaries for ovulation sites and collection of embryos from the donor and transfer into the recipients were made through this opening. The peritoneal edges and the abdominal muscles were sutured (continuous) with chromic cadgut (size, 1.0). The skin edges were sutured (holstead) with cotton thread. Furacin powder was sprinkled profusely while suturing each layer of tissues. Post-operative care was given for about a week in separate cubicles. Parenteral treatment with Albercilin (Ampicilin Sodium, Hoechst) and local dressing with Furacin ointment (Nitro-furazone) was used for 4 days.

Embryo Collection and Transfer Technique: The procedure used for embryo collection and transfer was as per Agrawal *et.al.* (1982) with minor modifications. A micropipette (50 µl) was used for transfer of embryos. Collections from donors and transfers to recipients were done 72 h from onset of oestrus. Dulbecco's PBS (Himedia) enriched with goat serum was used as flushing and transfer medium. 2 to 3 embryos (4-C to 12-C stage) per doe were transferred to uterine cornua ipsilateral to CL.

Post-operative Observations: Pregnancy in recipients was monitored using ultrasonic pregnancy detector. Donors on appearance of post operative oestrus were again bred to obtain more elite kids.

Results and Discussion

Thirty six morphologically normal embryos collected from elite Jamunapari goats were transferred surgically in 14 recipient goats (2-3 embryos/goat). The developmental stages of the transferred embryos ranged from 4-C to 12-C. However, majority of transferred embryos were 8-C stage.

Out of 14 recipients, 6 returned to oestrus within 21 days of transfer. Oestrus was delayed for more than a month in two and remaining six (43%) were confirmed pregnant at 60 days by ultrasonic pregnancy detector and delivered 9 normal (4 male, 5 female) kids (Fig. 1). Three more kids were obtained by natural breeding of donor goats (after embryo collection), increasing the number of kids born from 5 elite Jamunapari does to 12 (kidding rate-240%). Kidding rate in Jamunapari goats under natural breeding is 60% (Anon, 1986, 1987)

Elite Jamunapari kids produced by embryo transfer

In the present experiment using embryo transfer technique as a breeding tool, the kidding rate in elite Jamunapari goats increased 4 times vis-a-vis conventional breeding

technique. This is an effort to multiply elite Jamunapari goats at faster rate using low milk producing Jakhrana goats as surrogate mothers. There is possibility to further improve the prolificacy of elite Jamunapari goats 10-15 folds, using non-surgical embryo collection which has already been standardized in the laboratory.

Acknowledgement

The authors thank Dr. N.K. Bhattacharya, Director of the Institute for providing necessary facilities.

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IJAR:12:1:80-82:1991

Histomorphological Changes In The Reproductive Organs Of Superovulated Prepubertal Goats

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Superovulation has been carried out extensively for the purpose of obtaining large number of ova in embryo transfer by various combinations of hormonal treatments (Agrawal, 1986; Indra Mani and Vadnere, 1989). The present investigation was aimed at finding the various histomorphological changes in the reproductive tract by the administration of hormones for superovulation in prepubertal goats.

Material and Methods

The tissues from ovaries, oviducts and uteri were collected and preserved in 10% buffered formalin after ovario-hysterectomy of ten prepubertal goats (2-4 months of age) following their superovulation priming with progesterone @ 10 mg IM.

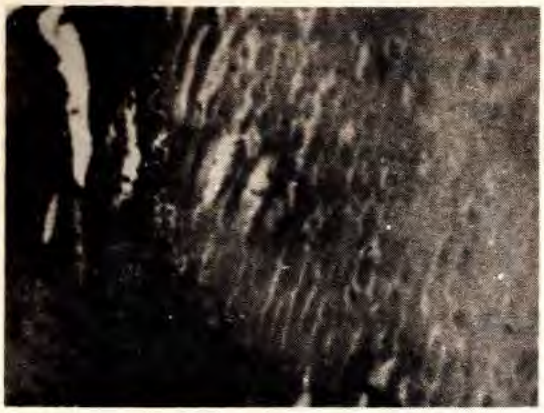

Fig. 1 : Photomicrograph of the ovary of superovulated prepubertal goat showing corpus haemorrhagicum H & E. X 70.

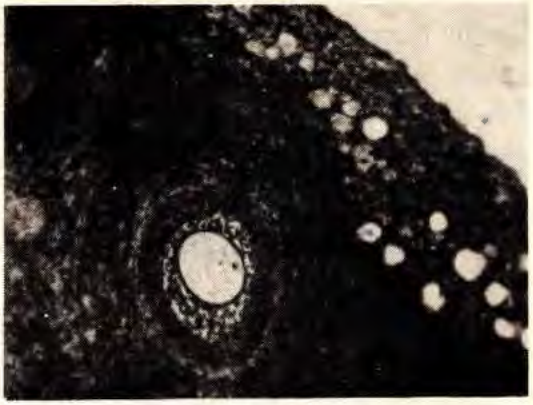

Fig. 2 : Photomicrograph of the ovary of a prepubertal control goat showing numerous primordial follicles and a growing follicle. H & E. X 70.

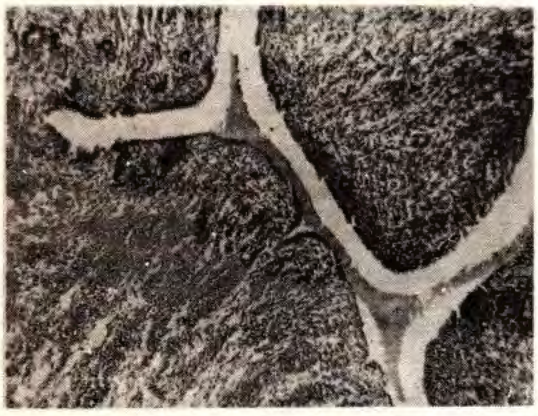

Fig. 3 : Photomicrograph of the uterus of a prepubertal control goat showing less developed uterine glands. H & E. X 70.

Fig. 4 : Photomicrograph of the uterus of a treated goat showing well developed uterine glands. H & E. X 70.

for 7 days followed by 2 doses of PMSG @ 750 IU, IM. 24 hours apart and 2 doses of HCG @ 1000 IU, IV. on the day of oestrus and one day later. The tissues from five non-treated prepubertal goats constituted the control samples. The tissues were then processed by the standard paraffin embedding technique and stained with haematoxylin and eosin.

Histo-morphological studies of the ovaries revealed a number of mature follicles, extensive corpora haemorrhagica and luteal tissues in the ovaries of treated goats (Fig. 1) suggesting hyperactivity, while the ovaries of control goats exhibited several growing and atretic follicles (Fig. 2). Similar observations were also reported by Singh and Madan (1987) in hormone induced prepubertal lambs.

The mucosal folds of the oviducts were highly branched and larger in the treated goats, which may be due to the higher amount of estrogen secreted by the growing follicles as reported by Ramachandraiah *et.al.* (1986) in estrus goats.

The uterine glands which were few with smaller acini in control goats (Fig.3) became numerous, enlarged, coiled and branched with large acini spread over the entire endometrium in the treated goats (Fig.4). This was in conformity with the findings of Singh and Madan (1987) in lambs. The thickness of the endometrium increased significantly in superovulated goat ($P < 0.01$).

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IJAR:12:1:82-84:1991

A Note On Serum Cholesterol Level In Muzaffarnagri Sheep During Different Seasons

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Conversion of cholesterol to androgens including testosterone was demonstrated in testis, ovaries, adrenals, placenta and submaxillary gland directly and via progesterone pathways (Srere *et al.*,1950; Brady, 1951; Landon and Greenberg, 1954; Slien white and Samuel, 1956; Lynn, 1956; Morris and Chaikoff, 1959; Fevold and Eik-Nes, 1961; Jungmann, 1968; Johnson *et al.*, 1969). Seasonal variations in the serum levels of circulating cholesterol are therefore likely to influence the magnitude of steroidogenesis and reproductive performance of the animals.

Material and Methods.

140 sexually mature and normal Muzaffarnagri ewes of different age groups in various reproductive phases were

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used for the present study. All the ewes were kept on identical ration, managemental conditions and normal environment prevailing at Bareilly (India).

Cholesterol was estimated as per Zak(1957) and Wooton(1964) from the supernatent clear serum obtained from 20 ml of blood collected from the Jugular veins of ewes during different seasons. More than 4-5 samples were taken from each ewe in each season. 1697 samples were studied.

Four seasons were covered thus :

(1) Hot dry 15th April-15 June
(2) Humid Hot 15th June-15th September
(3) Temperate 15th Sept.-15th November and Ist March-15th April.
(4) Cold 15th November-February end.

The data analysis was carried out as per Duncan (1955), Snedecor and Cochran (1968) and Searle (1971).

Result and Discussions

The average cholesterol level in season 1,2,3 and 4 was 197.58 ± 1.68, 190.29 ± 1.85, 204.13 ± 1.01 and 209.00 ± 3.55 mg/100ml of serum respectively (Table 1). Analysis of variance (Table 2) revealed that the serum cholesterol level differed significantly ($p < 0.01$) among 4 seasons. Further analysis with application of Duncan's multiple range test indicated that the serum cholesterol in season 2 was significantly less than that in season 3 and 4, but no significant difference was observed between season 1 and 2, and among 1,3 and 4 seasons. It was noted that the concentration of cholesterol in serum was maximum in season 4 followed

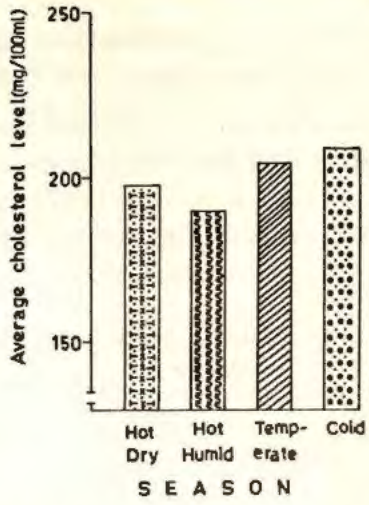

Fig. 1 : Average cholesterol values in different seasons in sheep

by seasons 3,1 and 2 respectively (Fig.1). The higher cholesterol values observed during colder season in the present study does not indicate any degree of stress experienced by Muzaffarnagri sheep during winter season. The sexual activity in native sheep is not so prominent in winter as compared to hot season in tropics (Sahni and Roy, 1967). Generally the non-seasonal nature of sexual activity in sheep in tropics is also reflected in marginal fluctuations in cholesterol level in different seasons. However, the sheep in our study were maintained under stall fed and protected conditions as compared to grazing sheep of semi-arid zone (Sahni and Roy, 1967). Serum cholesterol levels in general have been reported to decrease when the animals are under stress. Present result showing lower levels of serum cholesterol during hot dry and hot humid climatic conditions indicates that summer months are more stressful for sheep.

The response of serum cholesterol to summer and winter seasons in case of cattle (Jersey and Red Dane) was observed to be

reverse by Sinha *et al.*,(1981) and not significant in lactating cows (Kweon *et al.* 1986).

