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EDITORIAL

We congratulate the Government of India for appointing a Scientist Technocrat Dr. M.G.K. Menon as Union Minister for Science and Technology, which is a positive step in the right direction. It is a great honour to Indian Scientists in general and Dr. M.G.K. Menon, in particular.

We salute Dr. M.G.K. Menon and wish him a great success. We appeal and earnestly request him to ensure that adequate attention is paid to the funding and progress of Animal Sciences in India. Tamil Nadu has already taken the lead and initiative by establishing a separate University of Veterinary and Animal Sciences in September 1989, with Gujarat State to follow suit in early 1990. Such positive steps be encouraged and patronised by the Govt. of India & Various State Govts. for effecting a balanced development of Animal Sciences on par with crop sciences. Real boost to rural economy can only be provided by paying equal attention to both Crop and Animal Sciences which form the two giant wheels of prosperity. This is imperative since our National Government is committed to spend half (50%) of its resources for growth of agrarian economy in rural India and ultimate upliftment of the population below the poverty line (BPL).

EDITORIAL BOARD

Announcement

The Indian Society for Study of Animal Reproduction (ISSAR) has instituted following two awards for the best article related to Animal Reproduction published during the particular year.

1. Prof. Nils Lagerlof Memorial Award
2. Dr. G.B. Singh Memorial Award for Young Scientists

for the best clinical article on Animal Reproduction.

Entries are invited for these Awards for the Year **1989.**

Authors are requested to send for each Award separately. A reprints of their articles published in any Journal during the year **1989.** For "Dr. G.B. Singh Memorial Award" for young Scientists, the age of first author of the clinical article on Animal Reproduction should be below 35 years (Necessary certificate to be enclosed). The reprints of the articles may please be sent to Dr. D.R. Pargaonkar, Secretary, ISSAR, Head Deptt. of Gynaecology and Surgery, College of Veterinary and Animal Sciences, M.A.U., Parbhani 431 402 (Maharashtra).

The last date for receipt of applications alongwith Four reprints of articles separately for each Award is Monday, **30th April 1990.**

A.R. RAO
President, ISSAR.

सत्यमेव जयते

PROF. M.G.K. MENON

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January 4 , 1990

My dear Dr Kaikini

Thank you very much for your kind letter conveying your congratulations and good wishes on my appointment as Minister of State for Science & Technology. I am deeply grateful to you for writing to me and for your warm appreciative remarks. My efforts will be to ensure the development and growth of Science & Technology over a wide front to be able to meet the challenges that the country faces; and to ensure that these capabilities are made use of most effectively for national development, and particularly to benefit the largest numbers at grass-root levels. These tasks must pose both challenges as well as opportunities for our scientists and technologists to live, work and contribute to our nation's prosperity.

With warm regards,

Yours sincerely,

M G K Menon

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EDITORIAL

1. Gynaecology and Obstetrics.

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Field Problems Of Infertility In Dairy Cattle And Buffaloes*

A.S. KAIKINI

Retd. Dean, Faculty of Veterinary Science, Punjabrao Krishi Vidyapeeth, Akola & Emeritus Scientist (ICAR), PKV, Nagpur Veterinary College, Nagpur-440 006.

The success of dairy cattle and buffalo economics lies in ensuring proper and optimal reproductive rhythm of each individual female in the herd within normal physiological limits. Any deviaton or prolongation in the breeding rhythm results in a progressive economic loss due to widening of dry period, reduced calvings and lactations during the lifetime of the animal. Barren or infertile cows/buffaloes mean a loss in milk production, whereas fewer calves reduce the efficiency of selection in dairy herd improvement. Efforts should therefore be made to enhance fertility in dairy animals by narrowing down their dry period to the barest minimum range of 60 to 90 days. Thus, fertility of Milch animals plays a pivotal role in dairy economics.

Incidence of Infertility

It is estimated that even in the best managed herds, the incidence of infertility ranges from 15% to 20% - majority of which is due to repeat breeding. This situation is aggravated in case of small holders and marginal farmers owning 2 to 5 cows or buffaloes, mainly due to lack of appropriate managerial practices and proper technical knowhow. This picture is reflected in the increasing number of infertility cases reported in the veterinary clinics and gynaeco-clinical animal health camps.

Reproductive failure accounts for more than half of all losses resulting from diseases of cattle. About 25% dairy cows under great stress for milk production are culled for reproductive reasons. 35% cows had cystic ovaries. (Young *et al*, 1983). According to Chhikara *et al*(1978) 26.5% Murrah buffaloes are culled for low milk yield, 88.2% for health reasons and 6.2% for reproductive disorders. Losses due to infertility and improper breeding in Egyptian cows and buffaloes are estimated to be more than 100 million pounds annually. (Osman, 1984).

Buffaloes tend to have a relatively slow rate of reproduction. Abbatoir studies of non-pregnant genitalia are indicative of more reproductive problems in buffaloes than cows with 40% to 74% normal buffalo tracts compared to 85% to 90% in cows. (Dobson and Kamonpatana, 1986). Buffaloes are reputed for late maturity, seasonal breeding, silent heat, anoestrum and long inter-calving periods.

In a quick All-India Survey on bovine infertility conducted by IVRI Team covering 20,000 cattle and buffaloes in rural and organised sector, 7.70% animals were diagnosed as sub-fertile or sterile. It was found that in herds with over 25 adult, 3% animals were sterile and 8% to 10% sub-fertile. (Bhattacharya, 1954). A team of F.A.O. Experts examined 3,000 cows and buffaloes

* C.R. Sane Oration Lecture delivered at the 8th ISSAR National Symposium on "Applied Reproduction in Farm Animals" held at Gujarat Agricultural University Campus, Anand, November 10-12, 1989

comprising of urban and rural animals in India and found that 61.8% cows and 31.0% buffaloes had sub-functional ovaries. (Lagerlof, 1954). In his survey of bovine infertility covering 10,865 bovines in India, Rao (1954) recorded a high incidence of infantile genitalia (18.99%) and sub-active ovaries (54.42%) in Heifers; 47.87% in cows and 38.51% in Red Sindhi cows. Kaikini (1967) in an intensive survey on bovine infertility conducted by him covering over 10,000 cows and buffaloes in more than 45 cattle breeding farms, buffalo farms, goshalas and rural areas in the earstwhile Bombay State (1952-54), found that about 4% of the animals were sterile, while double the number (8%) were sub-fertile.

Field Problems of Bovine Infertility

Majority of the cows in rural areas owned by farmers in India are "Non-Descript" (N.D.) type, with an assorted genetic make-up. Most of such Heifers not only mature remarkably late but their effective breeding period is also distressingly irregular, resulting in reduction of total lifetime milk production with lowering number of calves born per cow. As the generation interval is increased, the rate of genetic gain is also slow, jeopardising the economie interests. Obtaining cross-bred progeny (through A.I.) from the non-descript cows is also directly proportional to the erratic reproductive efficiency of the N.D. dams of poor and assorted genetic make-up. It is allied to rcovering metal from the scrap fed in Mini-steel Plants. (Kaikini, 1975). The causes of infertility are very many but the most common which are encountered in the field, besides malnutrition, are Abnormal behaviour; Functional disorders of gonads; Anovular heats, Sub-oestrus (Silent heat), Post-Partum anoestrum (in buffaloes) and Repeat breeding problem.

Behaviour: Kaikini *et al*, (1977) reported infertility in 350 local (N.D.) cows studied by them, which was due to abnormal excited oestrus behaviour ranging from kicking bull/teaser bull to kicking when mounted and throwing body down during service or insemination. Such cows (15%) had to be inseminated in recumbent position only.

Anovular heats: In our studies based on 500 local (N.D.) cows of University Heifer Project at Borgaon (Akola), anovular heats were recorded in 24% of the animals that came in heat resulting in repeat breeding (Kaikini, 1975). Similar findings have been reported by Khan and Luktuke (1967) and Deshpande and Deopurkar (1981). According to Van Rensburg (1962) many of the early Post-Partum heats are accompanied by a high incidence of anovular heats (34%) or delayed ovulations (66%) which is due to inadequate L.H. level. Delayed ovulation may be due to impairment of Gn-RH release (Pendse *et al*, 1977).

Functional Disorders: Kadu *et al* (1976) recorded a higher incidence of functional reproductive disorders in rural cattle (71.3%) than in farm cows (29.8%). Infections were more frequent in farm cattle (41.0%) than in rural field cattle (2.0%), in which genital abnormalities were higher (25.94%) as against nil in farm animals.

It is reported that about 10% to 15% dairy cows manifest abnormal ovarian activity during 1 to 2 months post- partum These functional disorders lead to repeat breeding (Casida, 1961; Britt, 1975). In early Post-Partum period, there is a relatively higher occurrence of silent oestrus (18.0%) accompanied by ovulation. Since such heats are not detected in time, inseminations are not synchronised with the proper stage of heat resulting in repeat breeding. Results of such various studies indicate that when 60% to 88%

Post-Partum cows classified as sub-oestrus are treated with luteolytic agents, fertile inseminations may result (Kadu & Kaikini, 1976).

Sub oestrus (Silent heat): is common in buffaloes (20% to 40%) with normal cyclical changes and unobserved oestrus. Various hormonal therapies have been used for treating sub-oestrus in buffaloes with encouraging results such as Estrumate I.M. (Rao and Rao, 1978, 1979a), Prosolvin Intervet (Chede, 1989).

Anoestrum: It is observed that about 10% to 15% cases with history of not coming in heat, presented in the Veterinary Clinics and Animal Health Camps turn out to be cases of normal pregnancy in the 1st or 2nd trimester of gestation period. In cases of true anoestrum, the animal is empty (non-pregnant) with the gonads smooth and oval/round giving no palpable evidence of either follicular or luteal activity. The problem of post-partum anoestrum is of major importance in buffaloes in which it is more acute than in the cows.

The post-partum fertile oestrus interval and inter-calving period is considerably long in buffaloes than in cows. Bansal (1976) recorded incidence of reproductive disorders ranging from 6.20% to 12.50%, of which anoestrum accounted for 56.82% to 70.57% of the total disorders.

Blood inorganic phosphorus, calcium and haemoglobin values were significantly lower in anoestrous buffaloes than in cycling or pregnant buffaloes. Kumar and Purbey (1984) observed that the post-partum oestrus interval in rural buffaloes was 10.25 months on an average.

El-Hariri *et al*, 1980) recorded increase in fertility of stallfed buffalo Heifers fed basic ration supplemented with 20g. milk powder plus 1g. Potassium iodide and 100g. iodine every alternate day. 90% experimental Heifers manifested oestrus with C.R. of 80%, as against nil in the control group. Bhatia *et al*, (1984) observed beneficial effect of dicalcium phosphate supplementation on anoestrum in buffalo cows. Oestrus was exhibited in 60% of the cases, of which 50% conceived.

Clomiphene citrate: Kaikini et al (1977) found Fertivet-FVT 300 (Ar- Ex. Labs., Bombay) therapy useful for activating anoestrus gonads (80%) in non-descript cows with resultant ovulation. Deshpande *et al*, (1976) reported excellent results (73.33%) of Fertivet therapy for induction of heat in anoestrous bufaloes. Hukeri et al (1979) found Fertivet oral therapy effective to induce oestrus in 85.72% of the treated group, with oestrus manifestation in 11.13 days (Av.). Kodagali *et al*, (1982) found intra-abomasal injection of Fertivet 600 to 1800mg. to be 100% effective for oestrus induction with ovulation in anoestrous buffaloes. Pattabi Raman et al (1983) reported intra-vaginal administration of Fertivet comparable to oral administration of the drug.

'Prajana' therapy: Rao and Keshavamurty (1971) reported efficacy of Prajana therapy for anoestrus in buffalo cows and heifers, with induced oestrus in 84.78% cases with C.R. of 72.72% for buffaloes. Porwal *et al* (1976) found Prajana therapy superior to Lugol's iodine application to os uteri and addition of 'Supermindif' to the feed of anoestrous buffaloes. Shah *et al*, (1983) obtained statistically significant results with Prajana therapy in 56 anoestrus buffaloes treated by them.

Deshpande (1983) found Aloes Compound (Messrs. Alarsin Co., Bombay) oral therapy suitable as ovarian activator in

anoestrous buffaloes. Of the 40 cases treated by him, 25 manifested oestrus within 20 days (16 within 7 days), 15 of which conceived.

Derashri and Kodagali (1984) administered triple sulphate mixture to nine anoestrus buffalues, oi which four came in heat and two remained pregnant.

Sohoni (1967) observed oestrus 4 to 7 days following enucleation of corpus luteum (C.L.) in 75% of the buffaloes so treated, without any complicatiuns such as fatal bleeding or development of tympany.

Repeat Breeding is the most common reproductive disorder in dairy cows and buffaloes irrespective of organised farms or field animals. It can only be dealt with by proper and timely reproduction management practices. The exact cause of repeat breeding (RB) problem is still an enigma in many cases. Hence RB is termed as idiopathic or unexplained infertility. In spite of best efforts, diagnosis and therapy, about 20% to 30% repeat breeders may still remain or continue as problem cases, necessitating their culling on economic grounds (Kaikini, 1983).

Management of Repeat Breeder Problem

In repeat breeders due to functional disorders, it is imperative to follow-up the sexual health control programme very rigidly. Gynaeco-Clinical examination of the animal at 24 hourly interval is essential to diagnose the time of ovulation and ovular or anovular heats. A critical study of the individual cases is essential. Regular monitoring of field cases is a must since casual diagnosis and therapy only once at the Clinic or Animal Health Camp will not serve the purpose.

Improper and negligent managemental regime is a major contributory factor of infertility in field cattle and buffaloes. Optimum managemental practices such as adequate feeding, watering, exercise, timely and complete milking, animal and byre hygiene, prevention of venereal infections, care during pregnancy, parturition and puerperium go a long way in alleviating the 'stress' conditions and help in maintenance of good fertility. It is necessary to educate the farmers and livestock owners regarding the importance of breeding hygiene, prophylaxis, detection of heats, periodical gynaeco-clinical check-up and maintenance of records of their cows.

Hormonal Therapy For Enhancing Reproductive Efficiency

Late Maturity, Prolonged post-partum anoestrus and a high incidence of sub-oestrus (silent heat) resulting in low fertility are the most chronic and frustating problems confronting veterinary gynaecologists in bovine reproduction. Recent reports indicate that such conditions could be corrected with judicious hormonal therapy for fertility improvement, provided the animals are fed properly and managed optimally. However, the major constraints are the cost of hormones, non-availability of commercial preparations with ease and lack of facilities for quick hormone assays to determine the endocrine status of the case prior to, during and following hormonal therapy which are vital for monitoring the response.

The major thrust should be to set up milk progesterone assay (Dip Stick) facilities for monitoring the ovarian activity and for detection of oestrus including weak/ silent heats, early embryonic mortality (E.E.M.) and early pregnancy in cows and buffaloes.

Appointment Breeding With Oestrous Synchronisation

Progestagens have been used with varying degree of success. Preparations such as Cronolene intra-vaginal Pessaries (Searle

& Co., U.K.); Norgestomet (Synchromet B-Intervet Sa France); PRID (Progesterone Releasing Intra-vaginal Device M/s CEVA, France) and Prostaglandin F_2 Alpha (Estrumate I.C.I., U.K.; Cloprostenol) are used by various workers with encouraging results. These results indicate that oestrus synchronisation is a feasible practical proposition to facilitate appointment breeding of herds of village buffaloes and also overcome the major problem of oestrus detection in this species. Whereas 100% synchronisation and a very high C.R. (52.5%) is seen after Prostaglandin F_2 Alpha therapy, near optimal C.R. is achieved with Norgestomet or PRID during lean season or Cronolene during peak season is associated with low C.R. of 25% and 31.3% respectively, the latter obviously due to prolonged (21 days) progestagen treatment. (Rao, 1982; Rao and Rao, 1977, 1978, 1979 and 1983).

Chede (1989) studied 41 rural buffaloes with long standing anoestrus in villages around Akola. They were treated on Day 1 with Synchromate B ear implant and 2 ml. injectable containing Norgestomet and Oestradiol Valerate. On Day 10 implant was removed and PMSG (Chronogest Intervet) 600 I.U. was administered I.M. The animals were inseminated at the set time of 48 to 60 hours post-implant removal. Although all 41 (100%) buffaloes had palpable mature follicles on their ovaries, only 34 (82.89%) manifested heat symptoms and 29 (70.73%) ovulated. 17 (41.63%) buffaloes conceived at first service. Of the remaining 24 buffaloes, 21 continued to show cyclicity and 19 (41.34%) conceived within the next three services.

Short term Progestagen treatment for induction of ovulatory oestrus and fertility using Norgestomet and PRID plus PMSG therapy in lactating true anoestrous buffaloes with considerable success has been reported by several workers. (Rao and Rao, 1979b; Narasimha Rao et al, 1985, 1987; Narasimha Rao and Sreemannarayana, 1983).

The short term progestagen therapy in particular seems highly valuable with 90% to 100% buffaloes responding to treatment within 2 to 5 days, irrespective of the season. The modified regimen that combines Norgestomet + PMSG + Prostaglandin F_2 Alpha and excludes Norgestomet + Oestradiol Valerate injection appears to be the most ideal and effective remedy for earlier synchronous onset of behavioural oestrus, near optimal C.R., cyclicity after treatment and shorter interval to conception. Whereas, PMSG stimulates follicular growth in true anoestrous buffaloes, Prostaglandin F_2 Alpha seems essential to provide necessary precision for better control of oestrus and ovulation timings.

Fertility Improvement

GnRH definitely improves C.R. in buffaloes (Rao and Rao, 1979a). Out of 372 buffaloes studied, alternate animal was administered Receptal 5ml. I.M. injection immediately after A.I. in a veterinary clinic the C.R. improved significantly over controls (53.4% Vs 32.3%; $P<0.01$) which is due to the beneficial effect of GnRH on regulation of ovulation timing and should therefore be immensely valuable in improving the fertility in the lowly fertile buffalo.

REFERENCES

Bansal, R.S. (1976): Thesis Abstr. **11** (4): 295, 296.

Bhatia, S.K.; Takkar, O.P.; Chauhan, F.S. and Singh, M. (1984): Proc. 5th. National Congress on Anim. Reprod., Pantnagar. (U.P.).

Bhattacharya, P. (1954): Annual Report, Division of Animal Genetics, IVRI, Izatnagar-243122. (U.P.)