This peculiarity in case of sheep is also supported by the fact that reproductive performance of this species is better in temperate and winter than in summer months. Higher levels of circulating cholesterol during this period could thus be useful in the process of steroidogenesis essential for reproductive functions. Lamond *et al.*,(1972) also reported that the average plasma progesterone concentration for ewes was higher in autumn than in summer.

Table. 1 : Averages and standards errors of serum cholesterol (mg/100 ml) during different seasons in Muzaffarnagri sheep.

Season			
1	2	3	4
197.58^{ab}	190.29^{a}	204.13^{b}	209.00^{b}
±	±	±	±
1.68	1.85	1.01	3.35

Means with the common letter are not significantly different from each other at 5% level.

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IJAR:12:1:85-86:1991

Effect Of Varying Intensity Of Ambient Temperature And Light On The Libido Of Nali, Corriedale And Crossbred Rams

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Rams exhibit little or no sexual interest in ewes for several weeks during summer (McKenzie and Berliner, 1937; Hafez and Scott, 1962). Seasonal breeding behaviour in sheer is due to photoperiodic effect (Hafez 1962) with breed variation (Lindsay, 1969). Shukla and Bhattacharya(1952) reported that there was no effect of season on sexual activity of Indian sheep breeds. Indigenous ewes show oestrus activity after monsoon rains of June (Tyagi and Lavania, 1969), but during that period Corriedale rams at Hissar showed little or no sexual drive. This study was therefore designed.

Material and Methods

In July, 1974 at Central Sheep Breeding Farm, Hissar a group of two teeth age, 10 imported Australian Corriedale rams, 5 Nali rams and 10 Crossbred (Nali x Corriedale) rams with previous history of excellent libido were exposed thrice to ewes in heat at 14.30 to 15.30 hrs. The ambient temperature was 40°, 41°, 42° and 45° C. Reaction time and ejaculation time were recorded. The time from entry of the ram to the collection area until first mount over the ewe was recorded as reaction time, and the time after first mount until ejaculation of semen in the A.V., as ejaculation time.

Results and Discussion

It was found from the study that breed had highly significant effect on both reaction time and ejaculation time ($P < 0.01$). At 45°C temperature, the Nali and Corriedale rams had 17 and 1,050 seconds of reaction time, respectively. The Corriedale rams had no ejaculation but Nali rams showed ejaculation time of 20 seconds, whereas the crossbred rams had reaction and ejaculation time of 31 and 50 seconds respectively.

With the increase in temperature beyond 40°C, the Corriedale rams showed increased duration of both reaction and ejaculation time; at 45°C, 75% of the rams had complete loss of sexual drive. Tiwari and Sahni (1974) had showed that 57% of Rambouillet rams between 2 to 3 years age group in Rajasthan had no sexual drive. According to Lindsay (1969) Merino rams maintained sexual activity at 43°C but Dorset Horn and Leicester rams did not. The intermediate behaviour of Corriedales may be due to their ancestry to Merino and Leicester.

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In order to maintain fertility and eliminate residual effects due to high ambient temperature of summer, a group of Corriedale rams were housed indoors during day time in an air-conditioned shed at 25-30°C, before onset of summer. The rams remained in darkness from 11.00 to 17.00 hrs in the shed. Daily ten Corriedale rams with proper sire caryon colours were joined to a flock of 480 Corriedale ewes which were mustered in a corner of the paddock at 18.30 hrs daily from July to October 1973. The night temperature ranged between 24-29°C.

To another group of 480 Corriedale ewes, 1% of aproned Nali and Crossbred rams were joined daily at 7.30 hrs and 17.00 hrs for an hour each time during the same period for detecting ewes in heat. During this period, the Nali and Crossbred ram group and Corriedale ram groups detected 797 and 765 ewes in heat. The ewes detected in heat in both the breed group of rams, were non-significant ($P > 0.5$). The improved performance of Corriedale rams may be due to reduced temperature of both day and night and reduced length of day light exposure due to housing in closed airconditioned sheds. Moule (1950) had reported similar results of excellent sexual drive among rams under reduced light group vis-a-vis rams kept in long day length. Thus it is concluded that under village conditons the exotic rams can be better used for breeding indigenous ewes by underground housing systems during hot days.

Acknowledgement

The authors are most grateful to Late Dr. A.K. Basuthakur, former Director, Central Sheep Breeding Farm, Hissar, for his guidance, encouragement and facilities provided to complete this work.

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IJAR:12:1:87-90:1991

Post Thaw Keeping Quality Of Frozen Buffalo Bull Semen Maintained At Room/Chilled Temperature*.

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ABSTRACT

Post thaw (PT) keeping quality (KQ) of frozen buffalo bull semen maintained at room/chilled temperature was studied to suggest a modified and convenient method of thawing of frozen semen for inseminating under field conditions. 160 freeze thawed straws of buffalo bull semen were studied for various seminal attributes.

The average post thaw progressive motile percentage after thawing at (i) room temp. (30°C for 30 secs) and (ii) chilled temp. (5° C for 5 mts) was 57.23 ± 2.05% and 55.02 ± 1.80% at 0 minutes; 51.49 ± 2.45% and 53.62 ± 1.05% at 30 mts; 52.13 ± 1.79% and 48.61 ± 2.28% at 60 mts. and 46.60 ± 2.03% and 45.62 ± 2.60% at 120 mts.

The average PT live sperm percentage for room and chilled temperature was 60.76 ± 0.68% and 57.64 ± 0.78% at 0 mt; 56.84 ± 1.06% and 51.77 ± 0.92% at 30 mts; 52.45 ± 1.42% and 52.89 ± 1.22% at 60 mts. and 51.34 ± 1.60% and 47.16 ± 1.11% at 120 mts respectively.

The average PT values of Acrosome damage percentage for room and chilled temperature were 31.52 ± 0.72% and 30.05 ± 0.55% at 0 mt.; 28.90 ± 0.55% and 32.44 ± 0.98% at 30 mts.; 32.16 ± 0.52% and 36.25 ± 1.03% at 60 mts. and 34.10 ± 0.67% and 38.10 ± 0.74% at 120 mts.

Fertility trials on 24 buffaloes resulted in pregnancy rate of 33.3% for 30 mts. storage at room temperature (R.T.), whereas all other results for two methods and four timing periods were negative. There was significant difference ($P < 0.05$) of progressive motile percentage between four timing periods which limits the use of frozen thawed buffalo bull semen at room/chilled temperature up to a period of 30 mts.

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It is essential to obtain maximum spermatozoal survival after freezing and thawing of straws but how rapidly the straws must be thawed for successful fertilization is uncertain. Various methods of thawing temperatures ranging from 20°C to 48°C have been tried. (Shetti, 1979; Puneet Kumar and Sharma, 1985).

Present studies were undertaken to suggest a modified and convenient method of thawing frozen semen and its best post-thaw keeping quality (PTKQ) up to insemination, under field conditions.

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* Part of M.V.Sc. thesis submitted by first author to Konkan Krishi Vidyapeeth, Dapoli.

Materials and Methods.

In all, 20 ejaculates from four buffalo bulls (2 Murrah and 2 Surti), 5 ejaculates each were studied for various seminal characters. Dilution was done with Tris egg yolk glycerol (6%) dilutor, with freezing and preservation in LN_2 as per standard technique.

160 freeze thawed straws of buffalo bull semen were studied in details for various seminal attributes viz. Progressive motile percentage, live sperm percentage and Acrosome damage percentage in respect of revival rates for two thawing temperatures: (1) Room Temperature (R.T.), 30°C for 30 secs. and (2) Chilled Temperature (CT), 5°C for 5 mts. and four timing periods of 0, 30, 60 and 120 minutes.

Analysis of variance done by Randomised Block Design (RBD) method and Critical Difference (C.D.) as per Snedecor and Cochran (1959).

Results and Discussion.

PTKQ of buffalo bull semen maintained at room/chilled temp. was as under (Table 1) :

(i) *Progressive motile percentage* after thawing at room and chilled temperature for four timing periods was 57.23 ± 2.05% and 55.02 ± 1.80% for 0 mt; 51.49 ± 2.45% and 53.62 ± 1.05% for 30 mts; 52.13 ± 1.79 and 48.61 ± 2.28% for 60 mts. and 46.60 ± 2.03% and 45.62 ± 2.60% for 120 mts.

The overall means for progressive motile percentage were 51.86 ± 1.82% and 50.57 ± 1.42% for room and chilled temperature respectively. There was no significant difference between two thawing methods but the values differed significantly ($p < 0.05$) between four timing periods, which shows that the progressive motile percentage goes on decreasing as the time of storage increases beyond 30 minutes.

Shetti (1979) found 42.97 ± 1.04% progressive motility after thawing at 37 °C for 30 seconds. These values are slightly less than the present values of 51.86 ± 1.82%. However, the present value of 50.57 ± 1.42% agrees with 58.91 ± 1.33% found by Patil (1981) at 5°C in Tris diluted semen. Phalak (1985) found 49.32 ± 1.24% progressive motile sperms after thawing the frozen semen at +37°C for 30 seconds which is in agreement with the present findings.

(ii) *Live sperm percentage* after thawing at room and chilled temperature for four timing periods was 60.67 ± 0.68% and 57.64 ± 0.78% for 0 mt.; 56.84 ± 1.06% and 51.77 ± 0.92% for 30 mt.; 52.45 ± 1.42% and 52.89 ± 1.22% for 60 mts. and 51.34 ± 1.60% and 47.16 ± 1.11% for 120 mts.

The overall means for live percent in this study were 55.35 ± 1.28 and 52.36 ± 1.47% for room and chilled temperature respectively. There was no significant difference of mean live sperm percentage between two thawing methods and between four timing periods, which shows that both the methods prove similar for this character.

Puneet Kumar and Sharma (1985) found encouraging results in the buffalo bull semen extended in Tris dilutor, frozen and thawed at ± 40°C for 30 secs.

(iii) *Acrosome damage percentage* after thawing, at room and chilled temperature for four timing periods was 31.52 ± 0.72% and 30.05 ± 0.55% for 0 mt.; 28.90 ± 0.55% and 32.44 ± 0.98% for 30 mts; 32.16 ± 0.52% and 36.25 ± 1.03% for 60 mts and 34.10 ± 0.67% and 38.10 ± 0.74% for 120 mts.

The overall mean percentage in this experiment was 31.65 ± 0.6% and 34.21 ± 1.28% for room and chilled temperature respectively. There was no significant difference between these two thawing methods as well as between four timing periods, clearly indicating that both these methods are similar in keeping quality regarding acrosome damage. Patil (1981) found 38.47 ± 0.87% acrosome damage in Tris diluted frozen semen thawed at 30°C for 30 secs., which is slightly higher than the present value of 31.65 ± 0.6%. Narasimharao *et al* (1989) found 44.5% acrosome damage after thawing at +37°C which is on the higher side.