Britt, J.H. (1975): Early Post-Partum breeding in Dairy Cows — A Review — J. Dairy Sci. **58** (2): 266-271.
Casida, L.E.A. (1961): Present status of repeat breeder cow problem — J. Dairy Sci. **44** (12): 2323.
Chede, S.A. (1989): Personal Communication.
Chhikara, B.S.; Balaine, D.S.; Chaudhary, S.R. and Chopra, S.C. (1978): Indian J. Dairy Sci. 31: 292-293.
Deshpande, A.D. (1983): Indian Vet. J. **60** (9): 758-760.
Deshpande, B.R. (1983): Importance of functional factors in repeat breeders — Compendium of National level ICAR Summer Institute on Repeat Breeding in Cattle, June 6-30, 1983., PKV, Akola-444 104.
Deshpande, B.R. and Deopurkar, V.L. (1981): Cited by Deshpande, B.R. (1983).
Deshpande, B.R.; Hukeri, V.B.; Velhankar, D.P. and Sane, C.R. (1976): Indian Vet. J. **53** (7): 561-563.
Derashri, H.J. and Kodagali, S.B. (1984): Proc. 5th. National Congress on Anim. Reprod., Pantnagar (U.P.)
Dobson, H. and Kamonpatana, M. (1986): J. Reprod. Fert. **77** (1): 36.
El-Hariri, M.N.; Awad, H.H. and El-Fadaly, M.A. (1980): J. Egypt Vet. Med. Assn. **40** (3): 89-96.
Hukeri, V.B.; Ansari, M.N. and Deshpande, B.R. (1979): Indian Vet. J. **56** (11): 958-961.
Kadu, M.S. and Kaikini, A.S. (1976): Studies on Post-Partum oestrus in Sahiwal cows - Maharashtra Agri. Univ. J. **2** (6): 139-147.
Kadu, M.S.; Belorkar, P.M.; Bhandari, R.M. and Khire, D.W. (1976): Reproductive disorders in cattle and buffaloes under field and farm conditions of eastern Maharashtra - Mahavet **3** 3-5.
Kaikini, A.S. (1967): Problems of Reproduction in cattle and buffaloes in India. Lead Paper Proc. Special Vet. Seminar Pfizer Ltd. with Maharashtra Vet. Assn. and Bombay Vet. Club, Bombay. Nov. 26, 1967.
Kaikini, A.S. (1975): Infertility in Animals — Proc. Seminar, ICMR Institute of Res in Reprod., Parel, Bombay-440 012.
Kaikini, A.S. (1983): Repeat Breeding in Cattle — An Enigma. — Compendium Proc. National level ICAR Summer Institute on Repeat Breeding in Cattle, June 6-30, 1983. PKV, Akola-444 104.
Kaikini, A.S.; Pargaonkar, D.R. and Dindorkar, C.V. (1977a): Studies on oestrus and oestrous cycle in non-descript (Native) cows — Proc. 1st Asian Congr. Fertil. & Steril., Bombay, Feb. 19-24, 1977.
Kaikini, A.S.; Pargaonkar, D.R. and Dindorkar, C.V. (1977b): Break-through therapy for anoestrum in cattle — Indian Vet. J. **54**: 667-672.
Khan, B.U. and Luktuke, S.N. (1967): Studies on the incidence of anoestrum and repeat breeding in Hariana cattale — Indian Vet. J. **44**: 678-683.
Kodagali, S.B.; Nema, S.P.; Kavani, F.S. and Derashri, H.J. (1982): Indian Vet. J. **59** (7): 535-537.
Kumar, S. and Purbey, L.N. (1984): Proc. 5th National Congr. Anim. Reprod., Pantnagar. (U.P.)
Lagerlof, N. (1954): Report to the Govt. of India on A.I., Sexual health control and Vet. Education — F.A.O. of United Nations, Terme de Caracalla, Italy, Rome.
Narsimha Rao, A.V.; Sreemannarayana, O. and Prabhakar Rao, K. (1985): Anim. Reprod. Sci. **8**: 129.
Narsimha Rao, A.V.; Sreemannarayana, O. and Kumari; G.L. (1987): Buffalo J. :Suppl. 1:61..
Narsimha Rao, A.V.; Sreemannarayana O. (1983): Theriogenology **18** (3): 305-310.
Osman, A.M. (1984): J. Egyptian Vet. Med. Assn. **44**: 85-95.
Pattabiraman, S.R.; Sheshagiri, V.N.; Devnathan, T.G. and Thangaraj, T.N. (1983):Indian J. Anim. Reprod. **3** (1): 73.
Pendse, M.D.; Kulkarni, P.D. and Sohoni, A.D. (1977): Use of Fertivet for treatment of repeat breeding cow in organised herd at Aarey Milk Colony, Bombay. — Indian Vet. J. **54**: 69-72.
Porwal, M.L.; Saxena, H.K.; Srivastava, A.M. and Karandikar, G.W. (1976): Indian Vet. J. **53** (6): 435-437.
Rao, R.M. and Rao, V.S. (1977): Indian Vet. J. **54** (3): 229-230.
Rao, A.R. and Rao, V.S. (1978): Vet. Rec. **103**: 288.
Rao, A.R. and Rao, S.V. (1979a): Vet. Rec. **105**: 168-169
Rao, A.R. and Rao, S.V. (1979b): Vet. Rec. **105**: 256.
Rao, N.M. (1982): Indian J. Anim. Reprod. **2** (1): 12-14.
Rao, A.R. and Chalapati Rao Ch. (1983): Vet. Rec. **113**: 623.
Rao, A.V.N. and Keshavamurty, A. (1971): Indian Vet. J. **48** (10): 1007-1114.
Shah, I.M.; Kavani, F.S. and Kodagali, S.B. (1983): Indian J. Anim. Reprod. **3** (1): 70.
Sohoni, A.D. (1967): FAO/SIDA Compendium of Post-Graduate Courses in Animal Reproduction, Royal Vet. College, Stockholm. (Sweden).
Van Rensburg, S.W. (1962): Ovulatory failure in Bovine — Oonderstepoort J. Vet. Res.: 29-35.
Young, G.B.; Lee, G.F.; Waddington, D.; Sales, D.L.; Bradley, J.S. and Spooner, R.I. (1983): Vet. Rec. **113**: 107-111.

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Studies On Hormonal Profiles Of Non-Descript Cows During Various Phases Of Reproduction

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ABSTRACT

Hormonal profiles of Non-Descript Cows have been studied during various phases of reproduction and also in true anoestrus cases. The levels of different hormones were estimated on day 1, 3, 10, 18, 45, 150, 240 and 5th day post-partum completing all the phases of reproduction. The levels of FSH, LH, Prolactin and Progesterone hormones ranged between 30.83 to 82.55, 1.38 to 5.35, 154 to 1000 and 0.23 to 5.92 ng/ml. respectively in normal fertile cows where as, the levels were 33.57 ng/ml. below measurable limits, 464.33 ng/ml. and below measurable limits in true anoestrum cases respectively. Hormonal profiles of Non-Descript cows have been studied and reported for the first time in the country.

* * *

Majority of the cows (about 80 per cent) in the country are Non-Discript. They have assorted genetic make-up and are with weak endocrine constitution (Lagerlof, 1954). These cows are being used on mass scale for cross-breeding programme with the objective of genetic improvement in their progeny. Anoestrus gonads is the main problem with these cows. Animals though apparently normal, fail to manifest oestrus cycle at regular intervals.

No data is available on the circulating hormonal levels in farmer owned native cows in the country. Hence, estimations of circulating levels of FSH, LH, prolactin and progesterone hormones were undertaken. The studies may help in formulating better approach to deal with true anoestrus problem of majority of the cows in the country.

Materials and Methods

The herd of 375 Non-Descript (N.D.) cows/ heifers was subjected to regular Gynaeco-clinical examination at the University Central Research Farm Borgaon (Akola). The animals were then sorted out as normal fertile animals and the other group of 137 comprised of true anoestrum cows.

Hormonal profiles of these cows was studied by Radio-Immuno Assay (RIA) technique at the Institute for Research in Reproduction (ICMR) Bombay. The blood serum samples were collected, labelled and preserved at -20°C until processed for Follicle Stimulating Hormone (FSH), Leutinising Hormone (LH), Prolactin and Progesterone estimations. For normal fertile animals the blood serum samples were collected on Day 1, Day 3, Day 10, Day 18, and if pregnant on Day 45, Day 150, Day 240 and on 5th day following parturition. From 137 anoestrus cows, blood serum samples were collected once only for studying their hormonal profile. Thus the hormonal profile was studied during the entire phases of reproduction in Non-

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Table 1. Details of average hormonal levels of normal fertile and true anoestrus Non-Descript cows during various phases of reproduction.

Hormones	No. of Animals	Various phases of Reproduction in normal fertile cows								Anoestrus cows	
		Day 1	Day 3	Day 10	Day 18	Day 45	Day 150	Day 240	Day 5th post-partum	No. of Animals	True anoestrus stage
FSH (ng/ml.)	6	82.55	68.13	54.97	38.75	37.92	30.83	30.25	35.57	6	33.57
LH (ng/ml.)	6	4.5	5.35	3.00	3.03	1.58	2.17	2.17	2.78	6	below measurable limits.
Prolactin (ng/ml.)	6	238.83	189.67	304.67	285.00	237.00	358.50	273.00	272.50	6	464.33
Progesterone ng/ml.	6	0.23	0.92	1.7	2.07	2.65	3.77	5.9	0.23	6	below measurable limits.

Descript cows. FSH, LH, prolactin and progesterone levels were estimated in ng/ml. by RIA technique during various phases of reproduction in normal fertile cows and of true anoestrus cows, as per the methods of Greenwood *et al.* (1963) and Midgley (1966), with slight modifications. Statistical treatment as per Snedecor and Cochran (1967) was given to the data obtained from hormonal estimations.

Results and Discussion

Different hormonal levels estimated (in ng/ml.) by R.I.A. technique during various phases of reproduction in Non-Descript cows are presented in Table 1. The mean levels of blood serum FSH were found to be ranging between 30.83 to 82.55 ng/ml. and 22.5 to 53.5 ng/ml. in fertile and Anoestrus cows, respectively. FSH levels averaged 82.55 ng/ml. and 33.57 ng/ml. on day of oestrus in normal fertile cows and true anoestrus cows, respectively. It was interesting to note that in true anoestrus condition though there were no palpable follicles, yet the blood serum FSH levels were appreciable. Significant differences were observed during various phases of reproduction. It was further observed that FSH levels for day 18, true anoestrum and day 45 were significantly lower than those on day 10 and more than day 3 and day 1, respectively.

No data on circulating levels of FSH in cows is available in general and for Indian cows in particular. The observations of the present studies regarding blood serum FSH levels on day 1 (Oestrus) are in agreement with those of Akber *et al.* (1973), who reported 78 ± 8 ng/ml. levels of FSH in cows at oestrus.

The mean levels of blood serum LH were found to be ranging between 1.38 to 5.35 ng/ml. in normal fertile cows and below measurable limits in true anoestrum cows. There were significant differences in LH levels during various phases of reproduction. It was further observed that the LH levels were significantly low during advanced stage of pregnancy. It was also found that LH levels were significantly high during day 1, day 3, day 10 compared to other phases of reproduction.

The blood serum L.H. levels were found to be much lower on the day of estrus than those reported by Henricks *et al.* (1967); Kiddy and Odell (1969); Spraugh *et al.* (1971); Carr (1972); Trebble (1973); Ariji *et al.* (1974); Hale (1974) and Wiltbank (1974) who reported the values as 40.4, 14.5, 61.0, 20-120, 65.0, 8-60 and 42.42 ng/ml. in exotic cows. High levels of LH observed in exotic cows by various workers may be due to genetic variations, better plane of nutrition and strong endocrine constitution of those cows. However, the values obtained in present studies are in agreement with those of Kodagali (1978), who reported similar levels of LH in Gir cows.

The mean levels of blood serum prolactin were found to be ranging between 189.67 to 358.5 ng/ml. in normal fertile cows and 154 to 1,000 ng/ml. in anoestrus cows. It was interesting to note that there were no significant differences in hormonal levels between the various phases of reproduction. However, the levels were significantly higher in true anoestrus cows.

Data on circulating levels of blood serum prolactin hormone is not available. The values observed on day 1, (Oestrus) under the present studies are in agreement with Ariji *et al.* (1974) and Woodland *et al.* (1974), who reported prolactin values of 15 to 300 and 200 ng/ml., respectively.

The mean levels of blood serum progesterone were found to be ranging between 0.23 to 5.92 ng/ml. in normal fertile

cows but below measurable limits in true anoestrus cases. The levels from true anoestrum cases and day 1 and post-parturient samples were significantly lower than during all other phases of reproduction. It was also observed that the levels on day 18 were significantly high for cows, which on further followup were found to be pregnant.

The levels observed on day 1 (Oestrus) were in agreement with Stebenfeldt *et al.* (1969), Donaldson *et al.* (1970), Robertson (1972), Wettermann (1973) and Dobrawslski (1974), who all have reported 0.1 to 0.4 ng/ml. progesterone level on day 1 of the cycle. The progesterone levels observed during first 3 days of the cycle and on day 18 for pregnant cows in the present studies are in agreement with those of Agrawal *et al.* (1977) for Haryana cows.

Findings of the present studies regarding LH and progesterone levels below measurable limits and prolactin exceptionally high, indicate the possibility of a vicious circle between these hormones and ovarian activity. It appears that animals with poor body condition under stress manifest such type of hormonal profile leading to anoestrus condition. However, the influence of high levels of prolactin in true anoestrus cases needs further investigation.

REFERENCES

Agarwal, S.A.; Rahman, S.A.; Lumas, K.R.; Agarwal, V.K. and Ahmed, A. (1977): Studies on steroid hormones. Progesterone concentration in the blood serum of Zebu cows during oestrus cycle. Indian J. Anim. Sci. **47**: 715-719.

Akbar, A.M.; Nett, T.M. and Niswender, G.D. (1973): Radioimmuno-assay of FSH. Endocrinol. **51**: 66-69.

Ariji, G.R.; Wiltbank, J.N. and Hopwood, M.L. (1974): Hormone levels in pre-parturient beef cows. J. Anim. Sci. **39**: 338.

Carr, W.R. (1971): Plasma LH levels in cows during the oestrus cycle. J. Reprod. Fert. **27**: 141.

Dobrowalski, W.; Snochowski, M. and Stszkiewicz, M. (1974): Progesterone content of the peripheral blood of cow during the oestrus cycle. Vet. Bull. **44** (9): 4756.

Donaldson, L.E.; Bassett, J.M. and Thorburn, C.D. (1970): Peripheral plasma progesterone concentration of cows. Endocrinol. **48**: 599-614.

Greenwood, F.C.; Hunter, W.M. and Glover, C.J.S. (1963): The preparation of I 125 labelled HCG of high specific activity Biochem. J. **89**: 114.

Hale, D.H. (1974): Peripheral plasma LH levels in cows. South Afric. J. Anim. Sci. **4**: 51.

Henricks, D.M.; Dickey, J.F. Anderson, L.L. and Guthrie, H.D. (1969): Progesterone in systemic and ovarian venous blood and corpora lutea of cycling cows. Exp. Biol. 26: 366.

Kiddy, C.A. and Odell, W.D. (1969): RIA of blood TLH at oestrus and ovulation in cattle. Paper presented at Ann. Meet. Amer. Soci. Anim. Sci. Indiana-1969.

Kodagali, S.B. (1978): Environmental influence on ovarian activity in Gir cows and trials with 'Fertivet' in post-partum anoestrus condition. MVSc. Thesis, K.K.V. Dapoli 1978.

Lagerlof, N. (1954): Report to the Government of India on A.I. Sexual Health Control and Veterinary Education Pub. F.A.O. Rome, Italy.

Midglay, A.R. (1966): Radioimmuno-assay: A method of HCG estimation. Endocrinol. **79**: 10-18.

Robertson, H.A. (1972): Segmental changes in plasma progesterone in the cow during the oestrus cycle, pregnancy and at parturition. Can. J. Anim. Sci. **52**: 645-658.

Snedecor, G.W. and Cochran, W.G. (1967): Statistical Methods. 6th Edn. Oxford and IBH Pub. Co. Bombay.

Sprague, E.A.; Hopwood, M.L. and Niswender, G.D. (1971): Progesterone and LH levels in peripheral blood of cycling beef cows. J. Anim. Sci. **33**: 199.

Stebenfeldt, G.H.; Ewing, L.L. and MacDonald, L.E. (1969): Peripheral plasma progesterone levels during the bovine oestrus cycle J. Reprod. Fert. **19**: 433.

Treeble, R.L.; Sorenson, A.M.; Woodword, T.L.; Comer J.S.; Boverly, J.R. and Flooger, J.L. (1973): Serum progestins and LH levels in non-suckled primiparous hiefers Nature **246**: 494.

Wettermann, R.P. (1973): LH Prolactin Estradiol and Progesterone in bovine blood serum during early pregnancy J. Anim. Sci. **36** (1): 51-56.

Wiltbank, J.N. and Hoopwood, N.L. (1974): Hormone levels in pre and post-parturient beef cows J. Anim. **39**: 338-347.

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Plasma Progesterone Levels During Estrous Cycle And Early Pregnancy In Deccani Ewes*

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ABSTRACT

Changes in the concentration of progesterone hormone were measured by radioimmunoassay (RIA) in the jugular venous plasma of six Deccani ewes throughout the estrous cycle and during the first 60 days of gestation in five Deccani ewes.

The level of progesterone exhibited an ascending trend from the basal levels noticed on estrus day to post-estrus day 8 (0.26 to 2.25 ng/ml.). The plasma progesterone levels remained steady from post-estrus day 8 to 14 with a mean peak value of 3.23 ng/ml. on day 13.7 exhibiting a rapid decline from post-estrus day 14 to the day of subsequent estrus. Similar trend to that of the cycling ewes till day 14 was noticed in pregnant ewes. Subsequently, the levels rose up and maintained a plateau till day 20, with a second spurt in the progesterone level upto the end of day 60 of gestation.

* * *

Several investigators in the West have reported the concentration of progesterone in peripheral or ovarian venous plasma of sheep during the estrous cycle and pregnancy (Bassett *et al.*, 1969; Robertson and Sarada, 1971; Sarada *et al.*, 1973; Emady *et al.*, 1974; Ammar-Khodja *et al.*, 1976; McDonnel, 1976; Pant *et al.*, 1977; Quirke *et al.*, 1979; Shemesh *et al.*, 1979; Botha and Morgenthal, 1980; Schams *et al.*, 1982 and Oyedipe *et al.*, 1986). However, little information is available on the progesterone levels in the Indian breeds of ewe. Reddy (1981) measured the levels of progesterone hormone in cycling and pregnant ewes of Nellore breed. An elucidation and comparison of the progesterone profiles in native ewes prompted the undertaking of this study.

Materials and Methods

(i) *Animals*: Progesterone profiles in six cycling and five pregnant Deccani ewes were determined. Two estrous cycles were allowed to pass before the commencement of plasma collection schedule. The ewes were tested for the manifestation of estrus at six hourly intervals by teasing with a vasectomised ram. The first positive acceptance was taken as the onset of estrus and designated as day 'O' and the time as 'O' hour.