(iv) *Fertility trials* for these two methods of thawing and four timing periods were under taken. Three buffaloes each were inseminated by using semen thawed by each method, and each timing period. Total 24 buffaloes were inseminated. These buffaloes were gynaeco-clinically examined for pregnancy diagnosis after 8 weeks of insemination. The pregnancy rate was 33.3% for 30 mts. of storage at room temperature, whereas all other results for two methods and four timing periods were negative. This pregnancy rate is lower than 50.9% reported by Suryaprakasan *et al* (1985) and 43 to 47% reported by Bhavsar *et al* (1989). Further extensive trials under field conditions are necessary.

This study clearly indicates that motility is hampered in both thawing methods (RT and CT) after the storage of buffalo bull semen for 30 minutes.

Acknowledgements

The authors are thankful to the authorities of Development Corporation of Konkan Ltd. and Dairy Development Department, M.S., Bombay for providing the facilities for conducting this study.

Table 1 : Comparison of means of progressive motile %, Live sperm % and acrosome damage % of buffalo bull spermatozoa in two thawing temperatures and four timing periods (minutes).

Sr.	Parameters	Av. % of spermatozoa after thawing at							
		30°C for 30 sec. (Room)				5°C for 5 mins. (Chilled)			
		0	30	60	120	0	30	60	120
1.	Progressive motile %	57.23 ± 2.05	51.49 ± 2.45	52.13 ± 1.79	46.60 ± 2.03	55.02 ± 1.80	53.62 ± 1.05	48.61 ± 2.28	45.62 ± 2.60
2.	Live sperm %	60.76 ± 0.68	56.84 ± 1.06	52.45 ± 1.42	51.34 ± 1.60	57.64 ± 0.78	51.77 ± 0.92	52.89 ± 1.22	47.16 ± 1.11
3.	Acrosome damage %	31.52 ± 0.72	28.90 ± 0.55	32.16 ± 0.52	34.10 ± 0.67	30.05 ± 0.55	32.44 ± 0.98	36.25 ± 1.03	38.10 ± 0.74

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IJAR:12:1:90-91:1991

Physico-Morphological And Biochemical Characteristics Of Semen Of Hampshire And Crossbred Boars*

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ABSTRACT

The study on the Physico-morphological and biochemical semen characteristics of 4 Hampshire and 4 Crossbred boars revealed highly significant difference ($P < 0.01$) in gel mass and filtered volume of semen and significant difference ($P < 0.05$) in total volume and initial fructose content of semen between the breeds. There was no significant difference in sperm abnormalities, GOT, GPT, acid phosphatase and alkaline phosphatase activities between Hampshire and crossbred boar semen.

* * *

There is a high degree of relationship between the fertility and various characteristics of semen. Perusal of available literature reveals scanty reports (Sreekumaran and Raja, 1976; Tamuli, 1982) on the characteristics of boar semen in India. The present work was undertaken to study the varioys physico-morphological and biochemical characsteristics of Hampshire and crossbred boar semen.

Materials and Methods

A total of 64 ejaculates comprising 8 from each of the 4 Hampshire and 4 crossbred (Hampshire x local) boars, aged 9 to 12 months, were collected by simple fist method. The various physico-morphological characteristics were estimated as per the technique followed by Tamuli (1982).

* A part of M.V.Sc. thesis submitted to Assam Agril. University by the first author.

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Initial fructose was estimated following the method of Mann (1964). The GOT and GPT activities (Reitman and Frankel, 1957) and acid phosphatase and alkaline phosphatase activities (Kind and King, 1954 were estimated using Span diagnostic kits. The data were analysed as per Snedecor and Cochran (1967).

Results and Discussion

The mean values of gel mass, filtered volume, total volume of semen, progressively motile sperm, live spermatozoa and concentration of spermatozoa were 33.75 ±2.53 ml, 156.71 ± 9.65 ml, 191.65 ± 11.84 ml, 78.98 ± 0.70%, 90.58 ± 0.70% and 239.33 ± 17.55 million per ml respectively, in Hampshire and 20.81 ± 1.04 ml, 107.31 ± 5.46 ml, 129.41 ± 6.42 ml, 81.63 ± 1.30 %, 90.77 ± 0.46% and 257.92 ± 13.32 million per ml respectively, in crossbred boars. There were highly significant differences ($P < 0.01$) in gel mass and filtered volume of semen and significant differences ($P < 0.05$) in total volume of semen between Hampshire and crossbred boars. These findings are comparable with those recorded by Sreekumaran and Raja (1976) and Ostapchuk and Revenko (1986).

The mean percentages of head, midpiece, tail and acrosomal abnormalities were 2.00 ± 0.29, 17.70 ± 1.85, 3.08 ± 0.45, 3.03 ± 0.28 respectively, in Hampshire and 1.34 ± 0.21, 11.15 ± 1.27, 3.33 ± 0.51, 3.35 ± 0.31 respectively, in crossbred boars. There was no significant difference in abnormalities of spermatozoa between Hampshire and crossbred boars. This finding corroborates with that of Sreekumaran and Raja (1976) and Tamuli (1982).

The mean initial fructose content, GOT, GPT, acid phosphatase and alkaline phosphatase activities were 17.79 ± 1.27 mg/100 ml, 10.13 ± 1.12 units/ml, 3.47 ± 0.87 units/ml, 30.23 ± 3.69 KA units/dl and 284.41 ± 28.79 KA units/dl respectively, in Hampshire and 11.57 ± 1.42 mg/100 ml, 10.76 ± 1.99 units/ml, 4.41 ± 0.80 units/ml, 39.16 ± 3.11 KA units/dl and 350.98 ± 26.25 KA units/dl respectively in crossbred boars. There was significant difference in initial fructose content between Hampshire and crossbred boars. The biochemical findings were comparable with those of Mann (1964) and Sreekumaran and Raja (1977).

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SHORT COMMUNICATIONS

IJAR:12:1:92-93:1991

A Note On Clinico-Haematological Changes In Normal Cyclic, Anoestrus And Repeat Breeding Buffaloes.

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Two important factors for reduced fertility in buffaloes are the longer anoestrus period and repeat breeding. In rural conditions where animal management, particularly the feeding practices are not given much importance, such reproductive disorders have been found to be quite common. Present study deals with the clinical and blood cellular changes of nondescript rural buffaloes with anoestrus and repeat breeding problem.

Material and Methods

The study was conducted on 35 nondescript rural buffaloes brought to O.R.P. Centre (IVRI, Izatnagar) either for insemination or for anoestrus and repeat breeding problems. Detailed history was obtained, clinical and behavioral symptoms noted and the buffaloes gynaeco-clinically examined to ascertain the status of genital organs. Accordingly, the animals were grouped as normal cyclic, anoestrus and repeat breeders. Ten normal cyclic buffaloes exhibited oestrus with presence of a mature graafian follicle, tonic uterus and open os. 14 Anoestrus animals did not show any sign of oestrus since past 8 to 10 months and had smooth, inactive ovaries and flaccid uterus. 11 buffaloes which did not conceive even after 4-5 inseminations/natural service with fertile semen, in subsequent oestrus cycle were grouped as repeat breeders. The length of oestrus cycle was normal (19-22 days).

Blood collected aspetically from jugular vein, was used for estimation of total erythrocyte count (TEC), Haemoglobin (Hb), packed cell volume (PCV), total leucocyte count (TLC), differential leucocyte count (DLC) and erythrocyte sedimentation rate (ESR) as per methods described by Schalm *et.al.* (1975). Haematological indices, mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular volume (MCV) were calculated. The data were statistically analysed (Snedecor and Cochran, 1967).

Results and Discussion

Significant lower values of TEC, Hb and PCV were observed in anoestrus and repeat breeder buffaloes. These values were TEC : 6.87 ± 0.83, 5.13 ± 0.82, and 5.16 ± 0.78 x 10^6/cmm; Hb : 12.02 ± 1.18, 9.03 ± 1.29 and 9.13 ± 1.22 gm% and PCV 38.12 ± 5.64, 28.98 ± 4.13 and 31.03 ± 5.25 in

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normal cyclic, anoestrus and repeat breeder group, respectively. This indicated anaemic changes in anoestrus and repeat breeder buffaloes, resulting in reproductive disorders. Similar anaemic changes in anoestrus and repeat breeding animals have been reported (Sharma *et.al*, 1983; Kumar *et.al*, 1984) MCH and MCHC values did not differ in anoestrus and repeat breeder buffaloes from that of normal cyclic buffaloes. The MCV value increased significantly in anoestrus and repeat breeder compared to normal cyclic group. Anaemic changes with increased MCV value are normally observed in haemolytic anaemia and in the present study, it might be due to sub-clinical blood protozoan infection. Dwivedi *et.al.* (1979) and Mallick *et.al.* (1983) have reported prevalence of babesiosis in the buffaloes of this area.

TLC was 6.18 ± 0.72, 9.57 ± 1.47 and 8.61 ± 1.21 x 10^3/cmm in the normal cyclic, anoestrus and repeat breeder buffaloes. Highly significant increase in TLC of anoestrus and repeat breeder buffaloes with a pattern of neutrophilia and lymphopenia was observed. No significant change was observed in eosinophil, monocyte and basophil percentage and clotting time of blood in all the three groups of buffaloes studied.

Acknowledgements

The authors are thankful to Director and Joint Director (Ext. Edn.) IVRI, for providing facilities to conduct this study.

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IJAR:12:1:94-95:1991

Artificial Induction Of Lactation In Dairy Cows

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ABSTRACT

Lactation was induced in three infertile cows, but the production potential was not upto the mark as observed in cows following normal parturition.

* * *

Artificial induction of lactation in infertile cows has been experimented with varied success (Maurya, 1980; Nowshahri and Maurya, 1983 and Fleming, and Head, 1986). Information on its success in Arid Zone area is scarce, which prompted us to undertake this study.

Materials and Methods

Three cows (2 Red-Dane cross-bred and 1 Rathi) stationed at Rathi bull-farm, Urmul Dairy, Bikaner were included in this study for artificial induction of lactation. All the three cows had failed to conceive inspite of all efforts, after their fourth lactation and were dry since last two years.

The animals were administered stilboestrol (Vetoestrol M & B, Bombay.) @ 30 mg S/C daily for 3 days, followed by 20 mg I.M. injection daily for another 6 days. Simul taneously, Hydroxyprogesterone acetate (Proluton Depot, German Remedies Bombay.) 250 mg I.M. was given daily for 7 days. After the 9th day of treatment, 5 contraceptive pills containing Norethisterone 1 mg and Ethinyl estradiol 30 mg per tablet (MALA-N, IDPL, Gurgaon.) were fed daily so as to maintain estrogen concentration in the blood. Dexamethasone (Dexona, CADILA, Ahmedabad) 40 mg I.M. was injected daily from day 11 to 15. The udder and teats were massaged daily till the flow of milk started.

Results and Discussion

It was noticed that the ductular mammary tissue developed gradually till the 8th day and then faster till day 11, when on milking, watery fluid started coming out, which turned milky in appearance after administration of dexamethasone. The initial milk yield was nearly 1/2-1 litre per milking, but it gradually increased to 3-3.5 litres. This quantity was more or less maintained in all the cows for nearly six months, after which one cow died. Other two cows remained in milk for another 8-10 months, but the milk yield was only 1/2 litre per milking. After the induction of lactation, initially the milk was of unpleasant odour, taste and it curdled on boiling and due to the probability of steroid secretion in the milk, it was not used for human consumption. However, after nearly 20 days the flavour and taste of the milk improved, the curdling disappeared and it was fit for consumption. The total cost of induced lactation was approximately Rs. 400/- per cow.