(ii) *Sample collection schedule:* The plasma samples were obtained from the blood collected by vene-puncture at 12 hourly intervals from post-estrus day 14 uptil the onset of estrus. The samples were collected at four hourly intervals from the onset of estrus uptil the next 36 hours. Subsequent to 4 hourly collection schedule, the collections were obtained once daily uptil the onset of next estrus.

Plasma samples from ewes that were mated with a fertile ram were discarded when the mated ewes exhibited heat within 20 days after mating. The collection of plasma

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samples was continued on alternate days uptil day 60 of pregnancy in the remaining ewes presumed to be settled. The pregnancy was confirmed at three months of gestation by abdominal ballotment method. The plama samples from five pregnant ewes were retained for establishing the progesterone concentration subsequent to the confirmation of pregnancy status. Immediately after the separation of plasma, a drop of 0.01 per cent thiomersol per ml. of plasma was added and stored at -20°C.

(iii) *Progesterone assay*: RIA for progesterone was carried out by adopting the procedure of Perez (1979). The buffers and other solutions were prepared as per Orczyk *et al.* (1974) and Perez (1979).

Results and Discussion

Estrus (day 'O' of the cycle) was defined as the day on which the lowest concentration of progesterone was recorded (Table 1).

The decline in progesterone levels commencing around three days earlier to the subsequent heat (day 14 of the estrous cycle), reached the lowest level at about the middle of the heat period (Fig. 1). Subsequently the progesterone levels ascended till day 8 of the cycle. The progesterone levels exhibited a plateau from around day 8 to 11 of the estrous cycle. Subsequent to this level, the progesterone concentration rose uptil day 14 of the cycle. The maximum progesterone level of about 3.23 ng/ml. of plasma was detected around day 14 of the cycle.

The progesterone levels on the day of estrus, time of commencement of ascendancy, duration of ascendancy, attainment of plateau, duration of plateau, maximum levels of progesterone and its relationship of time to estrus, the descent of progesterone levels and basal levels of progesterone are depicted in Table 1.

The pattern of distribution of progesterone concentration observed during the 17 day cycle was similar to that observed by Pant *et al.* (1977); Quirke *et al.* (1979); Botha and Morgenthal (1980); Reddy (1981); Schams *et al.* (1982) and Oyedipe *et al.* (1986).

The Plasma progesterone profile in pregnant ewes was found to be similar to that of cycling ewes uptil day 14 of the cycle (Fig. 2). The circulating progesterone levels declined from day 14 in unmated ewes, whereas, a progressive increase in the progesterone levels was evident uptil day 60 of gestatiun in mated ewes. The mean progesterone levels in peripheral circulation on day of éstrus and periodically at an interval of ten days uptil day 60 of gestation are presented in Table 2.

The trend of plasma progesterone concentraion in pregnant ewes was found to be identical with the observations of other investigators (Bassett *et al.*, 1969; Robertson and Sarda, 1971; Sarda *et al.*, 1973; Emady *et al.*, 1974; Amar-Khodja *et al.*, 1976; McDonnel, 1976 and Shemesh *et al.*, 1979). The ascendancy of progesterone levels observed in pregnant ewes, in contrast to the descending trend recorded on day 14 of the cycling ewes, might be due to the perpetuation of the corpus luteum and its seeretory activity, as a result of cessation of production of $PGF_2 \alpha$ by tbe gravid uterus. The ascendancy of progesterone levels observed from day 13 to 60 might be due to the formation of the placenta as reported by McLaren (1980), indicating the initiation of incremental elevation of progesterone of the placental origin.

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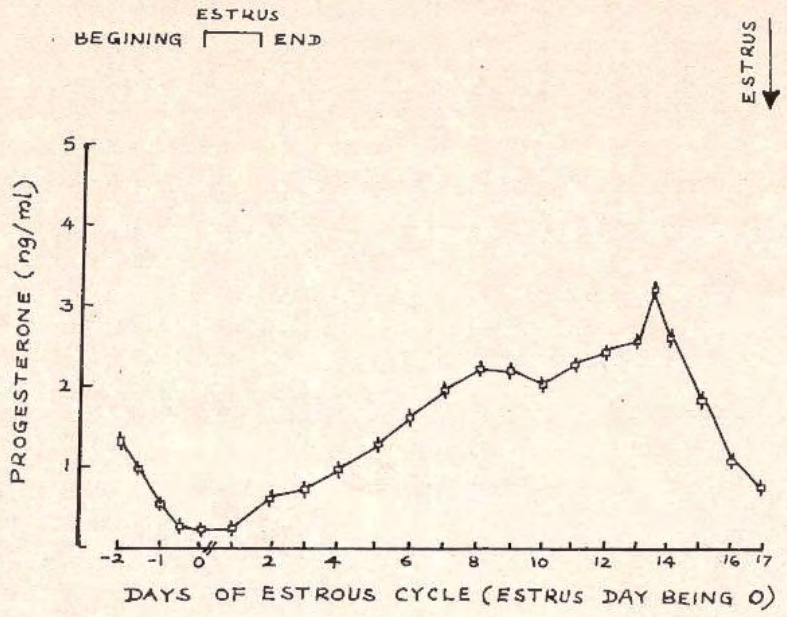

FIG 1 : Mean concentration in jugular vein plasma of Progesterone in six ewes during the estrous cycle.

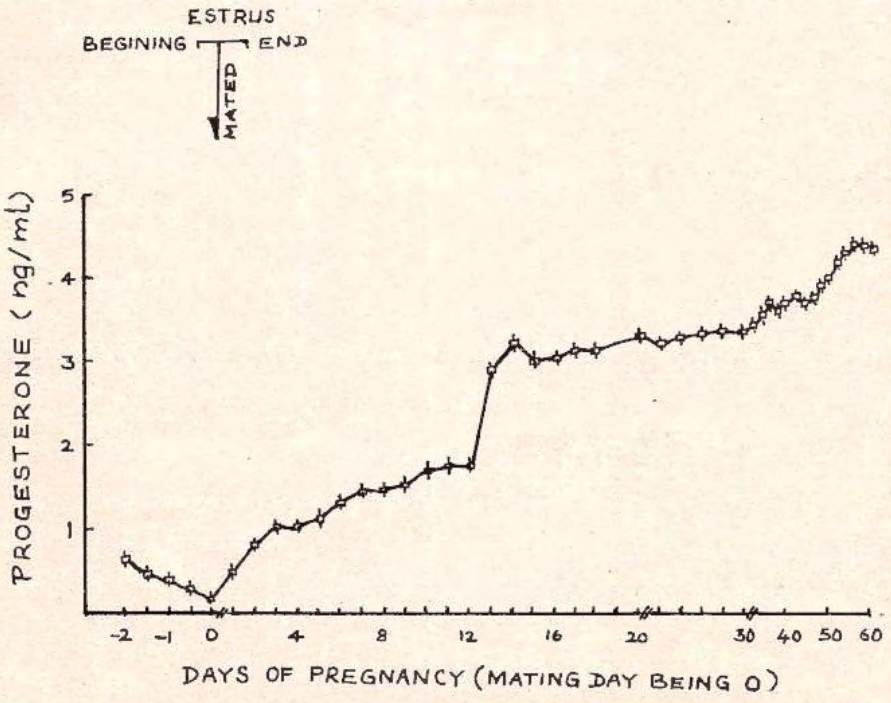

FIG 2 : Mean concentration in jugular vein plasma of Progesterone in five ewes during pregnancy.

Table 1: Mean plasma progesterone levels in peripheral circulation in ewes during estrous cycle

Ewe No.	At the commencement of Estrus (ng/ml)	Commencement of ascendancy of progesterone		Attainment of plateau (day)	Duration of ascendancy (day)	Duration of plateau (day)	Maximum levels of progesterone		Commencement of desdancy of progesterone (day)*	Basal level (ng/ml)
		Level (ng/ml)	Time** (day)				Level (ng/ml)	Time** (day)		
1	0.40	0.35	+1	+7	6	3	3.0	+13	-4	0.44
2	0.25	0.10	+1	+8	7	3	3.2	+14	-4	0.38
3	0.10	0.55	+1	+8	7	3	3.6	+13	-3	0.59
4	0.50	0.20	+1	+7	6	3	3.1	+15	-4	0.67
5	0.20	0.20	+1	+8	7	4	2.6	+13	-4	0.35
6	0.40	0.15	+1	+8	7	3	3.9	+14	-4	0.61
Mean	0.31	0.26	+1	7.67	6.67	3.17	3.23	13.67	-3.83	0.51
S.E.	±0.0611	±0.0614		±0.2108	±0.2108	±0.1667	±0.1874	±0.3333	±0.1667	±0.0546

* Progesterone concentration before the onset of estrus (Day 0 being the estrus day)

** Progesterone concentration after the onset of estrus (Day 0 being the estrus day)

Table 2: Plasma progesterone levels on estrus day, post-mating day 10 to 60 in pregnant ewes

Ewe No.	Plasma progesterone levels in ng/ml.						
	At the commencement of Estrus	on day 10	on day 20	on day 30	on day 40	on day 50	on day 60
1	0.40	2.50	3.80	3.65	3.50	4.00	4.40
2	0.10	1.55	2.95	3.20	3.70	4.35	4.90
3	0.15	1.50	3.30	3.10	3.60	3.75	4.65
4	0.10	1.40	3.50	3.80	4.30	4.40	4.75
5	0.30	1.85	2.90	3.10	3.40	3.60	4.30
Mean	0.21	1.76	3.29	3.37	3.70	4.02	4.60
S.E.	±0.0600	±0.1996	±0.1691	±0.1480	±0.1581	±0.1586	±0.1107

REFERENCES

Ammar-Khodja, F.; Darbeida, H.; Frik, L.; Akchiche, O.; Bouaoud, F. and Brudieux, R. (1976). Variation in blood progesterone level during the oestrous cycle and early pregnancy in Tadmit ewes. Anim. Breed. Abstr. **47**: 5514.

Bassett, J.M.; Oxborrow, T.J.; Smith, I.D. and Thorburn, G.D. (1969): The concentration of progesterone in the peripheral plasma of the pregnant ewe. J. Endocr., **45**: 449-457.

Botha, H.K. and Morgenthal, J.C. (1980): Progesterone concentration in the blood plasma of South African Mutton Merino ewes. Anim. Breed. Abstr., **50**: 264.

Emady, M., Hadley, J.C., Noakes, D.E. and Arthur, G.H. (1974): Progesterone level in the peripheral blood of pregnant ewes. Vet. Rec. **95**: 168-169.

McDonnel, H. (1976): Peripheral plasma progesterone in the ewe: its application to the diagnosis of early pregnancy following oestrus synchronization treatment. Vet. Bull. **46**: 4647.

McLaren, A. (1980): Fertilization, cleavage and implantation. In: "Reproduction in Farm Animals". Hafez, E.S.E., 4th Edn. Lea & Febiger, Philadelphia. P. 243.

Orczyk, G.P., Richene, M., Glemarth and Behrmas, M.N. (1974): RIA of progesterone. In "Methods of hormone radioimmunoassay". Cited by Jeffe, B.N. and Behram, M.N., Academic Press,New York and London. P. 347.

Oyedipe, E.O., Pathiraja, N., Edquist, L.E. and Buvanendran, V. (1986): Onset of puberty and estrous cycle phenomena in yankasa ewes as monitored by plasma progesterone concentrations. Anim. Reprod. Sci., **12**: 195-199.

Pant, H.C.; Hopkinson, C.R.N. and Fitzpatrick, R.J. (1977): Concentrations of oestradiol, progesterone, luteinizing hormone and follicle stimulating hormone in the jugular venous plasma of ewes during the oestrous cycle. J. Endocr., **73**: 247-255.

Perez, R.C. (1979): Evaluation of progesterone radioimmunoassay and its application in Cuban cattle. Ph.D. thesis, Swedish Univ.Agri. Sci., Uppsala, Sweden.

Quirke, J.F.; Hanraham, J.P. and Gosling, J.P. (1981): Duration of oestrus, ovulation rate, time of ovulation and plasma LH, total estrogen and progesterone in galway adult ewes and ewe lambs. J. Reprod. Fertil., **61**: 265-272.

Reddy, K.P. (1981): Plasma progesterone levels during estrous cycle and early pregnancy in ewes. M.Sc. thesis. A.P. Agri. Univ., Hyderabad-500 030.

Robertson, H.A. and Sarda, I.R. (1971): A very early pregnancy test for mammals: Its application in the cow, ewe and sow. J. Endocr. **49**: 407-419.

Sarda, I.R., Robertson, H.A. and Smeaton, T.C. (1973): Sequential changes in plasma progesterone levels in the ewe during the oestrous cycle and during pregnancy in intact and ovariectomised sheep. Canad. J. Anim. Sci., **53**: 25-34.

Schams, D.; Lahlou-Kassi, A. and Glatzel, P. (1982): Oxytocin concentrations in peripheral blood during the oestrous cycle and after ovariectomy in two breeds of sheep with low and high fecundity. J. Endocr., **92**: 9-13.

Shemesh, M.; Ayalon, N. and Major, U. (1979): Early pregnancy diagnosis in the ewe, based on milk progesterone levels. J. Reprod. Fertil., **56**: 301-304.

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Effect Of Hormones On Superovulation And Embryo Recovery In Kids.

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ABSTRACT

Twentyfour nondescript kids of 2 to 4 months age were subjected to hormonal treatments of progesterone priming and no priming, two doses of PMSG @750 IU each I.M. at an interval of 24 hours and one or two I.V. doses of 1000 IU of H.C.G. All the kids exhibited oestrus within 72-96 hours of

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progesterone withdrawal. Oestrus in progesterone primed goats was intense as compared to non-primed goats. No significant differences ($P > 0.05$). were observed between the progesterone primed and nonprimed kids for mean number of unruptured follicles, ovulation rate and the number of ova recovered. However, there was increase in the number of matured (18.33) and ruptured follicles (15.0), ovulation percentage (81.82%) and decrease in the unruptured follicles (3.33) in goats receiving a second dose of H.C.G. A low fertilization rate (0-60%) was observed in all the kids.

* * *

Superovulation is an essential step in embryo transfer area to harvest a large crop of fertilized ova either for basic research or for transfer in the recipients. Superovulation in adult goats with hormonal treatments has been reported in literature (Agrawal,1986 and Indra Mani and Vadnere,, 1989) but such information in prepubertal goats is meagre. Induction of oestrus and multiovulation in young kids not only helps in reducing the generation interval but also in rapid multiplication of superior animals. With this aim in view, the present investigation was planned with different regimens of gonadotropins, progesterone priming and no priming to superovulate and harvest fertilized ova from prepubertal goats.

Materials and Methods

Twentyfour prepubertal nondescript goats of 2 to 4 months age comprised the experimental animals. The experiment was carried out during winter months. The prepubertal goats were divided into two groups, A and B. Group A animals were subjected to progesterone priming @ 10 mg/day/goat for 7 days intramuscularly (I.M.), while group B animals were not primed. Two doses of PMSG (Folligon, Intervet International, B.V , Holland) @ 750 IU/goat were administered 24 hours apart, one day after withdrawal of progesterone. HCG 1000 IU (Chorulon, Intervet International, B.V Holland) was administered intravenously 24 hours after appearance of oestrus (A1 and B1). One additional dose of HCG was administered on the following day to 4 goats in each A and B groups (A2 and B2). The goats were observed for signs of oestrus with the help of an approned buck and were bred naturally with short statured fertile buck two times in the oestrous period, 8-12 hours after the onset of oestrus. All the goats had the same managemental regimen. Laparotomy was performed 3-5 days after the onset of oestrus. The fertilized ova were used in another experiment of slow and rapid methods of cooling.

Results and Discussion

The results of different dose levels of gonadotropins, progesterone priming and no priming are depicted in Table 1. All the prepubertal goats exhibited oestrus 1-2 days after the second PMSG injection. The oestrus in progesterone primed goats was intense as compared to non-primed ones. Similar findings were reported by Reeves (1987) in ewe lambs. Differences between the two groups as regards mean number of unruptured follieles, ovulation rate and the number of ova recovered, were insignificant. These findings were contrary to those of Trounson *et al.* (1977) who recorded a correlation between the ovulation rate and the duration of progesterone priming. The percent ova recovery was however higher in progesterone primed group than the nonprimed group, which was also reported by Goerke *et al.* (1973) in lambs. However, they obtained a lower percentage of ova recovery in both the groups than in the present investigations.

The increase in the mean number of matured and ruptured follicles, percent ovulation and decrease in the mean number of unruptured follicles in groups A_2 and B_2 as compared to groups A_1 and B_1 is similar to the findings of Mansour (1959) in ewe lambs and possibly due to the effect of additional dose of HCG which is a potent ovulating hormone. The beneficial effect of second dose of HCG as apparent in the present experiment is because of probable absence of ovulation factor in lamb pituitary till 16 weeks of age (Mansour, 1959).

The lower fertilization rate in all the prepubertal goats could be due to the infantile state of the fallopian tubes and difficulty in breeding the goats naturally (Marden, 1953). Surgical insemination in to the uterus of the prepubertal goats could be the answer for improving the fertility rate. Lower fertilization was also reported by Black *et al.* (1953) and Jainudeen *et al.* (1956) in calves. It is thus concluded that prepubertal kids of 2 to 4 months of age could be successfully utilised for superovulation by use of gonadotropins.

Table 1: Superovulatory response of immature kids to hormonal treatments

Group	Type of hormonal treatment	Mean No. of matured follicles ± S.E.	Mean No. of corpora lutea / ruptured follicles ± S.E.	Mean No. of unruptured follicles ± S.E.	Percentage of ovulation	Mean No. of ova recovered ± S.E.	Percenta of ova recovery
A_1.	Progesterone priming 2 PMSG + 1 HCG	17.0±4.04	8.67±4.48	8.33±0.67	51.00	3.67±1.86	42.33
A_2.	Progesterone + 2PMSG + 2HCG	20.33±3.93	14.33±3.33	6.00±1.00	70.49	5.67±0.67	39.53
B_1.	2 PMSG + 1 HCG	16.33±5.36	8.33±4.1	8.00±2.52	51.02	2.67±1.76	32.05
B_2.	2 PMSG + 2 HCG	18.33±3.84	15.00±3.21	3.33±1.20	81.82	4.67±2.40	31.11

REFERENCES

Agrawal, K.P. (1986): Hormonal control of ovulation and induction of superovulation in Barberi goats used as donors in embryo transplantation studies. Indian J. Anim. Reprod. 7 (1): 81-83.

Black, W.G.; Ulberg, L.C.; Christian, R.E. and Casida L.E. (1953). Ovulation and fertilization in the hormone stimulated calf. J. Dairy Sci. 36: 274-280.

Goerke, T.P. and Dutt, R.H. (1973): Induction of ovulation and fertilization in the 90 day old lamb. J. Anim. Sci. 36: 211.

Indra Mani and Vadnere S.V. (1989): Superovulation and synchronization of oestrous in goats. Indian J. Anim. Reprod. 10 (1): 46-48.

Jainudeen, M.R.; Hafez, E.S.E. and Line Weaver, J.A. (1966): Superovulation in the calf. J. Reprod. Fert. 12: 149-153.

Mansour, A.N. (1959): The hormonal control of ovulation in immature lamb. J. Agric. Sci. Camb. 52: 57-94.

Marden, W.G.R. (1953): The hormone control of ovulation in the calf. J. Agric. Sci. 43: 381-406.

Trounson, A.O.; Willandren, S.M. and Moor, R.M. (1977): Reproductive function in prepubertal lambs ovulation, embryo development and ovarian steroidogenesis. J. Reprod. Fert. 49: 69-75.

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Superovulatory Response And Milk Progesterone Levels In Cow Heifers Following Gonadotrophin Administration.

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ABSTRACT

Six cross-bred heifers were injected 2000 i.u. PMSG on days 8 to 11 of the estrous cycle. All animals exhibited estrus and were inseminated. Each cow further received 1500 i.u. of HCG immediately following insemination. The number of palpable corpora lutea varied from 3 to 10 (mean, 7). No specific correlation between the number of corpora lutea and milk progesterone was found on various days post-estrus. None of the hiefer became pregnant and repeated cycle after 22-27 days.

* * *

The number of corpora lutea provoked is generally used as a measure of the efficiency of treatment for the superovulatory response or as a control on the efficiency of embryo production and recovery (Monniaux *et al.*, 1983; Donaldson, 1985). Analysis of hormones particularly the amount of progesterone present in the milk or blood plasma of superovulated cow, have been frequently used as an aid to the interpretation of superovulatory response (Pope and Swinburne, 1980). The objective of the present work was to study the relationship, if any, between the progesterone concentration in milk and the number of corpora lutea in heifers following induction of super-ovulation.

Materials and Methods

The experiment was carried out on 6 crossbred cow heifers, which 11 months ago had been used in another experiment involving induction of lactation by exogenous administration of steroid hormones. Since then these animals were cycling normally and were in lactation at the beginning of the present study. The animals were injected i/m with 2000 i.u. pregnant mare serum gonadotropin (Folligon, Intervet International, Holland) on days 8 to 11 of the estrous cycle. They exhibited estrus 72 hr post-PMSG administration and were artificially inseminated 12 and 24 hr of start of estrus. They also received 1500 i.u. of human chorionic gonadotropin (chorulon, Intervet International, Holland) i/m following the first insemination.

Ovulation rate was determined by counting the number of corpora lutea (C.L.) by rectal palpation on day 10 post-estrus.

Morning milk samples from 5 heifers on alternate days throughout one estrous cycle were collected. Each sample comprised of pooled milk from all the 4 quarters. The samples were preserved with potassium dichromate and stored at -20°C pending estimation of progesterone. The samples were defatted by centrifugation at 2000g for 45 min at 4°C before estimation of hormone. The RIA technique used was according to WHO Manual (1982).

Results and Discussion

All the heifers exhibited behavioural estrus 72 hrs after PMSG administration. All of them were inseminated twice during the estrus. None, however, settled and repeated

cycles after 22-27 days. No reason for this observation can be given. In another study we had observed that this schedule of treatment lead to better conception rate in cycling and repeat breeders. (Dabas *et al.*, unpublished).

The number of C.L. observed ranged from 3 to 10 (mean= 7) and both ovaries had responded to the treatment (Table 1). The right ovary appeared to have responded more favourably (4.3 ± 0.4) than the left ovary (2.67 ± 0.7). Earlier, several workers (Henricks and Hill, 1978; Donaldson, 1985; Saumande and Batra, 1985) had also reported superovulatory response in cattle following 2000 I.U. PMSG. Variable superovulatory response observed, could be due to response of individual animal or due to inaccuracy of the estimation of corpora lutea by rectal palpation (Monniaux *et al.*, 1983). The data on the milk progesterone concentrations (Fig. 1 and Table 2) indicates that prior to PMSG injection the average concentration of milk progesterone was 2.24 ng/ml., which declined to 1.12 ng/ml. on the day of estrus. It thereafter rose sharply on days 2(4.72 ng/ml) and 4(10.56 ng/ml) post-estrus and then became more or less steady upto day 14 post-estrus. Several workers (Henricks and Lemond, 1972; Saumande, 1980; Saumande and Batra, 1985) also reported increased plasma progesterone concentration after PMSG injection. The increase in progesterone level after PMSG injection reflected the stimulatory effect of this gonadotropin on the corpus luteum and presumably due to its LH activity (Stewart *et al.*, 1976). No specific correlation between the no. of C.L. and milk progesterone concentration could be detected on various days post-estrus.

Several earlier workers did not observe any relationship between number of C.L. and blood plasma progesterone (Lamond and Gaddy, 1972; Rajamehendran *et al.*, 1976). Progesterone concentrations fluctuated from one day to another and the magnitude of the increase in concentration of milk progesterone was less than that reported by Lamond and Gaddy (1972). Glencross and Abeywardene (1983) reported that progesterone concentration in plasma was about twice than in defatted milk, but both fluids have similar pattern during the estrous cycle, while Shemesh *et al.*, (1978) observed same level of progesterone in fat-free fore milk and plasma of pregnant/nonpregnant cows.

None of the beifers became pregnant and repeated cycle after 22-27 days. Extension of estrous cycle is probably due to the excess number of C.L. during the superovulatory estrous cycle (Takasashi and Horita, 1983). Contrary to the findings of Takasashi and Saito (1981), no drop in milk production in heifers following treatment with gonadotropin was observed.

In conclusion, the present results and those previously reported for progesterone before and after ovulation (Tamboura *et al.*, 1985; Saumande *et al.*, 1985; Saumande and Batra, 1985) demonstrate that measurement of progesterone concentration in defatted milk gives better indication of the ovarian response to a superovulatory treatment, than the measurement of concentrations in blood. Finally, milk samples are easier to collect and handle than blood samples, which require rapid centrifugation to prevent steroid break down (Vahdat *et al.*, 1981). These practical considerations led us to suggest that the assay of progesterone should be done in defatted milk rather than in plasma.

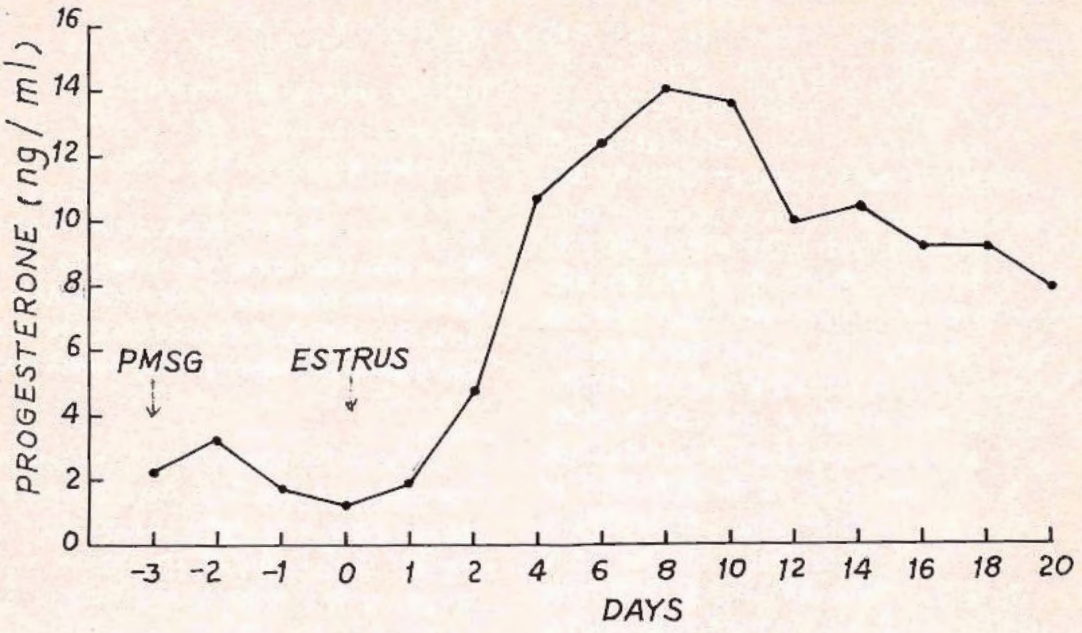

Fig. 1. Progesterone concentration (ng/ml) in defatted milk of superovulated cow heifers.

Table - 1: Ovarian response to PMSG treatment in heifers.

Sl. No.	Animal No.	Age (Months)	Number of corpora Lutea 10 days post-estrus		
			RO	LO	Total
1.	76	90	4	1	5
2.	110	61	3	0	3
3.	142	33	4	3	7
4.	127	41	6	4	10
5.	117	54	5	5	10
6.	115	58	4	3	7
Mean ± SE		56.2±8	4.3±0.4	2.67±0.7	7.0±1.1

RO = Right Ovary; LO = Left Ovary

Table 2: Progesterone concentration (ng/ml) in defatted milk of superovulated cow heifers.

Sl. No.	Animal No.	Days														
		-3	-2	-1	0	1	2	4	6	8	10	12	14	16	18	20
1	76	2.0	4.6	2.2	0.8	2.8	3.6	4.8	4.8	8.8	7.2	4.8	4.8	6.4	6.4	5.2
2	142	2.4	3.8	2.0	1.2	2.0	8.0	16.0	16.0	22.4	16.0	16.0	20.4	16.8	14.8	9.6
3	110	1.8	2.0	1.8	1.0	1.4	3.6	4.0	13.6	12.0	13.6	9.6	9.2	4.0	3.2	3.2
4	117	2.6	3.4	2.0	1.6	1.8	4.4	5.6	10.4	8.0	11.2	10.0	8.0	7.2	8.8	10.4
5	127	2.4	2.0	1.8	1.0	1.2	4.0	22.4	16.0	19.2	20.0	10.4	9.6	12.0	12.8	11.2
Average		2.24	3.16	1.96	1.12	1.84	4.72	10.56	12.16	14.08	13.6	10.16	10.4	9.28	9.20	7.92

Day - 0 = Day of estrus; Day - 3 = Day of PMSG injection

REFERENCES

Dabas, Y.P.S.; Sud, S.C. and Atheya, U.K. (1988): Unpublished data.

Donaldson, L.E. (1985): Estimation of superovulation response in donor cows. Vet. Rec. **117**: 33-34.

Glencross, R.G. and Abeywardene, S.A. (1983): Concentrations of oestradiol -17 B and progesterone in plasma and defatted milk of cattle during the oestrous cycle. Bitr. Vet. J. **139**: 49-51.

Henricks D.M. and Hill, J.R. (1978): Effect of PMSG and PGF2 alpha on gonadal hormones and reproduction in beef heifer. J. Anim. Sci. **46**: 1309-1315.

Henricks, D.M. and Lamond, D.R. (1972): Hormonal interrelations in beef cows with induced multiple ovulations. Nature. **235**: 222-223.

Lamond, D.R. and Gaddy, R.G. (1972): Plasma progesterone in cows with multiple ovulations. J. Reprod. Fertil. **29**: 307-311.

Monniaux. D., Chupin, D. and Saumande, J. (1983): Superovulation response of cattle. Theriogenology. **19**: 55-81.

Pope, G.S. and Swinburne, J.K. (1980): Hormones in milk: their physiological significance and value as diagnostic aids. J. Dairy Res. **47**: 429-449.

Rajamahendran, R., Lague, P.C. and Baker, R.D. (1976): Plasma progesterone levels in cycling and gonadotrophin-prostaglandin-treated heifers. Canadian J. Anim. Sci. **56**: 37-42.

Saumande, J. (1980): Concentrations of luteinizing hormone, oestradiol -17 B and progesterone in the plasma of heifers treated to induce superovulation. J. Endocrinol. **84**: 425-437.

Saumande, J. and Batra, S.K. (1985): Superovulation in the Cow: comparison of oestradiol -17 Band progesterone patterns in plasma and milk of cows induced to superovlate, relationship with ovarian responses. J. Endocrinol. **107**: 259-264.

Saumande, J.; Tamboura, D. and Chupin, D. (1985): Changes in milk and plasma concentrations of progesterone in cows after treatment to induce superovulation and their relationships with number of ovulations anf of embryos collected. Theriogenology. **23**: 719-731.

Shemesh, M.; Ayalon, N.; Shalev, E.; Nerya, A.; Schindler, H. and Mileguir, F. (1978): Milk progesterone measurement in dairy cows: correlation with estrus and pregnancy determination. Theriogenology. **9**: 343-352.

Stewart, F., Allen, W.R. and Moor, R.M. (1976). Pregnant mare serum gonadotrophin: ratio of follicle stimulating hormone and luteinizing hormone activities measured by radiorecepter assay. J. Endocrinol. **71**: 371-382.

Takasashi, Y. and Horita, N. (1983): Fertility and length of the post treatment oestrous cycle of Holestein-Friesian heifers after superovulation and non-surgical embryo recovery. Japanese J. Anim. Reprod. **29**: 80-83.

Takasashi, Y. and Saito, N. (1981): Decrease in the milk production of dairy cows after superovulation. Japanese J. Anim. Reprod. 27: 49-51.

Tamboura, D., Chupin, D. and Saumande, J. (1985): Superovulation in cows: a relationship between progesterone secretion before ovulation and the quality of embryos. Anim. Reprod. Sci. 8: 327-334.

Vahdat, F., Hurtgen, J.P.; Whitemore, D.L.; Seguin, B.E. and Johnston, S.D. (1981): Decline in assayable progesterone in bovine plasma: effect of time, temperature, anticoagulant and presence of blood cells. Amer. J. Vet. Res. 42: 521-522.

W.H.O. Special Programme of Research Development and Research Training Human Reproduction (1982): Programme for the provision of matched Assay reagents for radioimmunoassay of hormones in reproductive physiology. (Method Manual). Ed. Sufi, S.B.; Donaldson, A., Jaffcaate, S.L. World Health Organisation, Geneva, Switzerland.

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Endocrine Response After Gonadotrophin Releasing Hormone In Normal And Oestradiol Primed Luteal Phase Cows

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Steroid modulation of the serum gonadotrophin response induced by GnRH in bovines during the oestrous cycle has been described by Schallanberger *et al*, (1985). The effect of exogenous Oestradiol (E_2) on GnRH - induced LH and FSH release and luteal function in cyclic cows has not been previously reported. The present paper describes the response patterns of LH and FSH and progesterone (P_4) following administration of a GnRH analogue in normal and E_2 pretreated mid-luteal cows.

* * *

Four cyclic crossbred cows of the University of Manitoba, Canada, were treated at mid-cycle with single i.m. injections of 1 mg Oestradiol -17 β (Sigma Chemicals Co; St. Louis, USA) in arachis oil (cow A) or 250 mcg of Ganadorelin hydrochloride (Factrel, Ayerst Labs, Montreal, Canada) (Cow B) or E_2 followed 6 h later by GnRH (cows C & D).

Blood samples were obtained from indwelling catheters in the jugular vein at intervals of 2 h after injection of E_2 and at 0.5 h for 2 h before and 8 h after administration of GnRH, at 1 h till 12 h and 2 h thereafter until 24 h from the beginning of treatment. Serum was separated and assayed for hormone content by RIA using the methods of Yuthasastrakosol (1975) for P_4, Yu *et al* (1974) for E_2, Howland (1972) for LH and Chang (1978) for FSH.

The injection of GnRH induced a surge release of serum LH from 0.40 to a peak height of 6.30 ng/ml. within 180 m. and returned to basal level in 7 h. The serum FSH rose with a similar temporal pattern with a peak of 1.13 ng/ml 150 m.

GnRH, injected 6 h after E_2 when serum E_2 was high (45.1 to 97.3 pg/ml.), elicited a greater LH response in cows C and D with peak heights of 9.1 and 22.5 ng/ml. and areas under response curve of 56 and 96 respectively. However, the magnitude of LH response was inversely related to the pre-injection serum P_4, in that a lesser peak in cow C, (P_4 -2.60 ng/ml.) and a greater peak in cow D (P_4 -1.12 ng/ml.) was seen.

The peak FSH after GnRH was also greater in E_2 primed cows, but was not

modulated by serum P_4. Single E_2 in cow B failed to evoke any gonadotrophin release.

Serum P_4 increased within 30 m. following GnRH fron. 4.72 to a peak of 7.59 ng/ml. in 4.5 h; whereas in E_2 primed cows, it rose from 2.60 to 5.47 ng/ml. in 6 h (cow C) and from 1.12 to 2.82 ng/ml. in 3 h (cow D). In all the cows, the P_4 returned to basal levels within 12 to 18 h after GnRH.

The results of diminished GnRH induced LH release but not of FSH in luteal phase cows, are congruous with those of Schallenberger *et al* (1985) who have shown that the luteal phase P_4 depressed secretion of LH, but not of FSH. E_2 pre-treatment 6 h prior to GnRH, on the other hand, increased the pituitary responsiveness to release more LH and FSH in response to GnRH and this seems to be dependant on systemic P_4, since higher P_4 levels completely masked this effect, while lower P_4 levels did not. However, the FSH release was not affected indicating that LH release alone is largely steroid modulated in cows. These results are in conformity with the *In Vitro* studies made by Padmanabhan and Convey (1981).

The acute P_4 response following GnRH in this study was relative to the pre-injection P_4 levels, transient (12-18 h) in nature and not influenced by either the magnitude of LH response or E_2 priming. The luteotrophic capacity of GnRH is attributed to its ability to release LH (Macmillan *et al.*, 1984) and the release of LH is consistently followed by P_4 peaks at a lag time of 10 min. in mid - luteal cows (Procknor *et al.*, 1986).

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REFERENCES

Cheng, K.W. (1978): Development and characterization of a homologous radioimmunoassay for bovine follicle stimulating hormone. J. Endocr. 77: 185-191.

Howland, B.E. (1972): Effect of restricted feed intake on LH levels in female rats. J. Anim. Sci. 34: 445-449.

Mac Millan, K.L.; Day, A.M.; Taufa, V.K.; Gibb, M. and Pearce, M.G. (1984): Effects of an agonist of GnRH in cattle: Hormone concentrations and oestrous cycle length. Anim. Reprod. Sci. 8: 203-212.

Padmanabhan, V. and Convey, E.M. (1981): P4 inhibits the ability of E2 to increase basal and LH - RH induced LH release from bovine pituitary cells in culture: neither P4 nor E2 affects FSH release. Endocrinology **109**: 1091-1096.

Procknor, M.; Dachir, S.; Owens, R.E.; Little, D.E. and Harms, P.G. (1986): Temporal relationship of the pulsatile fluctuation of LH and P4 in cattle: a time series cross-correlation analysis. J. Anim. Sci. 62: 191-198.