Although lactation was successfully induced the milk production potential was low and not upto the mark. However the treatment helped to boost the economy of the producer when we take into account the losses due to non-production. Extensive trials on a large scale with thorough experimentation are essential before it could be used extensively to boost up milk production in infertile animals of the arid tract.

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IJAR:12:1:95-96:1991

Cytometry Of Buck Spermatozoa

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The cytometrical measurements of buck spermatozoa are reported by Keshavreddy (1983) in Non-Descript bucks and Majid *et.al.* (1980) in crossbred bucks. The present study was conducted to record the cytometrical measurements of Osmanabadi and crossbred buck spermatozoa.

Material and Methods

Present study was conducted on 4 Osmanabadi, 2 Beetal x Osmanabadi, 2 Alpine x Osmanabadi, 2 Saanen x Osmanabadi bucks from Goat Research Unit, MAU, Parbhani. The bucks were mature and clinically normal, of 1.5 to 5 years age. Semen was collected by A.V. method twice in a week for two months. Slides were prepared from fresh semen and stained with Eosin and Nigrosin dyes and observed under oil immer sion lens. Unstained straight spermatozoa being normal and live, were measured with eye piece micrometre. Length and width of head, mid-piece and tail length of spermatozoa was recorded.

Results and discussion

Present findings (Table 1) are in approximation with Keshavereddy (1983) who reported head length, head width, mid piece length, tail length and total length of non-descript bucks spermatozoa as 8.43, 4.41 11.83, 37.83, 58.28 microns respectively. Similar findings are also reported by Majid *et.al.* (1986) in Black Bengal bucks: head length, head width, tail length and total length recorded 8.45, 4.39, 47.35 and 56.29 microns respectively. Highly significant difference was observed within the breeds and individuals for the cytometric parameters.

Table 1 : Breedwise cytometric measurements (microns) of Buck spermatozoa

Sr. No.	Breed	Head length	Head width	Mid piece length	Tail length	Total length	Head area (Sq.m.)	Mid piece area (Sq.m)
1.	Osmanabadi (96)	9.11 ± 0.023	4.545 ± 0.000	12.924 ± 0.086	36.872 ± 0.209	58.797 ± 0.109	40.955 ± 0.010	9.771 ± 0.063
2.	Beetal x Osmanabadi 50% (48)	8.783 ± 0.088	4.545 ± 0.000	12.719 ± 0.173	37.524 ± 0.251	59.026 ± 0.237	39.948 ± 0.408	9.739 ± 0.157
3.	Alpine x Osmanabadi 50% (48)	8.774 ± 0.067	4.576 ± 0.031	12.751 ± 0.134	37.518 ± 0.238	59.043 ± 0.242	40.212 ± 0.568	9.644 ± 0.136
4.	Saanen x Osmanabadi 50% (24)	8.932 ± 0.120	4.545 ± 0.000	13.508 ± 0.221	32.219 ± 1.345	54.659 ± 1.409	40.679 ± 0.508	10.273 ± 0.175

Figures in brackets are number of observations

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IJAR:12:1:96-97:1991

Morphological Studies On Gravid Uteri Of Deccani Ewe (Ovis aries)*

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A few preliminary works on morphological studies on gravid uteri of sheep have been reported earlier by Joubert (1956) and Shrivastava (1972). More information on the morphology of the gravid uteri of ewe is necessary to improve the reproductive efficiency in this species.

Forty gravid uteri of Deccani ewe were collected from the local abattoir. Observations on the dimensional changes in the gravid uteri revealed a significant difference ($P < 0.01$) between the length of greater and lesser curvatures of gravid and nongravid cornua. Similar observations were reported

* Part of the thesis submitted by the first author to Andhra Pradesh Agricultural University, Hyderabad, in partial fulfilment for M.V.Sc. degree (1988).

by Joubert (1956) and Roberts (1971)

The diameter of the gravid uterine horn increased gradually as the gestation advanced and the difference between the gravid and nongravid horn was significant ($P < 0.01$), similar to the findings of Craig (1959).

Amniotic fluid was found to be clear and watery during early stages of gestation and became thick and viscid as the gestation advanced. The quantity of amniotic fluid was found to increase gradually from 60 ml at day 42 to 450 ml at day 126 of gestation. Subsequently the quantity showed a decreased trend as the gestation advanced and it was 250 ml at day 140 of gestation.

The average number of placentomes in the gravid horn was 41.27 ± 0.95 in comparison to 38.60 ± 0.85 in the nongravid horn with a mean difference of 2.67 which was significant ($P < 0.01$). The placentomes in both the horns were arranged in four rows, two rows each, dorsally and ventrally. More placentomes were observed on the dorsal aspect of the uterus due to the close apposition of increased area of chorio-allantois to the maternal endometrium. The free surface of the maternal caruncle was concave in shape which serves as a firm grip for the fetal membranes. This arrangement helps in reducing the incidence of insecure pregnancies in ewe.

The circumference of the placentomes was increased from 4.5 to 11.0 cm as the foetal age advanced from day 40 to 112 of gestation and then onwards it decreased gradually with the advancement of gestation due to the narrowing and decrease in the thickness of chorionic villi. Similar observation was made by Kelly and Ekstein (1969). Accessory placentomes were not observed in this study and this may help in reducing the incidence of insecure pregnancies in ewe.

A significant negative correlation of 0.91 was observed between the crown-rump (C.R.) length of foetus and the thickness of the wall of gravid uterus, which is in accordance with the report of Jainudeen and Hafez (1987).

There was a significant correlation of 0.99 between the C.R. length age of the foetus. This finding is in tune with the earlier report of Craig (1959).

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CLINICAL ARTICLES

IJAR:12:1:98:1991

Vaginal Obstruction In A Pregnant Holestein Fresian Heifer

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A rare case of vaginal obstruction in a pregnant Holestein Fresian heifer was recorded.

* * *

Case Report

A four years old HF heifer was presented to the Veterinary Polyclinic, Parbhani with history that she has completed the gestation period and is due for parturition. Rupture of both the water bags was noticed by the owner, but even after a lapse of 14 hours, animal failed to calve.

P.R. examination of the animal revealed that foetal parts were available in the birth canal. However there was absence of fremitus. On P.V. examination, operator's hand got obstructed in vaginal passage due to the presence of a vertical thick fibrous band. The vaginal passage was divided by the fibrous band into two halves. During manual handling, the band got ruptured and further examination was possible. Cervix was dilated and with slight assistance the animal delivered a still born male calf. It was a full term male calf without any anomalies.

IJAR:12:1:98-101:1991

Spontaneous Rupture Of Vagina In Buffalo Heifers

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Vaginal wall can rupture while handling dystocia in bovines due to faulty obstetrical technique. Extrusion of intestines through the ruptured vaginal wall has been reported in sheep (Harris, 1961; Watt, 1961 and White, 1961). The present communication puts on record two cases of spontaneous rupture of vagina in buffalo heifers

Fig. 1. Herniation of pregnant horn through vaginal tear at the time of parturition.
C - Cervix P - Pregnant Horn V - Vaginal wall.

presented in the specialised unit of P.A.U. Veterinary Clinics, Ludhiana. In one case, the pregnant uterus at full term herniated through the ruptured vagina, while in the second, post-partum extrusion of the involuting uterus, intestines and urinary bladder occurred. Both the animals had history of chronic ante-partum vaginal prolapse and were dull, depressed and recumbent with sunken eyes.

Case 1 : A four year old buffalo-heifer in full term showed labour pains the previous night resulting in partial protrusion of the intact uterus. Both, the cervix which was two fingers open and the pregnant uterus, protruded out of vulva (Fig.1). Vaginal exploration revealed a tear about 25 cm long in the dorso-lateral vaginal wall, through which the pregnant horn herniated. The animal was treated for shock with Prednisolone acetate (200 mg) and bleeding uterine vessels crushed. As foetal fluids and two foetal limbs were palpable, 'external hysterotomy' was performed and a dead female calf was extracted after correction of the retained head. Loosely attached foetal membranes were removed and 4 Furea (Nitrofurazone-60 mg, Urea-6.09/bolus-Eskayef Ltd., Bangalore) bolus were placed in the uterus before suturing it. The herniating uterus was replaced in the abdominal cavity and vaginal wall sutured with chromic gut No. 3 using Cushing pattern. The prolapsed part of cervix and vagina was replaced in the pelvic cavity.

Case 2 : In a buffalo heifer of three years age, parturition as well as expulsion of the foetal membranes occurred normally four days back. But a day prior to its presentation in the clinics, both the pregnant and non pregnant horns along with the intestinal loops prolapsed through the vulva lips (Fig.2). Careful exploration revealed a tear on the left dorso-lateral vaginal wall, through which serosal surfaces of pregnant and non-pregnant horns together with intestinal loops protruded. Another tear was located on the vaginal floor from where the urinary bladder was herniated. After proper

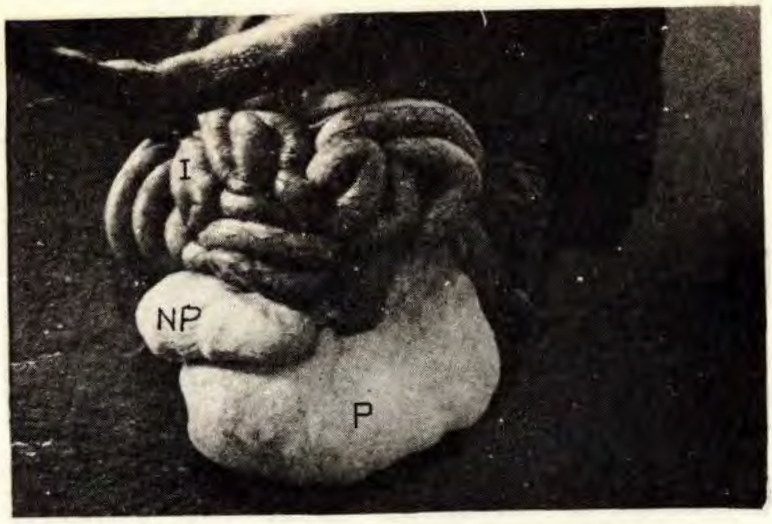

Fig. 2. Post-partum herniation of intestines, pregnant and non-pregnant horns through vaginal tear
C - Cervix I - Intestines NP - Non-pregnant Horn P Pregnant Horn

cleaning and lubrication, the intestinal loops and involuting uterus were replaced aseptically into the abdominal cavity through the dorsal tear. Similarly, the herniated urinary bladder was replaced. Both the tears were sutured with chromic gut No. 3 using continuous pattern. Buhner's sutures were applied on the vulval lips to retain the prolapsing mass. Pre and Post-operative treatment in both the cases was similar and included administration of 40 mg Dexona (Dexamethasone-4mg/ml-Cadila Laboratories, Ahmedabad), 50 ml Terramycin (Oxytetracycline-50mg/ml-Pfizer Ltd., Bombay) 30 ml Novalgin (Analging 0.5g/ml-Hoechst India Ltd., Bombay.) I.M. and 4.0 lit. Dextrose Saline (5%) I.V. Inspite of this treatment, both the animals collapsed.

Discussion : Uterine and abdominal contractions are responsible for the onset of labour pains and expulsion of foetal membranes. Involution of uterus is also governed by uterine contractions, though of low amplitude and frequency. Spontaneous rupture of vagina during advanced gestation has been reported in ewes (Harris, 1961; Sinclair, 1961 and Knottenbelt, 1988) and in buffalo leading to prolapse of urinary bladder (Prabhakar *et.al.*,1988). Both the presented cases had suffered from chronic vaginal prolapse. The resultant inflammatory reaction might have weakened the vaginal wall, rendering it more prone to tear. Excessive tenesums in ewes having vaginal prolapse has been reported to cause rupture of vagina (Roberts, 1971) independent of the degree of vaginal prolapse (Knottenbelt, 1988). In Case 1, erratic myometrial contractions fortified with strong abdominal contractions might have forced the foetal limbs against vaginal wall leading to its rupture with subsequent herniation of the pregnant uterus. Similar case in sheep is reported by

Fox (1962). In case 2, the resultant irritation following tear might have stimulated the abdominal contractions forcing the uterus, intestines and urinary bladder through the tear. However, the exact cause of vaginal rupture and herniation of the visceral organs could not be ascertained in the present cases, as reported earlier in ewes by Knottenbelt (1988). The prognosis in such cases is always poor. Intra-abdominal haemorrhage complicated with shock due to exposure of visceral organs, might be responsible for the death of these animals.

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IJAR:12:1:101-102:1991

Muco-Vagina In A Murrah Buffalo (Bubalus bubalis)- A Clinical Report

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ABSTRACT

Occurrence of mucovagina is reported in a uniparous buffalo. A hand ball size cul-de-sac vaginal distension in cranial part of vagina forming a complete septum dividing vagina into two halves was found. Puncture of septal wall resulted in oozing of clear odourless fluid of oestrual mucus consistency measuring 1,500 ml and negative for pathogenic organisms. Buffalo conceived with insemination following manual removal of vaginal septum.

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History and Clinical Examination : A five year old Murrah buffalo in its first lactation was brought to Veterinary Clinics of the

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University, with the history of repeat breeding following dystocia eight months earlier. Feed and water intake was normal. Oestrous cycle resumed 2 months after calving, but conception failure occurred during last-five successive matings with different fertile buffalo bulls. Rectal examination revealed vaginal distention with normal cervix and uterus and a mature graafian follicle on right ovary. Vaginal distention appeared like a hand ball size cul-de-sac in cranial part of vagina. Vaginoscopy visualised complete septum in vagina dividing it into two halves.

Treatment : Posterior epidural anaesthesia was induced with 7 ml of 2% Lignocain hydrochloride (ASTRA-IDL Ltd., Bangalore), after cleaning the perineal region with 1% potassium permanganate solution and disinfecting with spirit. Sterile gloved and lubricated hand was introduced into the vagina and the index finger penetrated into the septal wall resulting in puncture of septum with oozing of clear odourless fluid of oestrual mucus consistency and measured 1.5 litre in volume. Haemorrhage could not be evidenced from the vaginal septum. Fluid removed from cul-de-sac was found to be negative for microorganisms. Complete removal of the mucus was followed by creation of normal vaginal passage by manually dilating the septal opening. Furacin ointment (Eskayef Ltd., Bangalore) and Xylocain Jelly (ASTRA-IDL Ltd., Bangalore) was applied over the teared septum and the buffalo in standing oestrus was inseminated on the same day, resulting in conception.

Discussion : Segmental aplasia of mullerian duct and persistent hymen predisposes to mucometra and mucovagina in cattle (Nordland, 1956; Roberts, 1971). Imperforate hymen is associated with mucometra and mucovagina and usually ruptured at coitus in heifers. McEntee (1970) observed conception in heifers with thin hymenal dorso-ventral band and reported rupture of hymenal remnants at coitus. In the present report, foetus was delivered by forced extraction. Rupture of vaginal wall due to forced extraction could have resulted in extensive adhesions and malunion, inasmuch as vaginal rupture occurs in foot nape posture and dorso-pubic position of bovine fetus (Arthur *et.al.*, 1982).

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IJAR:12:1:103-104:1991

Consequences Of Progesterone Therapy For Threatened Abortion In A Buffalo

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Regression of CL and fall in plasma progesterone levels precede parturition. Higher doses of exogenous pregesterone lead to prolongation of gestation (First and Lohse, 1984). Whether progesterone therapy can arrest abortion occurring due to brucellosis is not known. This paper records the outcome of progesterone treatment in a buffalo aborting due to brucellosis.

Case Report

A pluriparous 11-month pregnant buffalo with no signs of parturition was presented for check-up. Earlier, she had labour pains at 7 months of gestation, with slight discharge from vagina and let down of milk. A local Vet injected 500 mg progesterone (Proluton Depot, German Remedies Pvt. Ltd., Bombay) to prevent the threatened abortion. The signs of abortion subsided in few hours. Detailed examination now revealed closed cervix with cervical seal intact. The enlarged uterus extended from pelvic to abdominal cavity and was filled with watery fluid. The foetus and cotyledons were not palpable even by lifting the abdomen with the help of a wooden plank. The case was tentatively diagnosed as hydrometra. An i/m injection of 25 mg PGF_2 - Alpha (Lutalyse, Upjohn Ltd., Sussex) was given to induce lysis of CL and evacuate the uterine contents. Venous blood samples were collected before PGF_2-alpha treatment and at the time of delivery of foetus. Serum was separated, sent for brucellosis test and also preserved at - 20°C for RIA of progesterone (Thorneycroft and Stone, 1972).

Loosening of cervix and liquification of cervical seal started 12 hours following PGF_2-alpha treatment. The progressive dilatation of cervix continued and water bags ruptured 48 hours after treatment. A large quantity of green watery fluid was drained out. Further exploration revealed a small dead foetus lying deep into the abdominal cavity. It was delivered by correction and slight traction. The placenta with necrosed and small cotyledons was easily detached and removed manually.

The foetal croup-rump (CR) length was 70 cm. and body weight 20 kg. The serum progesterone level which was 2.00 ng/ml before PGF_2-alpha treatment, declined to 285 pg/ml on removal of the foetus. A strong antibody titre (1:320) against brucellosis, was recorded. These findings suggested that the foetus died of brucellosis at 7 months of gestation. The symptoms of abortion, however, subsided following progesterone therapy. CL was also maintained as indicated by plasma progesterone levels. No-

rmally, the lysis of CL should precede the process of abortion. In the present case, however, the maintenance of CL with subsistence of a dead foetus over a period of 4 months following progesterone therapy, needs exploration. A progesterone-induced suppression of uterine contractions and of PGF_2-alpha release (Lindell *et.al.*,1980) coupled with lack of estradiol production from necrosed placenta may explain the prolonged CL life.

It is concluded that progesterone therapy arrested an already started abortion resulting in over carrying of the dead foetus. It is recommended that progesterone should not be administered to prevent impending abortion and that PGF_2-alpha can be successfully used to induce expulsion of dead foetus in buffaloes with prolonged gestation.

Acknowledgement

The authors are thankful to Dr. D.R, Sharma, Bacteriologist, Animal Disease Research Centre, P.A.U., Ludhiana for brucellosis agglutination test.

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IJAR:12:1:104-105:1991

Dystocia Due To Foetal Hydroperitoneum In A Murrah Buffalo

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Incidence of foetal dystocia due to hydroperitoneum is reported in Ayrshire and Friesian cattle (Roberts, 1986). However, such report is not documented in buffaloes.

Case Report

An eight year old Murrah buffalo in second stage of labour was brought to the Veterinary Clinics with the history of dystocia since past 8 hours. Hind limbs of the fetus were visible in birth passage, Obstetrical examination per vaginum revealed dead foetus with distended abdomen, restricting further manipulation in birth passage, despite complete cervical dialatation.

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Foetal abdomen was incised after inducing epidural anaesthesia with 2% procain hydrochloride. On incision, straw coloured fluid oozed from distended abdomen of foetus, measuring 20 litres (approx.) in volume. Foetus was greatly reduced in size and delivered by forced extraction. Placenta dropped normally without the evidence of genital infection. Post-operative antibiotic and fluid therapy was given to prevent shock and infection. The recovery was normal.

There was no evidence of gross tissue degeneration in the affected foetus. Distended foetal abdomen collapsed due to removal of fluid from peritoneal cavity. Liver and spleen of the foetus were enlarged, with petechial haemorrhage on intestinal serosa.

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IJAR:12:1:105-106:1991

Some Studies On An Ascitic Fetus Causing Dystocia In A Buffalo

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Fetal ascites is a rare type of dropsical condition that can cause dystocia in animals. This condition is seen in association with chronic metritis (Sastry *et.al.*, 1975), dropsical conditions of the uterus, mesothelioma of fetal abdomen and brucellosis (Roberts, 1971). However its exact etiology is obscure. Fetal circulatory disturbances are considered as a possible cause, but study on related visceral organs of the fetus has not been reported in literature.

The present work puts on record a case of fetal ascites causing dystocia in a buffalo. Histopathology of some of the fetal visceral organs was undertaken to find out abnormalities, if any, leading to prenatal intra-peritoneal accumulation of fluid.

Case Report

A ten year old pluriparous buffalo was presented for treatment of dystocia. The gestation was complete, parturition started and water bags ruptured, a day before presentation. The abdomen of buffalo had been abnormally enlarging for the last two months. P.V. examination revealed a large dead fetus in posterior longitudinal presentation and dorso-pubic position, with slightly anasarcous hind limbs presented in the fully dilated birth canal. The foetal abdomen was distended with fluid and wedged against the pelvic inlet.

A huge, bulging fetal abdomen rendered the traction and mutation unsuccessful. The abdomen was incised with a guarded knife to drain the ascitic fluid leading to shrinkage. The foetus was delivered with slight traction and proper lubrication of birth canal. The buffalo was discharged after necessary hospitalization and treatment.

Detailed post-mortem studies of the fetus were undertaken. The fetus was other wise normal and fully developed, unlike fairly small fetuses recorded in cows by Roberts (1971). All the visceral organs were fully developed and were grossly normal. Histopathology revealed normal liver and kidneys.

The afterbirth was shed soon after the dystocia was relieved. Contrary to the findings of Sastry *et.al.* (1975) where hydro-amnion was associated with oedema of the fetal membranes, placenta in this case was normal. Also, there was no evidence of suppurative and or chronic metritis. Arthur *et.al.* (1982) stated peritoneal dropsy as a common accompaniment of infectious diseases of the fetus. But no lesion in the fetal organs depicted any infection in this fetus, which was also free from achondroplasia. The exact cause of this condition remains unexplained.