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Preliminary Trials On Superovulation, Non-surgical Embryo Recovery And Embryo Transfer In Cows.

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ABSTRACT

A trial of superovulation, non-surgical embryo recovery and embryo transfer in crossbred cows was conducted at Akola. Superovulation was induced with FSH and PMSG + HCG. Embryos were collected on

7th day after oestrus. The mean number of corpora lutea was 12 ± 1. The mean 8.33 embryos were collected, of which 0.66 were morphologically normal and transferrable and 7.66 were unfertilized. Embryos were transferred to two recipients. One recipient was found to be pregnant and second returned to normal oestrus on 21 day.

* * *

The practical application of embryo transfer in cattle can be greatly increased, if embryos are collected and transferred non-surgically. In India the entire technique of embryo transfer is in an early stage. There are a few reports on embryo transfer in sheep and goats (Zanwar, 1984) and cows (Totey *et al*, 1988).

Materials and Methods

Three crossbred (Two Jersey x Sahiwal and One Holstein Friesian x Hariana) cows were used as donors and Ten cross bred cows as recipients in this trial. The donor animals were given treatment as detailed in Table-1.

Recipients were treated with $PGF_2 \alpha$ (Dinofertin) 24 hours earlier than donor cows in order to achieve exact oestrus synchronization. All the donors were inseminated with frozen semen, four times, at 12 hrs interval after oestrus was detected.

Non-surgical embryo collection was attempted on day after first insemination. Each donor was confined in a trevis. Epidural anaesthesia was given. The ovaries were palpated and superovulatory response was recorded. With aseptic precautions, a three way round tip 18 gauge Foley's catheter with 30 ml. inflatable baloon was introduced into the uterus with the aid of a sterile stylet. After manipulation through cervix, the inflatable baloon was placed at the base of the appropriate uterine cornua, where it was inflated slowly with 15-20 ml of air depending upon the size of the horn. Dulbecco phosphate buffer saline (DPBS) solution was fortified with 4% heat treated total calf serum, 100 I.U. sodium penicillin G and 100 mcg streptomycine per ml.

The uterine lumen was flushed with DPBS by intermittent gravity flow. Each uterine horn was filled with 50-60 ml. of medium which was then allowed to flow into the collection vessel while the uterus was gently massaged. This was repeated until 400 to 500 ml. of medium was used. The Foley catheter was then inserted into the other uterine horn and the process repeated.

The fluid was collected through a filter. The fluid alongwith embryos was transferred from embryo filter into a petridish. Embryos were isolated and examined under Zoom Stereo-Microscope at 10 X Magnification.As soon as embryos were located under the microscope, they were transferred into a small dish containing fresh holding medium. The formation of holding medium was same as that of flushing medium, except for a concentration of 20 per cent heat treated foetal calf serum. Morphological study of embryos was undertaken and only good blastocyst stage embryos were transferred to the recipients.

Epidural anaesthesia was given to recipients to minimise straining. The blastocyst was aspirated into a 0.25 ml. french straw between two air pockets and two columns of holding medium. The straw was loaded in A.I. gun. The embryo was transferred non-surgically through the cervix in a manner similar to artificial insemination. Embryo was deposited approximately one third of the way up the uterine horn ipsilateral to corpus luteum.

Results and Discussion

The estimated number of corpora lutea and embryo recovery is given in Table-2. The mean number of corpora lutea was 12 ± 4. The mean percentage of recovery of medium was 94.53 ± 0.22. Three donors and ten recipients treated with 3 injections of $PGF_2\alpha$ (Dinofertin) came in oestrus between 60 and 72 hrs of treatment.

The number of unfertilized ova was 20 and only two embryos were obtained. Blastocysts were recovered from only one donor (No. 384). Embryos were transferred to two recipients (No. 427 and 249). One recipient (No. 249) came in heat 12 days after embryo transfer. One recipient (No. 427) was found pregnant after rectal examination on day 60.

The superovulatory response was better than reported by other workers (Totey *et al.* 1987, 1988). However, the yield of embryos in this trial was very low when compared to results obtained in cattle by various workers (Totey *et al.* 1988). The percentage of unfertilized ova was more in this trial. This may be due to suboptimal sperm transport, ovulation over a period of time or other causes. Fertilization rates of ova from superovulated donors are usually considered below the rates for ova from untreated donors (Elsden *et al.*, 1976). The high incidence of unfertilized ova might have been due to 32 mg dose of FSH used for superovulation which may be high for crosses of Bos indicus x Bos taurus cows. Higher dose of FSH may frequently cause continued follicle stimulation after ovulation, resulting in persistant large follicle accompanied by high oestrogen level. Abnormal high level of oestrogen produces detrimental effect on sperm transport and embryo survival (Cahil *et al.*, 1976).

Table - 1: Superovulation and Synchronization of oestrus.

Group/Category	Day	Treatment
I Donor Cows	0	20 mg $PGF_2\alpha$ (Dinofertin) I.M.
(Two Sahiwal x	11	20 mg $PGF_2\alpha$ (Dinofertin) I.M.
Jersey)	24	FSH 5.5 mg. I.M. in Morning and Evening.
	25	FSH 4.5 mg. I.M. in Morning and Evening.
	26	FSH 3.5 mg. I.M. in Morning and Evening.
	27	FSH 2.5 mg. I.M. in Morning and Evening.
	28	Heat check and A.I. 4 times at 12 hrs. interval.
	35	Embryo recovery and transfer
II Donor Cows	0	20 mg. $PGF_2\alpha$ (Donofertin) I.M.
(H.F. x Hariana)	13	2500 I.U. PMSG (Folligon) in Morning.
	15	$PGF_2\alpha$ (Dinofertin) I.M. 15 mg in Morning, 10 mg. in Evening.
	17	1200 I.U. H.C.G. (Chorulon) I.M. in Morning. Heat check and A.I. in Morning and Evening.
	18	A.I. in Morning and Evening.
	25	Embryo recovery and transfer.

Table 2: Results of superovulation and embryo recovery.

Donor No.	No. of CL	Recovery of medium (Recovered/infused) ml.	Embryo recovery Unfertilized	Blastocyst.
S x J 124	13	940/1000	9	-
S x J 130	12	900/950	8	-
H.F.x H 384	11	930/980	6	2

REFERENCES

Cahil, L.P.; Lowson, R.A.S. and Parr, R.A. (1976): The effect of age and nutritional stress on the survival of transferred embryos, Cited by Totey, S.M. et al; (1987):

Elsden, R.P.; Hasler, J.F. and Seidel, G.E.; Jr. (1976): Non surgical recovery of bovine eggs. Theriogenology 6: 523-526.

Mutter, L.R.; Graden, A.P. and Olds, D. (1964): Successful non surgical embryo transfer A.I. Digest 12: 3.

Totey S.M.; Gurpreet Singh, G.P.; Talwar and Gurcharan Singh (1987): Preliminary trials on super ovulation, Non surgical embryo recovery and transfer in cows. Indian J. Anim. Reprod. 8: 58-61.

Totey, S.M.; Singh, Gurpreet, Singh, Gurcharan, Eyestone W.H. and Talwar, G.P. (1988): Non-surgical embryo transfer in cow. Indian J. Anim. Sci. 58 (1): 54-59.

Zanwar, S. (1984): Cited by Totey, S.M. et al (1987):

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Transcervical Collection Of Ova From Repeat Breeder Crossbred Cows After Repeated Superovulation

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ABSTRACT

The study was conducted on seven crossbred repeat breeder cows. Superovulation regimen consisted of PMSG (1500 i.u.) and prostaglandin F_2 alpha (25 mg) by intramuscular route. Repeat superovulations were performed every eight to ten weeks keeping the drug and dose regimen unaltered. Transcervical technique for collection of ova was applied using phosphate buffer saline as flushing medium. A total of 77 ova were collected out of 227 ovulations (33.92%). Variability in superovulatory response and ova collection rate was recorded between individuals and treatments. Out of 77 ova collected, only 12.99% were normal developing, 20.78% were asynchronous and majority of the ova (66.23%) were unfertilized. Normal fertilized ova were recovered up to third superovulatory

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treatment, subsequent to which the ova were either asynchronous or unfertilized.

* * *

Successful embryo transfer programme depends largely upon constant supply of normal fertilized embryos from donor cows. In order to obtain large number of embryos/ova from a quality donor cow, repeat superovulation at regular intervals is imperative. Tanabe and Casida (1949) observed that fertilization failure was responsible for 39.7 percent fertility losses in non-superovulated repeat breeder cows and Ayalon (1969) recorded 17.0 percent fertilization failure in normal cows as well. Present study was undertaken to investigate the ova recovery rate and their morphological types from repeat breeder cows subsequent to repeated superovulations in order to find out effect of such repeat treatments upon ova recovery and their morphology.

Present investigation was carried out on seven crossbred (Friesian x Local) repeat breeder cows (4-8 years age) maintained at Ranchi Veterinary College, Ranchi. The animals were repeat breeders for the last six months or more with regular oestrous cycle and had normal genital organs. Feeding was carried out as per NRC standard and the cows were allowed grazing for 5-6 hours daily. The technique of Gupta *et al.* (1983) was followed for superovulation and the ovarian response was judged as per the criteria of Donaldson (1985). Repeat superovulation technique has been mentioned in our earlier publication (Bhattacharya *et al.*, 1989). The collection of ova was done between day 6-8 after insemination, transcervically with the help of two-way Foley catheter using phosphate buffer saline as flushing medium, as per the technique of Gupta *et al.* (1983). The ova were examined under phase contrast and were considered fertilized when dividing blastomeres could be observed under microscope. When there was no evidence of cleavage, the ova were grouped as unfertilized. The fertilized ova whose developmental stage did not synchronise with their chronological age were grouped as asynchronous ova.

Results

A total of 77 ova were collected out of 227 ovulations (33.92%) from six cows after six repeated superovulations (Table 1). Highest percentage (46.15) of ova could be collected from cow No. 5, followed by cow No. 1 (45.00%), cow No. 3 (43.90%) and cow No. 2 (35.48%). The recovery rate of ova was poor from cow No. 7 (10.00%) and cow No. 4 (7.69%), although in the former, the average ovarian response (50 C.L.) was second only to cow No. 5 (52 C.L.)Cow No. 6 developed pyometra after first superovulatory treatment and hence it was deleted from the experiment.

Table 1: Ova collected from individual cows after six repeated superovulations.

Cow No.	Number of C.L.	Number of ova collected	Percent
1	40	18	45.00
2	31	11	35.48
3	41	18	43.90
4	13	1	7.69
5	52	24	46.15
6	50	5	10.00

The ovarian response after 2nd superovulation decreased considerably with declining number of ova recovered (Table 2). However, the ova recovery rate was highest (41.67%) after third superovulatory treatment, followed by first (38.46%) and second (32.79%) treatments. The number of ova collected declined sharply between 4th to 6th treatments when a total of only 17 ova could be harvested (Table 2).

Table 2: Ova collected subsequent to each superovulatory treatment from six cows.

Treatment No.	Number of C.L.	Number of ova collected	Percent
I	65	25	38.46
II	61	20	32.79
III	36	15	41.67
IV	28	8	28.55
V	23	7	30.43
VI	14	2	14.29

Microscopic evaluation of ova revealed that there was a high percentage of unfertilized ova (66.23%) as compared to fertilized ova (33.77%). It is evident that maximum number of ova (Table 3) could be harvested from cow No. 5 (24), followed by cow Nos. 1 and 3 (18 each). The ovarian response in these cows was also high as compared to other three cows (Table 1). The ova recovery rate was very poor in cow No. 4, as was the ovarian response (1 ova/13 corpora lutea). Out of 26 fertilized ova, 16 were grouped as asynchronous and only 10 could be identified as normal fertilized (Table 3).

Majority of the ova could be harvested upto the first three treatments (60 out of 77) and the recovery rate was highest after 1st superovulatory treatment (Table 4). These 60 ova could be recovered out of 162 ovulations (36.59%) after the first three superovulations whereas the remaining 17 ova were collected out of 65 ovulations (26.15%) subsequent to later three superovulatory treatments. In addition, all the 10 normal fertilized ova were obtained after the first three superovulatory treatments and no normal ova could be harvested afte the last three treatments (Table 4).

Discussion

The ova recovery rate was superior following the first three superovulatory treatments as compared to later three treatments (Table 2). Subsequent to non-surgical collection, the ova recovery rate has been reported to vary with the type of catheter (Newcomb, 1980; Kudlac *et al.*, 1981 and Riha and Polasec, 1984), day of collection (Halley *et al.*, 1979; Greve, 1980 and Ozil *et al.*, 1980) and age and reproductive status of donor (Newcomb, 1980; and Ozil *et al.*, 1980 and Greve, 1980). The recovery rate observed during the present investigation is higher than the finding of Cox (1980). Nevertheless, higher recovery rates than the present one have been reported by several workers (Greve *et al.*, 1978; Ozil *et al.*, 1980; Belevich *et al.*, 1982; Chung *et al.*, 1983 and Tervit, 1983) from normal cows and heifers. Reports on ova recovery using superovulated infertile cows/heifers are scanty and studies by Linares *et al.* (1980) and Gustafsson (1985) revealed a comparatively lower recovery rate from such cows/heifers as compared to virgin heifers. Low recovery rate of embryos from repeat breeding heifers has been assigned to either malfunction of fimbriae during ovulation or disappearance of ova due to fragility of zona pellucida (Linares *et al.*, 1980).

Results of the present study indicate that only 12.99% of the ova were fertilized with normal development and 20.78% were asynchronous, retarded in development. Linares and Ploen (1981) observed that in superovulated repeat breeder heifers only 17% of the embryos recovered on day 6 after heat were normal. In a recent study (Donaldson, 1986), embryos of several stages of development were found within the same collection. A high percentage of ova recovered were unfertilized (66.23%) during the present study. The recovery rate of such ova showed an increasing trend after first superovulatory treatment to fifth treatment (Table 4). Moreover, no normal fertilized ova was detectable following 4th to 6th

superovulatory treatments. Since no report on repeated ova collection from superovulated repeat breeder cows is available, valid comparisons could not be made. Nevertheless, in one study out of 24 ova collected from repeat breeder unsuperovulated heifers, approximately 55% were normal developing (Linares and Ploen, 1981) which is much higher than the values obtained during the present study. However, Elsden *et al.* (1976) were able to recover only four normal ova (11%) in 38 non-surgical attempts with un-superovulated donors with known fertility problems, which is in close agreement with the present findings. In a late report Elsden *et al.* (1979) obtained a fertilization rate of 72% in 18 fertile cows, but only 35% in 23 infertile cows. Unfertilized ova have been collected from normal superovulated cows as well (Schilling *et al.*, 1980 and In *et al.*, 1983). Seidel *et al.* (1978) reported significantly low fertilization rate of ova recovered non-surgically from superovulated donors. Further examination of 286 unfertilized ova from such donors showed that 92% had no spermatozoa associated with them indicating that spermatozoa never reached such oocytes. Recently, Hawk (1988) also attributed reduced efficiency of sperm transport as one of the important factors leading to a reduction in fertilization rate by nearly 20 percent in superovulated cows as compared to single ovulation cows.

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Table 3: Morphological types of ova collected from individual cows after six repeated superovulations.

Cow No.	Fertilized (n = 26.30, 33.77%)		Unfertilized (n = 51, 66.23%)	Total (n = 77)
	Normal (n = 10, 12.99%)	Asynchronous (n = 16, 20.78%)		
1	2(11.11)	4(22.22)	12(66.67)	18
2	1(9.09)	2(18.18)	8(72.73)	11
3	3(16.67)	4(22.22)	11(61.11)	18
4	-*	-	1(100.00)	1
5	3(12.50)	5(20.83)	16(66.67)	24
6	1(20.00)	1(20.00)	3(60.00)	5

Numbers in parentheses indicate percentage.

Table 4: Morphological types of ova collected subsequent to each superovulatory treatment of six cows.

Treatment No.	Fertilized (n = 26, 33.77%)		Unfertilized (n = 51, 66.23%)	Total (n = 77)
	Normal (n = 10, 12.99%)	Asynchronous (n = 16, 20.78%)		
I	6(24.00)	4(16.00)	15(60.00)	25
II	3(15.00)	4(20.00)	13(65.00)	20
III	1(6.67)	3(20.00)	11(73.33)	15
IV	-	2(25.00)	6(75.00)	8
V	-	2(28.57)	5(71.42)	7
VI	-	1(50.00)	1(50.00)	2

Numbers in parentheses indicate percentage.

REFERENCES

Ayalon, N. (1969): Kimron Veterinary Institute, Beit Daan (Israel) pp. 1-92.

Belevich, V.P., Prokof'lev, M.I.; Chernykh, V.Y.; Ryabykh, V.P.; Bakhitov, M.I.; Malenko, G.P. and Petunina, V.M. (1982): Cattle Referativnyl Zhurnal 3. 58. 363.

Bhattacharya, B.N.; Sinha, A.K.; Sinha, S.N. and Singh, Balraj (1989): Indian J. Anim. Reprod. **10** (1): 51-56.

Chung, K.S.; Lee, H.T.; Park, H.D.; Chung, B.H. and Yoo, S.H. (1983): Korean Journal of Animal Sci. **25** (5): 408.

Cox, U.J.F. (1980): Collection of bovine embryo by non-surgical methods. Anim. Breed. Abstr. **49**: 383.

Donaldson, L.E. (1985): Vet. Rec. **117**: 33.

Donaldson, L.E. (1986): Vet. Rec. **118**: 661.

Elsden, R.P.; Hasler, J.F. and Seidel, Jr. G.E. (1976): Theriogenology **6**: 523.

Elsden, R.P.; Nelson, L.D. and Siedel, G.E.J. (1979): Theriogenology **11**: 17.

Greve, T.; Lehn-Jensen, H. and Rasbech, N.O. (1978): Practical application of non-surgical collection of bovine embryos in Danish Pedigree Cattle. A seminar in the Programme of Co-ordination of Research on Beef Production. Denmark (Anim. Breed. Abstr. **48**: 125).

Greve, T. (1980): Acta Veterinaria Scand. **21** (1): 26.

Gupta, R.C.; Sinha, A.K. and Swammy, A.K. (1983): Indian J. Anim. Reprod. **4** (1): 1.

Gustafsson, H. (1985): Theriogenology. **23** (3): 487.

Halley, S.M.; Rhodes, R.C.; Mckellar, L.D. and Randel, R.D. (1979): Theriogenology. **12** (2): 97.

Hawk, H.W. (1988): Theriogenology. **29**: 125.

In, K.S.; Lee, Y.B. and Chung, K.M. (1983): Korean Journal of Anim. Sci. **25** (3): 244.

Kudlac, E.; Vindler, A. and Hrivnak, J. (1981): Veterinarstvi, **29** (4): 158. Czechoslovakia.

Linares, T.; King, W.A.; Larsson, K.; Gustafsson, I. and Bane, A. (1980). Vet. Res. Comm. **4** (2): 113.

Linares, T. and Ploen, L. (1981): Zentralbatt fur Veterinarmedizin, Reine, C. 1981.

Newcomb, R. (1980); Vet. Rec., **106** (3): 48.

Ozil, J.P.; Heyman, Y. and Gasson, R. (1980): Embryo recovery in Young heifers and large old donor cows, 9th International Congress on Animal Reproduction and A.I. Anim. Breed. Abstr. **49**: 1937.

Riha, J. and Polasek, M. (1984): Zivocisna Vyroba. **29** (12): 1059. (Anim. Breed. Abstr. **53**: 2761).

Schilling, E.; Smidt, D. and Sacher, R. (1980): Quality of ova and embryos from superovulated cows. Institute fur Tierzucht and Tierverhatten. Mariensee, (DGR). Anim. Breed. Abstr. **49**: 2615.

Seidel, Jr. G.E.; Elsden, R.P.; Melson, L.D. and Hasler, J.F. (1978): Methods of ovum recovery and factors affecting fertilization of superovulated bovine ova. In: J.R. Sreenan (Ed.) Control of Reproduction in the cow. Martinus Nijhoff. The Hague. pp. 268.

Tanabe, T.Y. and Casida, L.E. (1949): J. Dairy Sci. 32: 237.

Tervit, H.R. (1983): Non-surgical recovery and transfer of cattle embryos. In Newzealand Ministry of Agriculture and Fisheries, Agriculture Research Division, Annual report, 1981-82. Wellington Newzealand. Anim. Breed. Abstr. 52: 454.

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Live Birth Of Calves As A Result Of Non-surgical Embryo Transfer Of Demi-Embryos Obtained By Splitting Of Embryos.

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Embryo transfer in cattle is now a commercial activity in the west (Baker, 1985). It is a useful technique to multiply rapidly the elite animals. We had earlier reported successful pregnancies and calves which were born as a result of fresh and frozen embryo transfer (Totey *et al* 1987, 1988, 1989). The embryos were successfully bisected and pregnancies from half embryos established (Singh *et al*, 1989). These results showed increased pregnancy rates per embryo and thus embryo bisection can be an additional tool to multiply elite animals. We now report birth of three normal healthy calves which are as a result of embryo transfer of demi (half) embryos that were transferred without zona non-surgically, into the recipients. These were split with the help of micromanipulator as day 7 early blastocysts.

* * *

Cross-bred (Holstein x Sahiwal) donor cows were superovulated with 28 mg FSH-P and embryos recovered non-surgically as detailed earlier (Totey *et al*, 1988). The embryos were graded for their quality and stage of development. The excellent embryos were bisected into two equal halves by a microblade through the zona pellucida. Care was taken in case of blastocytes that inner cell mass was equally cut into two. They were transferred non-surgically into the uterus of estrus synchronized recipients ipsilateral to corpus luteum. The pregnancies were uneventful with three recipients giving birth to 3 perfectly normal calves. One was male weighing 35 kg, born on 16th Nov. 1988; second a male weighing 35 Kg on Dec. 16, 1988 and third a female weighing 32 Kg on Jan. 9th, 1989 after a gestation of 277, 270 and 290 days respectively. One recipient was a crossbred cow and the other an indigenous non-descript low yielding cow. The experiment shows the practical utility of this technology to obtain large number of superior germ plasm rapidly by transfer of split embryos. Splitting of embryos gives a better return in terms of pregnancies as one is able to obtain one calf per transferable embryo flushed.

REFERENCES

Totey, S.M.; Singh, Gurpreet; Talwar, G.P. and Singh, Gurcharan (1987): Preliminary trials on superovulation, non surgical embryo recovery and embryo transfer in cows Indian J. Anim. Reprod. **8**: 58-61.

Totey, S.M.; Singh, Gurpreet; Singh, Gurcharan; Yestone, W.H. and Talwar, G.P. (1988): Non-surgical embryo transfer in cow Indian J. Anim. Sci. **58**: 54-59.

Totey, S.M.; Singh, Gurpreet; Anand, R; Singh, Gurucharan; Chillar, R.S. and Talwar, G.P. (1989): Successful pregnancies from cryopreserved crossbred bovine embryos transferred non-surgically to indigenous low yielding cows. Indian J. Anim. Sci. (under publication).

Singh, Gurpreet; Totey, S.M.; and Talwar, G.P. (1989): Pregnancies from crossbred split embryos in Indian Cattle Theriogenology **31**: 256. (Abs.)

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Classification And Categorization (Grading) Of Crossbred Bulls With Score Card Device

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The study was conducted on six crossbred bulls, kept under uniform husbandry practices, between November 1987 to June, 1988. On the basis of data on sexual and general health status, sexual behaviour, semen picture and conception rate, an attempt was made to compare classify and grade their reproductive efficiency, as suggested by Rajkonwar *et al* (1977) with modification in the form of formulating score card by giving due numerical weightage to every parameter considering its role in the reproductive efficiency of the bull. The six bulls were thus graded according to their sexual and general health status as good/fair/poor /unfit for breeding; sex drive (libido) and serving ability in artificial vagina as strong/medium /weak/poor; semen picture as excellent/good /fair /poor and conception rate as excellent/good/ fair/poor.

Sexual health status was ascertained by careful andrological examination of the genital organs and the general health status on the basis of conformation, temperament and physical condition of each bull. For numerical expression an arbitrary scale of 4 to 1 was used.

Serving behaviour was classified as described by Bane (1954) and graded arbitrarily between 0 to 4. Reaction time was recorded with a stopwatch as recommended by Singh *et al.* (1977) and an arbitrary scale of 3 to 1 was used.

Semen was collected once a week from each bull and ten collectios per bull were obtained. A comparative assessment of semen quality of each bull was made on the day of collection, and subsequently upto 72 hours at 5^0C temperature. Arbitrary scales used were: 4 to 0 for volume; 0 to 3 for colour/density; 1 to 3 for gross motility; 0 to 4 for mass motility; 0 to 5 for individual motility (Zemjanis 1970); 0 to 4 for pH; 3 to 0 for sperm concentration; 0 to 4 for per cent live spermatozoa; 0 to 4 for

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Table 1: Classification and categorization (grading) of the experimental crossbred bulls according to their score on sexual and general health status, sexual behaviour, semen picture and conception rate.

S. No.	Bull Brand No.	Sexual and general health status		Sexual behaviour		Semen Picture		Conception rate		Total Score obtained out of 54	Grade awarded
		Score obtained out of 4	Grading	Score obtained out of 8	Grading	Score obtained out of 37	Grading	Score obtained out of 6	Grading		
1	C140	4	Good	7	Strong	31.2	Excellent	6	Excellent	48.2(89.25)	A
2	C145	4	Good	6	Medium	30.8	Good	4	Fair	44.8(82.96)	B
3	H16	4	Good	6	Medium	29.9	Fair	5	Good	44.9(83.14)	B
4	H12	4	Good	6	Medium	30.3	Good	4	Fair	44.3(82.03)	B
5	C299	4	Good	6	Medium	31.5	Excellent	5	Good	46.5(86.11)	B
6	C411	4	Good	6	Medium	30.9	Good	6	Excellent	46.9(86.85)	B

Figures in parantheses indicate per cent score obtained.

Overall Grading :

Above 89 per cent : A : Excellent

80 to 89 per cent : B : Good

70 to 79 per cent : C : Satisfactory

60 to 69 per cent : D : Poor

per cent abnormal spermatozoa and 3 to 0 for methylene blue reduction time. 120 cows were inseminated at the rate of 20 cows per bull with the semen diluted in EYC diluter (Salisbury *et al*, 1941) stored at 5°C upto 72 hours and fertility confirmed 60 days post-insemination by rectal palpation for pregnancy and recorded on an arbitrary scale of 0 to 6.

In the score card designed, separate scoring was done on the basis of arbitrary scales mentioned above for every parameter and then the total score obtained (out of 54) was worked out for each bull and finally the classification and grading was done (Table I) on the basis of overall score obtained by each bull, as A(Excellent), B(Good), C(Satisfactory) and D(Poor). The performance of bull C140 was highest for every parameter since it was good for sexual and general health status, strong for sexual behaviour and excellent for semen picture and conception rate. Thus, this bull obtained "A" grade (Excellent) with 48.2 score (89.25 per cent) out of maximum score of 54, whereas the remaining five bulls with the scores between 82.03 to 86.85 per cent were awarded 'B' grades. These bulls were categorized as good for their sexual behaviour. In relation to semen picture, three bulls (C145, H12, and C411) were placed in good category, while bull No. C299 was categorized as excellent and bull No. H16 was categorized as fair. Two bulls (H16 and C299) were categorized as good, another two bulls (C145 and H12) as fair and one bull (C411) as excellent for conception rate (C.R.)

REFERENCES

Bane, A. (1954): Sexual function of bulls in relation to heredity, rearing intensity and somatic conditions. Acta. Agric. Scand. 4: 17.c.f. Anim. Breed. Abstr. 24: 261.

Rajkonwar, C.K.; Borgohain, B.N.; and Kakati, B.N. (1977): A report on the investigation of breeding bulls in Assam. Proc. First All India Symp. Anim. Reprod., Punjab Agricultural University, Ludhiana. Vol. 2.

Salisbury, G.W.; Fuller, H.K.; and Willette, E.B. (1941): Preservation of bovine spermatozoa in yolk citrate diluent and field results from its use. J. Dairy Sci. 24: 905.

Singh, G.B.; Pangaonkar, G.R. and Gupta, S.K. (1977): A proposed programme for complete bull evaluation. Proc. First All India Symp. Anim. Reprod., Punjab Agricultural University, Ludhiana, Vol. 2.

Zemjanis, R. (1970): Diagnostic and Therapeutic. Techniques in Animal Reproduction. 2nd Edn. Williams and Wilkins Baltimore PP-145, 147 and 150.

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The Application Of Resazurin Reduction Test In Relation To Post Thaw Recovery Rate Among Triple Crossbred Bulls[1]

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ABSTRACT

Resazurin reduction test was applied to the semen samples obtained from six triple crossbred bulls. The reduction time was inversely correlated ($P \leq 0.01$) to post thaw recovery rates at 0, 24 and 48 hrs. The

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reduction time was higher than that reported for pure breds by other researchers. The longer reduction time was attributed to the lesser metabolic activity of the sperm obtained from the experimental crossbred bulls.

* * *

The resazurin reduction test was introduced by Erb & Ehlers (1950) for estimating the fertilizing ability of the bulls (semen donors). They observed an inverse relation between reduction time and sperm concentration. The time required for semen to reduce resazurin to the pink end point was correlated with fertility.

There is meagre information on crossbred bulls with respect to resazurin reduction test in relation to post thaw recovery rates after deep freezing. An investigation was undertaken to assess the correlation between the reducing time and post thaw recovery scores at 0, 24 and 48 hrs.

Materials and Methods

The experiment was conducted on six crossbred [$_1/_2$ Holstein-Friesian (HF) x $_1/_4$ Brown-Swiss (BS) x $_1/_4$ Hariana (H)] bulls stationed at the Germ plasm centre, Animal Reproduction Division, IVRI, Izatnagar. The bulls were sampled from October'87 to March'88. The age of the bulls ranged between 3-12 years and were divided into two groups: (a) Between 3-5 years and (b) 9-12 years.

Group (a) consisted of $886E_1$, $809E_1$ and $620E_1$ crossbred bulls and group (b) consisted of $314X_1$, $613X_1$ and $1187X_1$ crossbreds. All the bulls were maintained under similar managerial conditions. The semen samples were collected on alternate days using artificial vagina during the morning hrs (7-8 a.m.) after giving a false mount. Twelve ejaculates from each crossbred bull were collected. Immediately (within 20 minutes) after collection, each semen sample was subjected to resazurin test. The resazurin reduction test was carried out as per the modified method of Erb *et al.* (1952). Resazurin solution was made by dissolving 11 mg of resazurin in 200 ml distilled water.

The semen samples were standardized with isotonic solution (2.9% sodium citrate dihydrate aqueous solution) to a concentration of 750,000/cu mm and 0.2 ml of standardized semen (150 million spermatozoa) was taken. Resazurin solution (0.1 ml) was added to each semen sample. The whole solution was covered with 1-1.5 cm thick layer of liquid paraffin to create anaerobic environment. The whole mixture was incubated at 37.5°C in a water bath. The time taken for the colour change to pink and then to colourless state was noted in seconds. The time lapse for each change of colour (violet to pink and pink to colourless end points) was noted.

Results and Discussion

The mean reduction time from violet to pink in the crossbred bulls was 236.33±22.10 seconds (Table 1). The first colour change was correlated with post thaw recovery rate. Depending on the metabolic activity of the spermatozoa, the resazurin reduction time varied.

The resazurin reduction time (RRT) did not differ significantly between the age groups but it did differ significantly ($P \leq 0.01$) between the bulls within the two age groups (Table 2).

The semen samples with lesser RRT exhibited higher post thaw recovery rates. The RRT (violet to pink) was negatively correlated with post thaw motility (Table 3) at 0-hr ($r=-0.65$, $P \leq 0.01$) at 24-hrs ($r=-0.61$, $P \leq 0.01$) and at 48-hrs, ($r=-0.57$, $P \leq 0.01$).

Semen of bull No. 613 X_1 took maximum reduction time of 478.16±72.59 seconds and had only 13.33±1.42% motility soon after thawing, whereas bull No. 886E had 43.33±2.56% motility soon after thawing and 136.66±19.88 seconds reduction time.

The mean time required for second colour change (pink to colourless) in the cross-breds was 609.01±69.32 seconds. This observed value was higher than that reported by Erb *et al.* (1955) and Flerchinger *et al.*(1956). The present higher reduction time among the triple crossbred bulls reflected the lower sperm metabolic activity and lower post-thaw recovery ratings.

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Table 1: The resazurin reduction time in crossbred bulls (Mean ± SE)

Semen Characteristics	BULL NUMBERS					
	886 E_1	809 E_1	620 E_1	514 X_1	613 X_1	1187 X_1
Resazurin reduction time (violet to pink) in seconds.	136.66 ± 19.88	160.41 ± 19.94	252.16 ± 57.62	159.33 ± 41.58	478.16 ± 72.57	231.25 ± 21.72
Resazurin reduction time (pink to colourless) in seconds.	509.58 ± 210.89	547.08 ± 244.51	672.91 ± 119.43	425.23 ± 69.16	950.38 ± 123.57	548.88 ± 36.41

Table 2: The analysis of variance of resazurin reduction time (violet to pink) in crossbred bulls.

Source of variation	df	MSS	F
Between age groups	1	204160.50	1.073 NS
Between Bulls within age group	4	190116.75	8.189**
Error	66	23216.07	

NS - Not significant

** Significant at 1% probability level.

Table 3: Correlation coefficient between resazurin reduction time and post thaw motility in crossbred bulls.

Semen Characteristics	Post thaw motility at 0-hour.	Post thaw motility at 24-hours.	Post thaw motility at 48-hours.
Resazurin reduction time (violet to pink)	-0.65**	-0.61**	-0.57**

** Significant at 1% probability level.

REFERENCES

Erb, R.E. and Ehlers, M.H. (1950): Resazurin reduction time as an indicator of bovine semen fertilizing capacity. J. Dairy Sci. 33: 853-864.

Erb, R.E.; Ehlers, M.H. and Flerchinger, M.H. (1952): Modified Resazurin reduction test for esimating fertilizing capacity of bull semen. J. Dairy Sci. 35: 881-888.

Erb, R.E.; Flerchinger, F.H.; Ehlers, M.H. and Milota, L.E. (1955): Metabolism of bull semen IV Relationships among physical measurements, metabolic activity and fertility. Washington Agri. Exp. Sta. Tech. Bull No. 18 State College of Washington U.S.A.

Flerchinger, F.H.; Erb, R.E.; Mikota, L.E. and Ehlers, M.H. (1956): Metbolism of bull semen III Relation of lactic acid and its accumulation during incubation with other semen quality measurements and non-returns. J. Dairy. Sci. 39: 1006-1014.

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Effect Of Prostaglandins On Cryo-preserved Buffalo Semen

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ABSTRACT

The effect of exogenously added prostaglandins (PGs) E_2 and F_2 alpha was evaluated on certain sperm characteristics of cryopreserved buffalo semen. Although the proportions of live spermatozoa did not vary, the percentage of spermatozoa with intact and healthy acrosome in chilled extended semen was reduced significantly ($P < 0.05$) by the PG treatment. The lower dose combination of PGs used resulted in improved motility ($P < 0.01$) albeit transient in the thawed semen and the response is bull specific with individual bull differences. The PG addition did not influence the livability, cold shock resistance and morphology of frozen-thawed buffalo sperm.

* * *

A.I. with frozen semen generally yields low fertility rates in farm animals (Langford *et al.*, 1979). The successful cryopreservation of semen which is very important to have a good fertility, depends on the clear understanding of the role of seminal plasma in addition to the semen extenders used. Since the addition of

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Table 1: Bull-wise data on initial neat semen quality.

Bull No.	Volume (ml)	pH	Mass activity (+++)	Initial* motility	Concentration (million/ml)	Live* sperms	Cold shock* resistant spermatozoa	Morpho-* logical abnormalities	Intact* acrosomes
M 45	2.25	7.02	2.25	61.12	990.00	69.38	43.25	19.91	74.89
M 100	2.50	7.17	2.08	61.76	698.33	67.14	40.91	20.58	72.84
M 583	2.13	7.03	2.25	63.17	1103.33	69.76	42.85	20.85	74.21
M 619	2.50	7.11	2.08	58.40	575.00	66.72	37.60	18.58	71.71
M 3996	2.42	7.13	2.33	62.87	1008.33	66.15	38.64	20.66	73.95
MPT	2.13	7.03	2.58	63.44	1271.67	67.00	40.13	21.07	73.64
Overall Mean±SE	2.32 ±0.1	7.08 ±0.00	2.26 ±0.1	61.80 ±0.5	941.11 ±51.7	67.69 ±0.9	40.56 ±1.1	20.28 ±0.8	73.54 ±0.5

* Mean of arc sin transformed data.

prostaglandins (PGs) to sheep semen prior to freezing was observed to improve the fertility rate (Zhiltsov *et al.*, 1974; Gustafsson *et al.*, 1975), attempts were made to study the effect of PG supplementation on certain sperm characteristics of cryopreserved buffalo semen, which could be linked to the fertility.