Acknowledgement

Authors are thankful to Dr. Nem Singh, Pathologist, Animal Disease Research Center, P.A.U., Ludhiana for undertaking histopathological studies.

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IJAR:12:1:106-107:1991

Uterine Torsion In A Goat

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Rotation of the uterus on its long axis with twisting of the anterior vagina is a common cause of bovine dystocia. It is occasionally observed in goats. Roberts (1972) reported that the incidence of uterine torsion in dairy cattle was 7.3% among 1,555 dystocia attended over a 10 year period. Sane *et.al.* (1982) reported a high incidence of uterine torsion in buffaloes ranging from 22.53% to 60.30% and 5% to 33% of total cases of dystocia recorded in cattle. Vyas (1987) and Chandrahasan *et.al.*

(1990) reported cases of uterine torsion in goats.

Case Report

A case of uterine torsion in a goat was recorded and treated at Veterinary Hospital, College of Agriculture, Pune in January 1991. The torsion was of 180^0 towards the right side.

An attempt was made to detort the uterus by Schafer's method but failed and hence caesarean section was carried out. The post-operative recovery was uneventful.

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IJAR:12:1:107-108:1991

Foetal Mummification In A Goat — A Case Report

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A non descript goat of about 3 years age was presented to the Veterinary Polyclinic on 6-10-90 with a history that it has completed the gestation period, had two previous normal kiddings and was bred by natural service. No mummification was reported during previous kiddings. The goat delivered three foetuses in the third kidding. Slight assistance for traction was required for expulsion of foetuses in anterior presentation at birth. The first foetus was medium sized indicating incomplete mummification, the second was full grown and the third was smallest like a dried chicken mass without hair (Fig.1).

The present findings are in agreement with Roberts (1971) who noted that in multitocus animals, the mummified foetus will not affect other growing foetuses. In the present case also the second foetus appeared normal.

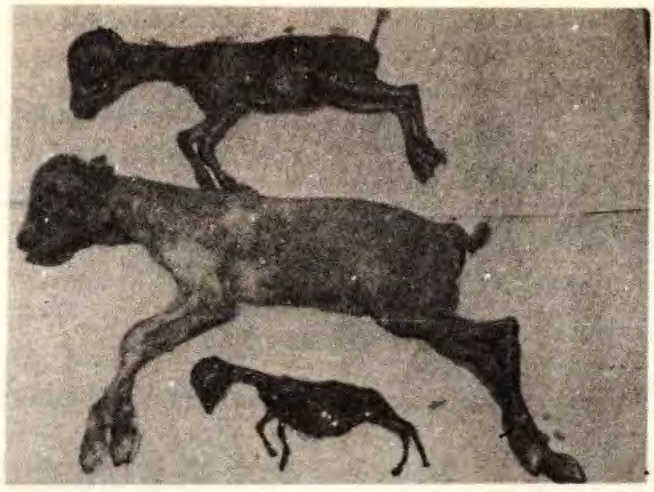

Fig. 1 : Normal and Mummified foetuses delivered by the Goat

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IJAR:12:1:108-110:1991

Foetal Monstrosity In A Bikaneri Camel (Camelus Dromedarius)

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ABSTRACT

The foetal monster was having severe muscle contracture, ankylosis of the hind limbs and flexed at both the carpal joints.

* * *

Published information regarding dystokia in a she camel is scarce (Gera and Datt, 1981). Moreover it is believed that the incidence of dystokia in camel is very low. A rare occurrence of monstrosities in this species has been reported (Arthur *et.al.*,1982). The present communication puts on record a clinical case of dystokia in a camel due to foetal monster. Dystokia was relieved following a caesarean section.

Case Report

A Bikaneri she camel (Camelus dromedarius) of seven years age was presented in the college clinics with a history of rupture of water bag 36 hours back, but thereafter with no progress in the process of parturition. There was evidence of manual traction

Fig. 1 : Contracture monster delivered from a Bikaneri she camel after caesarean section.

by the local Veterinarian to effect the vaginal delivery, but all in vain.

Clinical examination : On vaginal examination, foetal mouth and flexed, ankylosed carpal joints could be palpated. The attempts to straighten the forelimbs proved futile. There was oedema of the vulval lips and laceration of the vaginal passage. It was decided to perform caesarean section to deliver the calf.

Operative technique : The animal was restrained in normal sitting position and triflupromazine 100 mg (Siquil-Sarabhai Chemicals, Baroda) was administered intravenously, after diluting with blood itself in a slow speed and local anaesthetic infiltration by 2% lignocaine was also done. A 35 cm long oblique incision was given on the posterior side of the left para-lumbar fossa. The pregnant uterine horn was exposed, but could not be exteriorised. After incising the uterus, foetal delivery could be made possible with great difficulty. During the forced extraction through the incision, the hair from half of the foetal body were lost. The delivered calf was having ankylosis with muscle contracture (Fig.1). Both the hind limbs were showing bilateral carpal flexion. After removal of the foul smelling foetal membranes, antiseptic lavage of tetracycline (Hostacycline-Hoechst) solution was given to the uterine cavity and six tablets of furea (Smith Kline & French, India) were inserted inside the uterus. Suturing was done as per standard procedure, except that the uterine incision was closed by continuous lambert sutures using no. 3 Chromic cat gut-one parallel and the other perpendicular - to the incision. The animal was kept in the standing position after the operation. Post operati-

vely, the animal was given 4 litres I/V of 5% dextrose saline, 100 ml terramycin and 6 ml of dexa-methasone. The camel was discharged after 12 days of post operative care.

Discussion

A classical description regarding dystokia due to foetal monster is not available in the literature on camel. In this case monsteral dystokia was due to muscle contracture, bilateral flexion of the carpus, ankylosis of the hind limbs and complete stiffness of neck. This type of monster has been described in cows by Verma and Khar (1972). Pre-medication with Siquil and local anaesthetic infiltration provided adequate anaesthesia as also appreciated by other workers (Nigam *et.al.*,1977). Posterior oblique abdominal incision on left paralumbar fossa proved to be a good site for caesarean section in camel as described by other workers (Sharma and Pareek, 1970; Nigam *et.al.* 1977; Gera and Datt, 1981).

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Sharma, D.K. and Pareek, P.K. (1970). Caesarean section in a camel. Ceylon Vet. J. **18** : 46.

AN APPEAL

The ISSAR has decided at its executive meeting held at Hissar in February, 1991 to enroll institutions as permanent members of our Society. Under this scheme, an institution has to pay at one time Rs. 2,000/- to be enrolled as a permanent member and such members are entitled to receive 2 copies of each issue of our Journal on a permanent basis. This will go a long way to augment the resources of our Society and thereby regular publication of our Journal will be ensured.

I request you to kindly bring this to the notice of Dairy Cooperatives, Veterinary Hospitals, Pharmaceutical concerns and others concerned with Livestock development activities.

I seek your cooperation in enrolling institutional members to sustain our Society on sound financial footing to fullfill the objectives of the Society. For further details you may contact our Treasurer and Editor whose addresses are furnished below :-

(1) Dr. S.R. Pattabhiraman, Ph.D., Treasurer, ISSAR, Professor of Clinics, Madras Veterinary College, Madras - 600 007

(2) Dr. A.S. Kaikini, Ph.D., Editor, Indian Journal of Animal Reproduction, B-306, Ujwal Flats, Rahate Colony, Jail Road, Nagpur - 440 022.

Hyderabad-30.
Dt. 12.3.1991

Yours sincerely,
A. RAMAMOHANA RAO
President, I S S A R

ISSAR News

Dr. S.N. Luktuke honoured.

Dr. S.N. Luktuke

At the Special Convocation of Deemed University held in January 1991 as a part of 'Centenary Celebrations', the Indian Veterinary Research Institute, Izatnagar honoured Dr. S.N. Luktuke, Retd. Head, Division of Animal Reproduction, IVRI, and Eminent Scientist for his outstanding contribution in the field of Veterinary Gynaecology. Dr. Luktuke received the Prestigeous Award of embossed silver plate, a shawl and citation at the hands of the ICAR President Shri Devilal, Deputy Prime Minister.

• • •

The First Convocation of Tamil Nadu University of Veterinary and Animal Sciences was held on 11th January 1991 at Madras. It was presided and invocated by the Governor H.E. Surjit Singh Barnala, Chancellor of the University. Dr. K. Chandrasekaran, Pro-Chancellor and Minister for Animal Husbandry and Fisheries announced the institution of University Prizes and endowment for academic achievements.

Dr. R.C. Gupta

• • •

We are happy to present the Proceedings of ISSAR Conference held at HAU, Hisar, in February 1991, published elsewhere in this issue. The Conference was a grand success due to the personal active interest taken by the Organising Committee Members under the dynamic leadership of Dr. R.C. Gupta, Dean, Faculty of Veterinary Science, HAU, Hisar. We are grateful to him and them all.

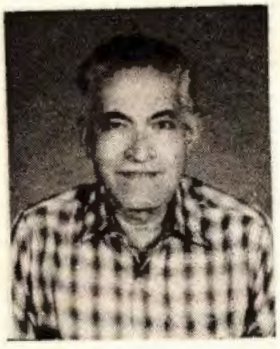
• • •

We congratulate Dr. A.L. Chaudhry, Vice-Chancellor, HAU, Hisar; Dr. R.D. Sharma, Professor and Head Department of Gynaecology & Obstetrics, Punjab Agricultural University, Ludhiana; Dr. V.B. Hukeri, Head, Department of Animal Reproduction, KKV, Bombay Veterinary College, Parel, Bombay 400 012 and Dr. D.R. Pargaonkar, Professor and Head, Department of Gynaecology & Surgery, MAU, Parbhani - 431 402, on their getting the coveted ISSAR Fellowship Awards.

Dr. V.B. Hukeri

Dr. R.D. Sharma

Dr. A.L. Chaudhry



Dr. A.S. Kaikini

Dr. D.R. Pargaonkar

We wish them best of luck and more laurels in future.

• • •

We congratulate Dr. D.R. Pargaonkar, Head Deptt. of Gynaecology, MAU, Parbhani and Dr. A.S. Kaikini Retd. Dean, Faculty of Veterinary Science, PKV, Akola on their getting the Prestigeous coveted Professor Nils Lagerlof Memorial Award, 1989, for their best research article in Animal Reproduction.

Dr. D.R. Pargaonkar is the energetic Secretary of ISSAR. Dr. A.S. Kaikini, Emeritus Scientist (ICAR) is the Editor, Indian Journal of Animal Reproduction (ISSAR).

We wish them best luck and all success.

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We congratulate Dr. S.K. Gupta, Junior Research Officer, Institute of Animal Health and Production, Kanke, Ranchi-834 007, on his getting the coveted Dr. G.B. Singh Memorial Young Scientist Award of ISSAR, 1989 for the best research article published.

We wish him best luck and every success.

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Dr. R.D. Sharma, Professor & Head, Deptt. of Gynaecology, PAU, has taken over as Additional Director of Research (Veterinary and Animal Sciences), PAU, Ludhiana w.e.f. 25-2-1991.

We congratulate Dr. R.D. Sharma on this achievement and wish him all success.