Materials and Methods

Six fertile Murrah buffalo bulls aged between 4 to 6 years maintained at Indo-Swiss Project, Visakhapatnam, were utilized for this study. Semen was collected twice a week for a period of 3 weeks by an artificial vagina. After initial evaluation, the semen samples, suitable for insemination, were extended in Tris egg yolk citrate at 37°C to contain 20 million spermatozoa/ml. The extended semen was partitioned into 3 aliquots. The PGs (M/S. Fuji chemical Co., Tokyo, Japan) E_2-2.5 ng and F_2 alpha-1.5 ng were added per ml of extended semen to one of the aliquots (T-2). The quantity of added PGs was doubled in one aliquot (T-3), the third being left without any supplementation (T-1). The extended semen was loaded in 0.5 ml French straws, sealed with Poly vinyl alcohol and then left for equilibration and cooling for 5-6 hours in a cold handling unit to reach 5°C. The semen samples were once again evaluated after equilibration for percentages of live spermatozoa (Blom, 1977) and spermatozoa with intact and healthy acrosomes (Watson, 1975). The filled straws were frozen by horizontal vapour freezing technique and preserved at -196°C. The semen was thawed at 37°C for 30 seconds after one weeks' storage in liquid nitrogen. The frozen-thawed semen samples were analysed immediately for the percentages of progressively motile sperm, live sperm, morphologically abnormal sperm (Hancock, 1957), spermatozoa with intact and healthy acrosomes and cold shock resistant sperms (Lasley *et al.*, 1942). The thawed semen sample was incubated at 37°C to assess the percentage of progressively motile sperm at hourly intervals for upto 4 hours. The data were analysed statistically (Snedecor and Cochran, 1980).

Results and Discussion

Chilled extended semen: The percentage of live spermatozoa (after arcsin transformation) averaged 71.97 ± 0.6, 71.73 ± 0.5 and 71.44 ± 0.6 in control, T_2 and T_3 respectively. Although previous reports on the effect of PGs on buffalo sperm viability at 4°C are scanty, the lack of treatment effect observed in buffaloes corroborates with the findings of Ramana (1986), who could not notice any difference in proportions of live spermatozoa within 24 hours of incubation at 4°C. The percentage of intact and healthy acrosomes significantly varied from 67.46 ± 0.9 in control to 64.64 ± 0.7 in T_2 and 65.33 ± 0.9 in T_3 ($P < 0.05$), indicating the adverse effect of PGs on acrosomal maintainance of buffalo sperm. Similar action of PGs especially PGE_2 was also reported in hamsters by Meizel and Turner (1984).

Frozen thawed semen: The mean post-thaw motile sperm observed for the treatments T_1, T_2 and T_3 at zero hours differed significantly ($P < 0.01$) in order of $T_2 > T_3 > T_1$ (Table 2). The smaller improvement observed in T_3 compared to that of T_2 might be due to increased PGF_2 alpha concentration used in T_3. This corroborates with the observation of Ramana (1986) who also found better motility with lower PG concentration in the buffalo semen preserved at 4°C. These results can be contemplated since addition of PGE_2 was shown to be more directly concerned with motility of sperm and stimulate spermatozoal activity (Schoenfeld *et al*, 1975) while PGF_2 alpha was inhibitory to sperm motility (Cohen *et al*, 1977; Rabbit *et al*, 1981). But similar improvement in post-

Table 2: Mean ± S.E. Values of frozen-thawed semen.

Parameter	Hrs	T - 1	T - 2	T - 3
		Control	PGE_2+PGF_2 alpha (lower conc.)	PGE_2+PGF_2 alpha (higher conc.)
Motile sperms	0	45.00 ± 0.4^a	51.12 ± 0.5^b	47.09 ± 0.6^c
	1	23.45 ± 1.8	23.04 ± 2.1	21.63 ± 2.0
	2	13.96 ± 2.0	15.61 ± 2.4	14.50 ± 1.9
	3	13.88 ± 2.0	12.71 ± 2.0	11.61 ± 1.9
	4	8.76 ± 1.2	10.29 ± 1.6	9.76 ± 1.6
Live sperms	0	52.09 ± 1.4	51.74 ± 1.0	52.19 ± 1.0
Cold shock resistant sperms	0	45.88 ± 1.3	45.59 ± 1.3	44.61 ± 1.3
Abnormal sperms	0	30.55 ± 1.0	28.33 ± 1.1	30.43 ± 1.0
Sperms with intact and healthy acrosomes	0	48.10 ± 1.0	46.15 ± 1.0	48.51 ± 0.7

Note: The values bearing different superscripts differ significantly ($P < 0.01$).

thaw sperm motility due to PG addition was not observed in sheep by Memon and Gustafsson (1984). Thus, it appears that buffalo sperm may be more sensitive to higher PG concentration. The treatment X bull interaction was also found to be significant ($P < 0.01$). The treatment T_2 gave greater beneficial effect than either T_3 and T_1 in bulls 110, 583, 3896 and MPT while in Bull 619, the post-thaw motility was $T_2 > T_3 > T_1$ ($P < 0.05$). The motility was significantly higher in T_2 and T_3 than T_1 in Bull 45. This is suggestive of individual bull differences in their initial seminal concentration of PGE_2 and PGF_2 alpha; and the effect of added PGs may depend on these endogenous PG levels. The lack of treatment effect on percent motile sperm at hourly intervals found in this experiment was in agreement with the findings of Ramana (1986).

There was no significant difference either between treatments or bulls in percentages of post-thaw live, cold shock resistant, abnormal spermatozoa and spermatozoa with intact and healthy acrosomes observed at zero hours. The higher concentration of PGF_2 alpha used in T_3 might be effective only in reducing the motility of post-thaw spermatozoa, but not enough to cause death of sperm. The prostaglandins might have effected acrosomal changes in the weaker spermatozoa of chilled extended semen which could otherwise get damaged following freezing and thawing process, since the observed variation in extended semen of different treatments vanished after freezing and thawing. The results agree with Varnavskii (1981) and Gustafsson *et al*, (1975) who noticed no difference in the survival rate of frozen ram spermatozoa treated with or without PGE_2 and PGF_2 alpha. Memon (1980) observed that higher dose of PGs adversely affected sperm survival and acrosomal morphology of frozen ram semen, while lower doses had no harmful effect. However, the level of PGs used in this

experiment are comparable only to the lower doses used by Memon (1980). Hence, the addition of prostaglandins E_2 and F_2 alpha can be used safely at lower levels (T_2) as a means for improving the fertility in buffaloes.

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REFERENCES

Blom, E. (1977): Sperm morphology with reference to bull infertility. Proc. Ist All India Symp. Anim. Reprod. 17-19 January, 1977. Punjab Agricultural University, Ludhiana, India. PP 61-81.

Cohen, M.S., Michael, J., Colin, M., Golimba and Hotchriss, R.S., (1977): The effect of PGs on sperm motility. Fertil. and Steril. **28** (1): 78-85.

Gustafsson, B.S., Edqvist, S., and Einarsson, S. (1975): The fertility of deep-frozen ram semen supplemented with PGF2 alpha Acta. Vet. Scand. **16**: 468-470.

Hancock, J.L. (1957): The morphology of bear spermatozoa, J. Roy. Micro. Sec. **76**: 84-97.

Langford, G.A.,; Hackett, A.J. and Marcus, G.J. (1984): Studies on ram sperm penetration in bovine cervical mucus. In 10th Internat. Cong. Anim. Reprod. and A.I. University of Illinois. Paper No. 58, 3 pp. Anim. Breed. Abst. **53**: 2181.

Lasley, J.F.; Easley, G.T. and Bogart, R. (1942): J. Anim. Sci. **1**: 79.

Meizel, S; Turner, K.O. (1984): The effects of products and inhibitors of Arachidonic acid metabolism on the hamster sperm acrosome reaction. J. Exptl. Zoology **231** (2): 283-288.

Memon, M.A. and Gustafsson, B.K. (1984): Effects of various concentrations and combinations of PGs on in vitro migration of frozen thawed ram spermatozoa in cervical mucus of ewes. Theriogenology **21** (5): 841-848.

Memon, M.A. (1980): Effects of prostaglandins on ram spermatozoa. Ph.D. thesis, University of Minnesota. C.F. Memon, M.A. and Gustafsson, B.K. (1984).

Rabbit, B.G.E.; Seidel, J.R. and Berndtson, W.E. (1981): Effect of Tris (Hydroxymethyl) amine methane salt of PGF2 alpha on post thaw motility of bovine spermatozoa. Dairy Sci. **60**: 1981-1983.

Ramana, G.V. (1986): M.V.Sc. Thesis (Anim. Reprod. & Gynae.), Andhra Pradesh Agricultural University, Hyderabad-500 030

Schoenfeld, C., Amelar, R.D. and Dubin, L. (1975): Stimulation of ejaculated human spermatozoa by caffeine. Fertil. Steril. **126**: 158-161.

Snedecor, G.W. and Cochran, W.G. (1980): Statistical methods. 7th Ed. Iowa State University Press. Ames, U.S.A.

Varnavskii, A. (1981): The effect of synthetic PGs in frozen ram semen on conception rate of ewes. Anim. Breed. Abstr. **50** (2): 779.

Watson, P.F. (1975): Use of a Giemsa stain to detect changes in acrosomes of deep frozen ram spermatozoa. Vet. Rec. **97**: 12-15.

Zhiltsov, N.Z.; Golub, V.S.; Varnav Skaya, V.A.; Azhgikhin, I.S.; Bobylev, R.V.; Gandel, V.G.; Pechennikov, V.M. (1974): Possibilities of using PGs for increasing the effectiveness of A.I. in Sheep. Zhivotnovodstvo. **8**: 67-70. Anim. Breed. Abst. **42**: 5357.

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Glycogen Phosphorylase Enzyme Of Cervical Mucus In Crossbred Cows To Predict Time Of Insemination

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Cervical mucus contains several enzymes including glycogen phosphorylase (Hafez, 1974). Enzymes of cervical mucus have an important role to play by providing energy for sperm motility, survival and transport in genital tract (Sheth *et al*, 1975).

Materials and Methods

The present work was carried out at C.B.F. Kandivli, Bombay during 1981 on the crosses of Gir cows with Jersey and Holstein. The animals were kept under ideal conditions of feeding and management. Cervical mucus was collected from 24 cows with normal oestrus cycle and 15 repeat breeders, prior to insemination by an apparatus consisting of 10 ml sterile glass pipette with 20 ml sterile record syringe attached to its tapering end by rubber adopter.

The cervical mucus was aspirated into pipette and transferred into glass vial for estimation of glycogen phosphorylase enzyme. The vials containing cervical mucus were brought in thermos flask for estimation of enzyme in laboratory. They were assessed on same day of collection on spectra 75 colorimeter as per Cohen and Fischer, (1972). Data were analysed statistically.

Results and Discussion

It is observed that the difference in the average concentration of glycogen phosphorylase enzyme between normal and repeat breeding crossbred cows (Table 1) was highly significant ($P < 0.01$).

Sheth *et al*, (1975) observed the pathway of glycogen phosphorylase involved in the degradation of glycogen during menstrual cycle of Bonnet monkey. There are no direct references to correlate the present variation of glycogen in cows. However, the cyclical variation of glycogen phosphorylase activity may throw light if a systematic study of the enzymes is carried out during the various phases of oestrus cycle. Glycogen phosphorylase activity which was low during early follicular phase increased as the cycle progressed till just before the LH level reached a peak value and thereafter declined during the luteal phase of cycle.

REFERENCES

Cohen, P and Fischer, E.E. (1972): Determination of glycogen phosphorylase in dog-fish skeleton muscle. Methods in enzymology, Vol. 28, Part B: 963.

Hafez, E.S.E. (1974): Reproduction in farm Animals. 3rd Edn. Pub. Lea & Feibiger P. 52.

Snedecor, G.W. and Cochran, W.G. (1967): Statistical methods. 6th Edn. Oxford and IBH Publishing Co., Calcutta 5.

Sheth, A.R.; Shah, G.V.; Gadgil, B.A. and Rao, S.S. (1975): Cyclic changes in the metabolism of glycogen in cervical mucus of Bonnet Monkeys (Macaca Radiata) J. Reprod. Fertil. **42**: 133-136.

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Table 1: The average concentration of glycogen phosphoryiase enzyme in normal and repeat breeding cows.

Sr. No.	Group of crossbred cows	No. of cows	Av.. mg of inorganic phosphorus liberated/hr/ml of cervical mucus.	't' value
1	Normal	24	9.13 ± 1.00 (1.26 - 19.65)	2.7186**
2	Repeat breeding	15	13.74 ± 1.40 (5.61 - 21.40)	
3	Normal-pregnant	19	8.82 ± 1.10 (1.26 - 19.65)	0.5947NS
4	Normal-non-pregnant	5	10.32 ± 2.61 (3.86 - 14.63)	
5	Repeat breeding pregnant	6	13.77 ± 2.49 (5.61 - 21.40)	0.0173NS
6	Repeat breeding non-pregnant	9	13.81 ± 1.85 (6.49 - 20.53)	

Standard error: ** highly significant S: Non-Significant.

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Effect Of Lunar Phases On Variability Of Inseminations In Cattle And Buffaloes

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ABSTRACT

Analysis of data on A.I. in cattle and buffaloes revealed that both phases of moon exert significant ($P < 0.01$) and positively correlated effect on the breeding behaviour of these animals. Percentage of A.I. during lunar phases remained fairly constant irrespective of seasons even in buffaloes. However, seasons greatly influenced breeding behaviour and conception rate in buffaloes. Interestingly in cattle, lunar phases, seasons and interaction between these two significantly affected conception rate.

* * *

Effect of lunar phases on breeding behaviour of organisms is well documented in chronobiology. Various reproductive physiological events occuring in association with moon were reported (Prosser, 1975). Similarly, nocturnal periodicity of estrus in domestic animals is an established fact. However, literature on the association between lunar dominated nocturnal environment and breeding behaviour of domestic animals is wanting. An attempt therefore is made in the present study to investigate the relationship between lunar dominated nocturnal environment and breeding behaviour of cattle and buffaloes by analysing variability of A.I. and conception rate (C.R.) during various seasons.

Materials and Methods

Data of 13,943 A.I. and conception in cattle and 10,947 in buffaloes from twelve randomly selected village dairy co-operatives

Table 1: Distribution of Inseminations and conception rates during various seasons and lunar phases in cattle and buffaloes.

	CATTLE						BUFFALOES					
Seasons	L_1	L_2	L_0	L_0 Mean	% of L_1 & L_2	Total	L_1	L_2	L_0	L_0 Mean	% of L_1 & L_2	Total
S_1	333.00 (42.64)	309.50 (41.90)	2161.50 (40.09)	89.02	20.05	3204.00 (41.54)	356.00 (34.27)	383.50 (34.16)	2839.50 (35.02)	103.03	20.66	3579.00 (34.48)
S_2	349.00 (40.40)	352.50 (39.71)	2900.50 (39.10)	102.31	19.48	3602.00 (39.74)	237.50 (28.63)	247.00 (28.34)	1931.00 (31.99)	68.30	20.05	2416.00 (29.65)
S_3	364.00 (39.83)	339.00 (38.00)	2674.50 (39.22)	93.19	20.83	3378.00 (39.02)	241.00 (31.12)	212.00 (32.00)	1664.15 (32.62)	58.34	21.41	2118.00 (31.91)
S_4	290.00 (42.76)	354.00 (41.24)	2665.00 (40.83)	93.01	19.46	3309.00 (41.61)	322.00 (33.23)	308.50 (33.06)	2203.50 (33.63)	72.40	22.24	2834.00 (33.31)
Total	1336.00	1335.50	1080.50	377.53	19.95	13493.00	1156.50	1151.50	8639.00	307.07	21.09	10947.00

Note: Figures in paranthesis indicate conception rate.

affiliated to this Union for a five year period (1984-1988) was tabulated as A.I. and conception rate during new moon (L_1), full moon (L_2) and other days (L_0), monthwise. The data was then grouped seasonally for analytical convenience as: S_1 cold and dry season:- January to March; S_2 hot and dry season:- April to June; S_3 hot and humid season:- July to September and S_4 cold and humid season:- October to December.

Statistical methods of Panse and Sukhatme (1964) were adopted for analysis of variance, correlation and partial regression of data. Bliss method of angular transformation of percentages was adopted for analysis of variance of conception rate as per Snedecor and Cochran (1967).

Results and Discussions

Present investigations reveal that both phases of moon have sinificant ($P > 0.01$) and positively correlated effect on number of cows and buffaloes inseminated. This lunar related reproductive behaviour is in consonance with the observations of Ramanathan (1932); Korringa (1957); Bunning (1973); Palmer (1973) and Saunders (1977). Positively correlated lunar effect with A.I. is discernible from the results of correlation analysis which in cattle were L_1 ($r = .9426$. $P < 0.01$), L_2 ($r = .9594$. $P > 0.01$) and in buffaloes L_1 ($r = .9474$. $P > 0.01$) and L_2 ($r = .9492$. $P > 0.01$). Full moon seems to exert higher influence in cattle than new moon as revealed in partial regression of data where $Y = 2994.97 + 0.47\ L_1 + 0.63\ L_2$, though both phases appear to exert almost equal influence in buffaloes. ($Y = 2424.82 + 0.512\ L_1 + 0.502\ L_2$). Reproductive physiological events occurring only once or few times during the year but always in association with some particular phase of the moon have been reported in many species of animals (Prosser, 1975). Supportive evidence for full moon dominated reproductive behaviour is evident in sea animal species L. fucata (Hoar, 1984) and in cattle heifers (Roy *et al*, 1980). However, the latter findings were disputed by Greer (1984) with chi square data analysis in beef heifers and concluded that occurrance of first estrum was randomly distributed throughout lunar cycle. Interestingly, Dewan (1969) has reported the occurrance of menstruaton in some primates over new moon.

Our observations show that 19.96% A.I. in cattle and 21.09% in buffaloes were being carried out during lunar phases (Table 1) irrespective of seasons. Interactions between lunar phases and seasons is not significant (Table 2) even in buffaloes indicating that seasonal changes do not influence lunar phase A.I. even in seasonal breeders. However, seasons seem to play significant role in the breeding behaviour of buffaloes (Table 2), an observation in tune with that of Ahmed *et al*, (1980) and Singh and Singh (1985).

Contrary to our expectations (Table 3), phases of moon, seasons and interactions between these two have significant ($P > 0.01$) effect on the conception rate in cattle, while only seasons have significant influence in buffaloes. Bhattacharya and Dhanda (1988) have also observed seasonality of conception in buffaloes.

Nocturnal periodicity of estrus is an established fact in cattle (Hurnik *et al*, 1980; Peters and Ball, 1987), in buffaloes (Jainudeen and Hafez, 1987) and in goats and sheep (Lincoln *et al*, 1977; Fraser, 1978). Endocrinological evidence of Lincoln *et al*, (1977); Frazer (1980) and Ruiz de Elvira *et al*, (1982) explains this periodicity as plasma levels of FSH, LH and melatonin show an acute increase during night. Further, the increase in melatonin plasma levels during night was attributed to the link between photoperiods and cycles of sexual activity in

Table 2: Analysis of variance of A.I. in cattle and buffaloes.