• • •

ISSAR Gujarat Chapter, Anand, is very active and organised activities involving local organisations as under :-

1. District level workshop on 'Augmenting Bovine Fertility' along with District Panchayat and Veterinary Polyclinic at Baroda on 16th February 1991. Thirty Veterinary Officers of Baroda District were benefitted. Dr. S.B. Kodagali, Dr. S.N. Luktuke and Dr. J.H. Prabhakar guided the technical deliberations under the able planning of Dr. Dante, D.A.H.O., Baroda.

2. Dr. I. Settergren, Emeritus Professor, Swedish University of Agricultural Sciences Uppsala, visited Anand on 18-19, March 1991. His talk on "Veterinary Education in the Changing Society in Sweden" was organised at the Gujarat Veterinary College, Anand, which was well attended.

3. Dinner was hosted in honour of Dr. I. Settergren, on 19th March 1991 at Anand and a Momento presented to him on behalf of ISSAR - Gujarat Chapter.

4. A one day practical workshop on "Repeat Breeding Syndrome" was organised at Baroda on 14th April 1991 for the benefit of practising Veterinarians of Baroda DCMP Union, which hosted the workshop. Dr. S.B. Kodagali, Dr. H.J. Derashri, Dr. J.S. Patil and Dr. J.H Prabhakar provided the expertise from ISSAR Gujarat Chapter. Dr. Prabhakar gave a slide show on reproductive pathology, collected by him in Sweden, which was very informative for the young veterinarians.

We deeply appreciate the useful activities of ISSAR Gujarat Chapter and sincerely hope that other State Chapters will emulate likewise.

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We earnestly request all the ISSAR State Chapters Secretaries to furnish information/ news of their respective activities regularly to the Editor, IJAR for publication under "ISSAR News"

12th International Congress on Animal Reproduction
August 23rd – 27th 1992
The Hague, The Netherlands

The congress covers main trends in animal reproduction and artificial insemination as well as novel developments. The four Plenary Sessions comprise 2-4 state of the art lectures. Invited speakers will present in depth leetures at the 12 Symposia. Current research and novel developments will be presensed at Poster Sessions and 16 Workshops. The organizing Committee welcomes abstracts for presentation in the Poster Sessions **before November 1st 1991.** For additional information please contact the Congress Secretary :

Dr. Steph J. Dieleman
C/o Nivekon
P. O. Box 90730
2509 LS The Hague
The Netherlands

telephone (31) 70 31 80 285
telefax (31) 70 32 49 263

INDIAN JOURNAL OR ANIMAL REPRODUCTION
GUIDE LINES TO AUTHORS

1. The Journal is published twice a year as a Volume comprising of June and December issues.
2. Paper should be TYPE-WRITTEN and double spaced all throughout (including references and tables) on white, durable bond paper of size 22 cm x 28 cm, with a 4 cm margin at the top, bottom and left hand side. Articles including illustrations, should be sent in duplicate after a careful check-up of typographical errors.
3. Articles should not exceed Six typed pages. Short Communications/Research notes and clinical articles should be limited to two typed pages.
4. A recent issue of the Journal be consulted for the format of articles and methods of citation of references in the text as well as at the end of the article.
5. The Abstract and Introduction should be in brief. Review of Literature should be crisp and pertinent to the problem. The main emphasis in the text should be on the actual work done by the author(s). Details of Materials and Methods including experimental design and techniques used should be given. Where the methods are well known, the citation of standard work is sufficient. References should be reduced to the barest minimum.
6. Mean results with the relevant standard errors should be presented, rather than detailed data. The statistical methods used should be clearly stated. Tables should be minimum and fit in the normal layout of the page. All weights and measures should be in Metric units.
7. The Results and Discussion should be combined to avoid repeatition. The Discussion should relate to the limitations or advantges of the author's actual work in comparison with that of others.
8. All articles are sent to Referees for scrutiny and author(s) should meet criticism by suitably revising the article. Block-making charges of Photographs, Graphs, Tables, Histograms and Line drawings appearing in the accepted articles shall have to be paid by the concerned author(s) in advance on receipt of the Bill from the Editor, I.J.A.R.
9. All efforts are made to acknowledge, process and accept the articles received for early publication. Authors are earnestly requested to become and enrol active paying subscribers of the Journal and help procure/book suitable advertisements for publication in the Journal to strengthen its financial resources.
10. Articles and all matters pertaining to the Journal be sent to the Editor, Indian Journal of Animal Reproduction, B-306, Ujwal Flats, Rahate Colony, Jail Road, Nagpur-440 022.

Report of the Organising Secretary, IX National Convention of ISSAR, HISAR

The IX National Convention and the All India Symposium of the Indian Society for the Study of Animal Reproduction was held at the Department of Gynaecology and Obstetrics, College of Veterinary Sciences, Haryana Agricultural University, Hisar from Feb. 6-8, 1991. The theme of the Symposium was "Recent Biotechnological Advances in Animal Reproduction" and attracted about 150 delegates from Veterinary colleges all over the country, State Departments of Animal Husbandry, Research Institutes of the Govt. of India, Insurance Agencies, Pharmaceutical companies etc.

The Symposium was inaugurated by Prof. C.R. Sane, founder President of ISSAR. Speaking on the occasion Prof. Sane highlighted the problems relevant to Animal Reproduction and the latest developments relevant to increasing food production in the country. Dr. A.L. Chaudhry, Vice-Chancellor, H.A.U., who presided over the inaugural function stressed the need for using latest biotechnological advances for enhancing the production from farm animals; while at the same time making adequate use of older technologies which are cost effective and are yet to be fully exploited.

Eminent Scientists who have rendered meritorious service to the cause of animal reproduction were conferred various honours and awards of the Society.

Dr. A.L. Chaudhry, Vice-Chancellor, H.A.U.; Dr. R.D. Sharma, Professor and Head, Department of Gynaecology & Obstetrics, PAU, Ludhiana; Dr. V.B. Hukeri, Professor & Head, Deptt. of Gynaecology & Obstetrics, College of Veterinary Science Bombay and Dr. D.R. Pargaonkar, Professor & Head, Deptt. of Gynaecology & Obstetrics, College of Veterinary Sciences, Parbhani, were awarded the Fellowship of the Society (ISSAR).

Prof. Nils Lagerlof Memorial award was presented to Drs. A.S. Kaikini and D.R. Pargaonkar. Prof. G.B. Singh memorial award was given to Dr. S.K. Gupta of Veterinary College, Ranchi.

The symposium had technical sessions on :-

1. Embryo Transfer and biotechniques
2. Physio-pathology of Reproduction
3. Male reproduction and Artificial Insemination
4. Reproductive disorders.

The Chairmen of all the technical sessions were consistently of the opinion that the quality of papers during this symposium were of a high order and it was hoped that these standards are further improved in the years to come. It was also agreed that greater stress needs to be laid on studies on equine reproduction so that more information about the reproductive problems of this species gets disseminated for the benefit of the researchers and equine breeders.

ISSAR Hisar Conference Glimpses.

Dean Dr. R.C. Gupta welcoming the delegates.

Dr. A.L. Chaudhry, Vice Chancellor, HAU receiving ISSAR Fellowship Award from Dr. C.R. Sane, Founder President, ISSAR.

Organising Committee Members

Dr. S.K. Khar, Organising Secretary, addressing the delegates

Young Scientist receiving Award from Chairman, Technical Session.

For each technical session Young Scientist awards were given for the best paper presentation to the following Scientists :-

1. Dr. V.K. Sharma	:	Embryo Transfer and Biotechnology
2. Dr. Aminudeen	:	Physio-pathology of reproduction
3. Dr. R.L. Dhoble	:	Male reproduction & A.I.
4. Dr. V.K. Gandotra	:	Reproductive disorders

The plenary session chaired by Dr. R.C. Gupta, Dean, College of Vety. Sciences, H.A.U., Hisar, drew the attention of the participating scientists towards their duties and responsibilities towards the enhancement of reproductive and productive potential of farm animals. Whereas the progress made in embryo biotechnology in the recent years in the country was highly appreciated, it was felt that a lot more needs to be achieved before the programme can be of benefit to the livestock owners.

The conference ended with a vote of thanks by the Secretary, ISSAR.

HAU, Hisar,
March 31, 1991

Dr. S.K. KHAR
Organising Secretary.

FROM SECRETARY'S DESK

Dear Members,

Through my appeal/Circular letters, I tried to approach you through your respective State Chapter Secretaries and your response was very encouraging. I am happy to give in brief the account of my office as under :

I have succeeded in procuring financial assistance regularly from the ICAR New Delhi for publication of our Society's Journal and for holding National Symposia. Upto this date, I have received Rs. 50,000/- as financial assistance from the ICAR, New Delhi which is credited with the Treasurer of our Society at Madras. ICAR provides financial assistance for holding Symposia only once in three years.

Procedural details have been streamlined for various awards. I am happy to inform you that response received for various awards was encouraging but I am sorry to communicate you that inspite of repeated reminders to all the State Chapter Secretaries, no entry for Best Chapter Award was received and hence the Award is not given this time. Details of the two committees constituted are :

Committee A :

1. Dr. R.C. Gupta	Hissar	Chairman
2. Dr. S.B. Kodagali	Anand	Member
3. Dr. S.N. Maurya	Pantnagar	Member

Committee B :

1. Dr. A.S. Kaikini	Nagpur	Chairman
2. Dr. S.A. Quayum	Madras	Member
3. Dr. M.R. Bhosrekar	Urlikanchan	Member
4. Dr. B.K. Singh	Ranchi	Member

The committees critically went through 20, 4 and 6 entries received for Professor Lagerlof Memorial Award, Dr. G.B. Singh Memorial Award (Young Scientist Award) and ISSAR Fellowship Award, respectively. The final verdict of the Committees is as under :

1. Prof. Lagerlof Memorial Award (1989) to Dr. D.R. Pargaonkar and Dr. A.S. Kaikini for their article entitled "Studies on hormonal profile of Non-Descript cows during various phases of reproduction" published in IJAR (1989) **10** (2) : 85-88.

2. Dr. G.B. Singh Memorial Award (1989) to Dr. S.K. Gupta for his article entitled, "Estimation of progesterone by Enzyme Immuno Assay technique in superovulate cows", published in RAU Research (1989), 213-219.

3. ISSAR Fellowship Awards have been bestowed on :

1. Dr. A.L. Chaudhry Vice-Chancellor H.A.U., Hissar
2. Dr. V.B. Hukeri Prof. of Gynaecology B.V.C. Bombay
3. Dr. R.D. Sharma Prof. of Gynaecology PAU, Ludhiana
4. Dr. D.R. Pargaonkar Prof. of Gynaecology MAU, Parbhani

for their meritorious contributions for the development of Animal Reproduction and ISSAR.

I would like to extend a million thanks to the Chairmen and Members of various Award Committees for their excellent evaluation work and Co-operation.

Main drain on the expenditure of my office is on postal charges particularly for despatching back volumes of our Journals to different institutions as per the directives of Dr. Kaikini, worthy Editor of I.J.A.R. Other important items of expenditure are cost of Silver Medals, Scrolls, printing charges of Citations, certificates etc. The details are as under :

1. Postage stamps	620=00
2. Reg. Post Parcels	930=00
3. Telegrams	80=00
4. Stationary, Xeroxing etc.	270=00
5. Travelling expenses	650=00
6. Printing charges (Parbhani)	900=00
7. Printing charges (Hissar)	1675=00
8. Silver Medals	1050=00
9. Cash Prizes to the Young Scientist (Best Presentation Award)	505=00
10. Audit Fees	200=00
Total Rs.	6880=00

Its my duty to focus your attention towards the fact, that inspite all the office bearers mainly the President, Treasurer, Editor and Secretary are located at different places still the activities of our Society are being carried out not only smoothly and efficiently but most economically too.

I am happy to state that the recently conducted National Symposium of our Society at Hisar was a grand success. Dr. S.K. Khar, Organising Secretary's detailed report is appearing in this issue. Prof. S.K. Khar and all his colleagues from Hisar have exerted a lot for making the Symposium a memorable one in all respects. I would like to thank Prof. Khar, Dr. R.C. Gupta, Dean, Vety. Faculty and all colleagues for their excellent cooperation.

As per the routine practice, the Society has presented a Cash prize of Rs. 101/- and a Certificate to the following Young Scientists (below 35 years of age) for Best Presentation of their papers in the Scientific sessions of the Conference.

1. Dr. V.K. Sharma, 2. Dr. Aminuddin, 3. Dr. Prabhakar, 4. Dr. Dhoble and 5. Dr. Gandotra.

On the eve of the National symposium at Hisar, the Executive Committee Meeting was held on 5th Feb. 1991. The important resolutions adopted are :

1. Subscription rates of IJAR may not be enhanced at this stage.
2. Apart from the existing categories of the memberships, there be one more category of "Institutional Life Membership" by paying Rs. 2000/- in one instalment. The institute thus enrolled will be entitled to get two copies of each issue of IJAR.
3. For further streamlining of the Award Committees it was resolved that,
   (a) There should be no member on Award Committee whose paper is for consideration of the Award.
   (b) Identity of the author (s) be decoded before forwarding papers to the Award Committee Chairman/Members.
   (c) Chairman/Members of the Award Committee be requested to follow evaluation format and award marks (Total 100 marks) for each item mentioned in the format.
   (d) The Awardee (s) first author(s) be requested to present their Award Winning paper (s) during the course of Symposium.
   (e) For Best Presentation Award, Speakar should be the first author of the paper.
   (f) Papers for consideration for Best Presentation Award should carry the caption on envelope "For consideration of Best Presentation Award". The organising Secretary be requested to screen and grade all such papers received by him and the grade list be made available to the Chairman of respective Sessions. Grading plus presentation put together should be considered for finalizing the scientist for 'Best Presentation Award'.
   (g) There should be one member from Executive Committee on each of the Award Committees.

On 7th February 1991, the General Body Meeting of the Society was held. It confirmed the minutes of the last G.B. Meeting held at Anand. Then the reports by Editor, Treasurer and Secretary were presented and accepted. Dr. Muzumdar of Hoechst Co. projected film on "Synchronization of Oestrus" at the Conference for which we are thankful to him.

Venue for the next National Sympsoum was considered and discussed. There were two offers from two hosts-one from Dr. Pattabiraman for holding the next Conference at Madras and the other from Dr. S.K. Gupta for holding the Conference at IVRI, Izatnagar, Majority of the Members expressed that the next Conference be held at Madras, being the head-quarter of the first Veterinary University in our Country. Hence, we shall be meeting in our next Conference probably at Madras.

I would like to thank all the members profusely for extending best cooperation. I also thank Dr. S.A. Bakshi and Dr. N.M. Markandeya (Staff Members from my Department) for their untiring assistance, without which, it would not have been possible for me to discharge my duties effectively.

D.R. PARGAONKAR
Hon. Secretary, ISSAR

TREASURER'S REPORT PRESENTED AT IXth NATIONAL CONVENTION OF ISSAR HELD AT HISAR DURING 6-8th FEBRUARY 1991.

The audited report for the year ending 31-3-90 has already been published in The Indian Journal of Animal Reproduction Vol. 11 June 1990 issue. An updated report on the membership and finance is presented now.

Membership of ISSAR : The members registered during the period under report mainly comprises of life members and Annual members. In 1990 as per the guidance and suggestions of the President and Editor of ISSAR the life members were listed separately and serially numbered which now formed the life membership number. As on 31.1.1991 there are 427 life members as against 312 life members in October 1989 and only 116 life members in January 1987. Regarding Annual members only those members who have paid annual membership for the past 3 years was taken into account and a separate list was prepared. Serial number with a prefix alphabet A was assigned to each annual member. As on 31.3.91 as per the revised list there are only 134 members.

Membership fee : With the introduction of facility to pay the life membership fee of Rs. 500/- in instalments more and more preferred to become life members. Of the total 427 life members 40 members who have opted to pay the membership instalment are yet to complete full payment. They are requested to pay the balance at an early date.

Life membership Certificate : Certificates have been sent to all life members who have paid the membership in full and to others the certificate will be sent as soon as they pay the balance amount due from them.

Directory of Life members : Directory of life members - 1990 with name and address of 349 life members was printed and sent to all life members. Certain important information about the activities of the society was also included in the revised Directory.

Finance

General Fund	1,28,700	
Nils Lagerlof Memorial fund	13,500	
G.B. Singh Memorial fund	13,000	
C.R. Sane Oration fund	3,000	
Total	1,58,200	in Fixed Deposits

ICAR Contribution

For printing IJAR	1986-87	Rs. 7,000
	1987-88	Rs. 7,000
	1988-89	Rs. 6,000
For conduct of Seminar (For 3 year period)	1989	Rs. 10,000

The amount has been fully and satisfactorily utilised, towards printing of IJAR and for the conduct of Seminars.

Madras - 600 007
Feb. 6, 1991

Dr. S.R. PATTABIRAMAN
Treasurer - ISSAR

THE INDIAN JOURNAL OF ANIMAL REPRODUCTION

(OFFICIAL ORGAN OF INDIAN SOCIETY FOR THE STUDY OF ANIMAL REPRODUCTION)

RECEIPT AND PAYMENT ACCOUNT FOR THE YEAR ENDED 31st MARCH, 1991

	RECEIPTS	AMOUNT	AMOUNT		PAYMENTS	AMOUNT	AMOUNT
To	Opening Balance :			By	Journal Printing :		
	Cash	293-95			Volume 11 1	30,205-00	
	Bank Balance with State Bank of India, Ramdaspeth Branch,				Volume 11 - 2	16,659-00	46,864-00
	S.B. A/c No. 61294	13,320-54	13,614-49	By	Printing & Stationery		1,156-90
To	ICAR Grants		10,000-00	By	Postage		8,287-55
To	Receipts from Treasurer (ISSAR)		15,000-00	By	Bank Commission		210-00
To	Subscription		20,583-95	By	Conveyance & Travelling Exp.		2,000-00
To	Sale of Old Volumes		1,750-00	By	Audit Fees		250-00
To	Advertisements		12,600-00	By	Office Maintenance Expenses		1,200-00
To	Block Making Charges		5,841-00	By	Closing Balance Cash with State Bank of India, Ramdaspeth Branch, S.B. A/c No. 61294		41,273-66
To	Interest on Savings Bank Account		1,071-17				
To	Dr. A.S. Kaikini (Cheque received from Treasurer in personal name transferred to S.B. A/c No. 61294)		15,000-00				
To	Dr. A.S. Kaikini (Temporary Loan)		5,781-50				
	TOTAL RS.		1,01,242-11		TOTAL RS.		1,01,242-11

CERTIFIED : That the figures shown in the above Receipts & Payments Account of "Indian Journal of Animal Reproduction" for the year ended 31/3/1991, agree with the books & vouchers maintained which have been audited by us and are found to be correct.

NAGPUR :

DATED : 23 May 1991

C.R. SAGDEO & CO.

CHARTERED ACCOUNTANTS

Announcement

The Directory of ISSAR Life Members will be revised and updated for the year 1991. All the Life Members are requested to send their current full address with PIN Code No. and also the balance Lifemembership amount due from them to The Treasurer, ISSAR on or before 30 th September 1991, positively.

Department of Clinics,
Madras Veterinary College,
Madras-600 007
May 31, 1991

Dr. S. R. Pattabiraman
Treasurer ISSAR

The Indian Society for the Study of Animal Reproduction, Madras
Balance Sheet as at 31st March 1991.

LIABILITIES			ASSETS		
General Fund :			Cash and Bank Balances :		
As per last Balance Sheet	111791-35		Cash on Hand		126-00
Add : Excess of Income for the year	42898-35	154689-70	Cash with State Bank of India, Madras in S.B. Account		17587-70
G.B. Singh Memorial Fund :			Investments :		
As per last Balance Sheet		11006-00	Nils Lagerlof Memorial Fund		
Nils Lagerlof Memorial Fund :			1000 Units of Unit Trust of India	13500-00	
As per last Balance Sheet		13450-00	Dr. G.B. Singh Memorial Fund-		
Prof. C.R. Sane Oration Fund :			Invested with TTDFC	13000-00	
As per last Balance Sheet	2240-00		Prof. C.R. Sane Oration Fund-		
Add : During the year	506-00	2746-00	Invested with TIDCO	3000-00	
Audit Fee Payable		500-00	General Fund :		
			With T.T.D.F.C.	70000-00	
			" TIDCO	25000-00	
			" Unit Trust of India	13400-00	
			" State Bank of India Mutual Fund	20000-00	157900-00
			Amounts Receivables :		
			Interest accrued on Fixed Deposits		6778-00
		182391-70			182391-70

MADRAS - 18, DATED : 27TH MAY 1991.

Vide our report of even date

PRESIDENT SECRETARY TREASURER

RAMANAN & Co.
CHARTERED ACCOUNTANTS.

The Indian Society for the Study of Animal Reproduction, Madras
Income and Expenditure Account for the year ended 31st March 1991.

EXPENDITURE			INCOME		
To Advance for Journal Printing		30600-00	By Annual Membership Fee		765-00
Establishment		775-00	Life Membership Fee		7369-00
Bank Charges		114-50	Interest Earned		31481-90
Conveyance		427-80			
Postage		1486-50	ICAR GRANT :		
Printing & Stationery		5064-75	For Journal Printing		10000-00
Prize Articles & Momentoes for Seminar		760-00	Advertisement Revenue		4000-00
Advance for Conference Expenses		5000-00			
Advance for Secretary Office Exp.		5000-00			
Advance for President Office Exp.		500-00			
Miscellaneous Expenses		89-00			
Audit Fees - For Statutory	500-00				
For Certifying statement	400-00	900-00			
Excess of Income over Expenditures transferred to General Fund		42898-35			
		93615-90			93615-90

MADRAS - 18, DATED : 27TH MAY 1991.

Vide our report of even date

PRESIDENT SECRETARY TREASURER

RAMANAN & Co.
CHARTERED ACCOUNTANTS.