Sources	Degree of freedom	Sum of squares	Mean sum of squares	Calculated 'F'
Years	4	8868.71 (4115.67) +		
Lunar Phases (L)	2	31257.84	15628.92	105.12**
		(23910.30)	(11955.55)	(60.57)**
Season (S)	3	292.96	97.65	0.66 N.S.
		(4593.29)	(1531.10)	(7.76)**
L x S	6	593.96	98.99	0.67 N.S.
		(1118.17)	(186.36)	(0.944) N.S.
Error	44	6542.07	147.68	
		(8685.08)	(197.39)	
Total	59	47555.51		
		(42422.51)		

** Significant P > 0.01 N.S.: Not Significant + Figures in parenthesis are those of buffaloes.

Table 3: Analysis of Variance of Conception rate in Cattle and Buffaloes.

Sources	Degree of freedom Df	Sum of squares SS	Mean sum of squares MSS	Calculated 'F'
Year	4	3.79 (6.09) +	0.947 (1.52)	
Lunar Phases (L)	2	3.98	1.99	5.85**
		(1.74)	(0.87)	(0.9886)N.S.
Season (S)	3	11.57	3.86	11.35**
		(88.25)	(29.42)	(33.43)**
L x S	6	5.17	0.862	2.54*
		(8.93)	(1.49)	(1.69) N.S.
Error	44	15.14	0.34	
		(38.89)	(0.88)	
Total	59	39.65		
		(143.90)		

** Significant (P > 0.01) at 1% level. * Significant (P > 0.05) at 5% level. N.S.: Not Significant.
+ Figures in paranthesis are those of buffaloes.

cattle. The present results establish a link between nocturnal periodicity of estrus and nocturnal environment predominated by lunar phases with appreciable lunar related reproductive behaviour in cattle and buffaloes.

This study being perhaps the first of its type, further investigations with abundant data drawn from different geo-physical environments are suggested for better understanding of lunar related reproductive behaviour in cattle and buffaloes.

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REFERENCES

Ahmed, N.; Choudry, R.A.; B.B. Khan (1980): Effect of month and season of calving on the subsequent calving on Nili Ravi Buffaloes. Anim. Reprod. Sci. 3: 301.

Bhattacharya, B.N. and O.P. Dhanda (1988): Seasonal effect on reproductive behaviour of Jaffrabadi Buffalo Breed. II World Buff. Cong. ICAR Publication, New Delhi p. 15.

Bunning. E. (1973): The physiological clock. 3rd Ed. Springler - Valog Heidelberg p 258.

Dewan. E.M. (1969): Monthly rhythms in Man. Jr. Sci. and Tech. **28**: 20-28.

Fraser, A.F. (1978): A General review of sexual behaviour in Livestock. Procd. 1st World Cong. Ethology. Appl. Zootechnics. **1**: 507-512.

Fraser, A.F. (1980): Farm Animal Behaviour. 2nd Edn. Pub. ELBS and Bailliere-Tindal, London Pp. 143-145.

Greer (1984): Effect of day length at birth and lunar phase on the occurrence of first estrum in beef heifers. Anim. Prodn. **39**: 59-63.

Hoar. S.W. (1984): Lunar and Tidal rhythms: General and comparative physiology 3rd Ed. Prentice Hall. Vancover. Canada Pp. 32-34.

Hurnik, J.F.; King G.J. and Robertson H.A. (1974): Estrus and related behaviour in post partum Holstein cows. Appl. Anim. Ethol. **2**: 25.

Jainudeen, M.R. and Hafez E.S.E. (1987): Reproduction in Farm Animals Pub. Lea & Fabiger, Philedelphia Pp. 308-310.

Korringa, P. (1957): Lunar periodicity. Men. Geol. Soc. Am. **67** (1): 917-934.

Lincoln, G.A.; Peet M.S. and Cunningham R.A. (1977): Seasonal and circadian changes in the episodic release of FSH, LH and testosterone in rams exposed to artificial photoperiods. J. endocrinol. **72**: 337.

Palmer J.D. (1973): Tidal Rhythms: The clock control of rhythmic physiology of marine organisms. Biol. Rev. **48**: 337-418.

Panse, V.G. and Sudhatme, P.V. (1967): Statistical methods for Agricultural workers ICAR Publications, New Delhi, Pp. 67-85.

Peters A.R. and Ball P.J.H. (1987): Estrus behaviour and its deduction: Reproduction in cattle. Pub. Butter worths, Wellington, New Zealand. Pp. 40-42.

Prosser, L.G. (1975): Biological Rhythms: Lunar related Rhythms. Comparative Animal Physiology. 3rd Ed. W.B. Saunders Co. U.S.A., Pp. 429-439.

Ramanathan, O. (1932): Light and Sexual periodicity in Indian Buffaloes. Nature **130**: 169-170.

Roy, J.B.H.; Gillics, C.M.; Perfitt, M.W. and Stobo I.J.F. (1980): Effect of season and Moon phase on the occurrence of extrus and conception in dairy heifers reared on high planes of nutrition. Anim. Prod. **31**: 13-26.

Ruiz de Elvira, M.C.; Herdon, J.G. and Wilson, M.E. (1982): Influence of estrogen treated females on sexual behaviour and Male testosterone levels of a social group of rhesus monkeys during non breeding season. Biol reprodn. **26**: 825-834.

Saunders D.S. (1977): Insect clocks. Comp. Biochem. Physiol. **56A**: 1-5.

Snedecor, G.W. and Cochran W.G. (1967): Statistical methods. 6th Ed. Oxford and IBH Publishing Co., New Delhi Pp. 327-329 and 569-571.

Singh, G. and Singh, G.B. (1985): Effect of month of calving on Post-partum estrus interval and service period in buffaloes. Proc. 1st World Buff. Cong. Cairo. Egypt. P. 960.

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Sperm Characteristics From Different Regions of Reproductive Tracts of Black Bengal Bucks*

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ABSTRACT

Studies on 45 Black Bengal bucks showed that sperm concentration and percentage of live spermatozoa were maximum in the cauda followed by caput, corpus and vas deferens. Motility of spermatozoa was highest in vas deferens followed by cauda and was absent in the caput epididymis.

* * *

This investigation was undertaken to study the extra-gonadal sperm reserve, motility and livability of sperm in the Black Bengal bucks as there is paucity of information in this respect.

Materials and Methods

Experimental animals consisted of 45 Black Bengal bucks. After castrating these bucks by open method (O' conner, 1980) the caput, corpus and cauda of two epididymes corresponding to both testes and vas deferens of each goat were separated out following standard method. The luminal contents of these four regions of each goat were obtained separately by incising them longitudinally and flushed with 1 ml of normal saline solution. The luminal contents were vertexed separately for 30 seconds. Sperm concentration of the luminal fluid of the three regions of epididymis and vas deferens was determined separately by the haemocytometer method. Motility of sperm was scored in the grade 0 to 100 percent by eye estimation, while percentages of live spermatozoa were determined by standard Eosin-Nigrosin staining. The results were analysed statistically as per Snedecor and Cochran (1976).

Results and Discussion

The average number of spermatozoa (X 10^7/ml) was found to be maximum (Table 1) in the cauda (1267.966 ± 10.728) followed by caput (935.066 ± 6.802), corpus (436.933 ± 7.754) and vas deferens (225.166 ± 6.180). This trend in extra-gonadal sperm reserve in goat was also reported by Jindal and Panda (1980).

This may be explained by the fact that cauda epididymis being the storehouse, contains maximum number of mature spermatozoa. During the journey of spermatozoa through epididymis, the percentage of motile sperm was maximum in the cauda (63.333 ± 0.855) and the same was absent in the caput. This is in confirmity with the findings of Jindal and Panda (1980). It was also observed that the motility of spermatozoa was higher in the vas deferens (65.333±0.699) than in cauda epididymis. Similar observations were made by Mukherjee and Bhattacharya (1949) while they studied spermatozoa from different levels of the male reproductive tracts of the sheep and goat. This is possibly due to the removal of inhibition factor present in the cauda. The differences in the percentage of motile spermatozoa from the three different regions of epididymis were found to be highly significant. Jindal and Panda (1980) also

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recorded the same result. Most of the spermatozoa from the three parts of epididymis were alive and maximum in the cauda (86.967 ± 0.706%) and minimum in corpus (74.233 ± 0.767%) respeetively. Findings of Glover (1961) corroborate with the present observations. Dead spermatozoa are selectively removed during their transit through the caput to vas deferens and cauda being the store house of spermatozoa have better environment for them. This is possibly responsible for the presence of greater quantity of live spermatozoa in the cauda epididymis.

Table 1: Mean and S.E. values of sperm reserves, sperm motility and live spermatozoa from the different epididymal regions and vas deferens of Black Bengal goat.

Region	Sperm reserves ($\times 10^7$/ml.)	Sperm motility (%)	Live sperm (%)	Number of observations
Caput.	935.066 ± 6.802	Absent.	80.867 ± 0.538	45
Corpus.	436.933 ± 7.754	15.333 ± 0.699	74.233 ± 0.767	45
Cauda.	1267.966 ± 10.728	63.333 ± 0.855	86.967 ± 0.706	45
Total Epididymal reserves.	2369.966 ± 25.160	—	—	45
Vas deferens	225.166 ± 6.188	65.33 ± 0.699	69.20 ± 0.727	45

REFERENCES

Jindal, S.K. and Panda J.N. (1980): Epididymal sperm reserves of the goat. J. Reprod. Fertil. **59** (2): 469-471.

Mukherjee, D.P. and Bhattacharya, P. (1949): Study of spermatozoa from different levels of the male reproductive tracts or the sheep, goat and buffalo. Proc. Zool. Soc. Beng. 2: 149-161.

O'conner, J.J. (1980): Dollar's Veterinary Surgery 4th Ind. Edn. The CBS Publishers and Distributors, New Delhi, India.

Snedecor, G.W. and Cochran, W.G. (1967): Statistical methods 6th Edn. The Iowa State University Press, Ames, Iowa, U.S.A.

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Effect Of Frequency Of Ejaculation On Semen Characteristics, Libido And Fertility In Cross-Bred Bucks*

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ABSTRACT

Optimum number of collections per day from adult cross-bred bucks (Saanen-Alpine-Malabari) were studied. Ejaculation once (Group I), twice (Group II) and thrice (Group III) daily for three months were studied. While density, mass activity and sperm concentration showed a decreasing trend on

* Forms a part of M.V.Sc. thesis of the senior author.

increasing the collection frequency; the volume, pH, motility percentage of dead sperms and percentage of abnormal sperms were unaffected. Methylene Blue Reduction time showed an increasing trend on increasing the ejaculation frequency ($P < 0.01$). Sperm viability on incubation at 46.5°C for 30 minutes and on preservation at 5°C for 72 hrs showed no significant difference between groups. Ejaculation frequencies were not found to affect the reaction time. The period of refractoriness in group II bucks and first period of refractoriness in group III bucks was 283.42 ± 643.93 and 332.34 ± 224.0 seconds respectively which was not significant. Fertility trial using semen of bucks ejaculated thrice daily gave a conception rate of 73.37%.

There was no deterioration of semen quality, libido and conception rate with increase in collection frequency without any significant advantage in increasing daily collections. Increasing frequency of collection from one to two times daily had definite advantage as it yields more number of spermatozoa for A.I.

* * *

There are established norms on the frequency of semen collection from rams of temperate regions where sheep are considered as seasonal breeders. (Roberts, 1971).

There are only few reports on the effect of frequency of semen collection on seminal attributes in goat, which unlike sheep are continuous breeders (Tewari *et al*, 1968; Prasad *et al*, 1970). Male animals offered frequent opportunities for copulation lose libido before the quality of ejaculate decline to a degree that would affect fertility (Roberts, 1971). Higher temperature viability test and Methylene Blue Reduction Time have some correlation with the fertility of semen (Arthur, 1982). This study was undertaken to evaluate the long term effect of different ejaculation frequencies on seminal attributes, libido and fertility in cross-bred bucks with a view to fix the optimum number of semen collections per day.

Materials and Methods

Nine adult Saanen-Alpine-Malabari cross-bred bucks aged 2 to 3 years, belonging to AICRP on Goats for Milk, Mannuthy were selected for the study. The bucks maintained under identical feeding and management were randomly allotted to three experimental groups of 3 bucks each.

Group I (G_1): One ejaculate was taken daily for a continuous period of 3 months.

Group II (G_2): Two successive ejaculates were taken daily for a continuous period of 3 months.

Group III (G_3): Three successive ejaculates were collected daily for a continuous period of 3 months.

Semen characteristics: Such as colour, volume, density, mass activity, motility and percentage of dead and abnormal sperms were estimated by standard procedures (Roberts, 1971). Hydrogen ion concentration was estimated using BDH, pH indicator strips. Sperm concentration was estimated using Bauch and Lomb Spectronic 20 photocolorimeter by standard procedure.

Methylene Blue Reduction Test (MBRT): This was done as per Beck and Salisbury (1943) with partial modifications. In a 10 ml test tube, 0.4 ml of Tris egg yolk diluent and 0.1 ml fresh semen were taken. After mixing, 0.05 ml of (0.05%) Methylene Blue solution was added, mixed and the test tube sealed with 1 cm layer of mineral oil and kept in a hot water bath at 115°F. The time taken for reduction of blue colour was recorded as MBR time.

Sperm Livability Test: Semen was diluted at the rate of 1:10 using Tris egg yolk diluent. From the diluted semen, 0.1 ml each was placed in three 10 ml test-tubes and incubated

for 30 minutes in a water bath at 46.5°C. The spermatozoan motility was assessed every 10 minutes, for 30 minutes. Motility of extended samples preserved at 5°C was also assessed at 24 hours interval until 96 hours of preservation or total cessation of motility, whichever was earlier.

Sex libido: was evaluated from reaction time and refractory period of individual bucks including the time taken for the two false mounts.

Fertility trial: Twenty does in heat were inseminated with semen collected from bucks ejaculated thrice daily. Pooled semen samples from bucks after a continuous period of two months of study, diluted in tris diluent giving a final concentration of 100 million sperms per dose (0.1 ml) was used for insemination. Fertility was assessed based on both conception and kidding rate.

The data was analysed statistically (Snedecor and Cochran, 1967).

Results

Semen characteristics: The thick creamy colour of first ejaculate changed to creamy→thin creamy→thin creamy yellow →yellowish milky with the increase in frequency and period of collection. Increase in frequency of collection showed a decreasing effect on density, mass activity and sperm concentration. Volume, pH, motility, percentage of dead sperms and percentage of abnormal sperms were unaffected (Table 1).

MBRT: showed an increasing trend on increasing the ejaculation frequency. The mean MBRT in seconds for group I, II and III were 133.09 ± 61.42, 229.80 ± 116.08 and 312.53 ± 104.13 respectively. Analysis of data proved that there was significant difference ($P < 0.01$) between groups I and II and I and III.

Sperm livability: Analysis of data revealed that there was no significant difference between groups in sperm livability (Table 2) on incubation for 30 minutes and sperm motility on preservation for 72 hrs, eventhough the initial motility was significantly different ($P < 0.05$). In contrast, sperm viability under chilled storage conditions showed a significant difference between groups ($P < 0.05$) at 96 hrs of preservation (Table 2). The percentage of spermatozoan motility for G_1, G_2 and G_3 at 96 hours of storage was 34.51 ± 25.23, 35.18 ± 24.66 and 22.72 ± 24.80 respectively. Analysis revealed that while G_1 and G_2 were homogenous, G_1 and G_3 and G_2 and G_3 showed heterogenisity.

Sex libido: The mean reaction time in seconds for Group I, II and III was 58.44 ± 38.27, 80.21 ± 90.44 and 93.85 ± 67.51 respectively. The differences in reaction time between the groups were, however, insignificant. The refractory period in case of group II bucks was found to be 283.42 ± 643.94 seconds. In group III bucks, the first refractory period averaged 332.34 ± 224.0 seconds as against the second refractory period of 431.16 ± 288.68 seconds. Analysis using paired 't' test revealed that there was no significant difference between refractory period of group II bucks and the first refractory period of group III bucks. However, in bucks ejaculated 3 times daily, the second refractory period was significantly more than the first refractory period ($P < 0.01$).

Fertility trial: Conception rate of does inseminated with semen of bucks ejaculated thrice daily for a continuous period of 2 months was 70.37%, with a kidding rate of 66.67%.

Discussions

Among the various seminal attributes studied, ejaculation frequency was found to influence the colour, density, mass activity and sperm concentration. The change in

Table 1: Effect of frequency of ejaculation on semen characteristics in cross-bred bucks.

Sl. No.	Seminal attributes	Group I (G_1) (one ejaculate daily)	Group II (G_2) (two ejaculates daily)	Group III (G_3) (three ejaculates daily)	'F' values
1	Volume (ml)	0.49 ± 0.16 (270)	0.50 ± 0.15 (270)	0.43 ± 0.09 (270)	0.59
2	Density (D)	3.36 ± 0.34^a (270)	2.67 ± 0.28^b (273)	2.22 ± 0.33^c (276)	29.43**
3	Mass activity (+)	3.64 ± 0.62^a (273)	3.36 ± 0.52^a (293)	2.86 ± 0.51^b (276)	17.65**
4	Motility (%)	82.18 ± 5.97 (273)	79.97 ± 7.97 (273)	76.08 ± 9.87 (276)	4.09
5	pH	6.87 ± 0.09 (273)	6.96 ± 0.11 (273)	7.09 ± 0.12 (276)	4.20
6	Concentration (million/cmm)	2.83 ± 0.81^a (201)	1.69 ± 0.37^b (202)	1.30 ± 0.32^b (228)	11.63**
7	Dead sperm (%)	9.25 ± 3.90 (169)	8.88 ± 4.71 (174)	8.92 ± 4.49 (170)	0.78
8	Total spermatozoan abnormality (%)	1.87 ± 1.81 (183)	3.33 ± 4.86 (183)	2.67 ± 2.15 (183)	1.04
9	Proximal protoplasmic droplets (%)	0.14 ± 0.40 (183)	0.21 ± 0.91 (183)	0.24 ± 0.51 (183)	0.10
10	Distal protoplasmic droplets (%)	0.71 ± 1.94 (183)	2.35 ± 5.47 (183)	0.61 ± 1.27 (183)	0.89

** $P < 0.01$.

Figures in parantheses denote number of observations

Values with different superscripts are significantly different.

Table 2: Effect of frequency of ejaculation on livability of spermatozoa in cross-bred bucks on incubation and preservation.

Groups	Initial motility	Viability of spermatozoa (%)						
		Incubation at 46.5 °C			Preservation at 5°C			
		10 mts	20 mts	30 mts	24 hrs	48 hrs	72 hrs	96 hrs
Group I	84.34 ± 4.33 (61)	60.89 ± 17.20 (61)	53.70 ± 23.18 (61)	36.82 ± 22.92 (61)	70.16 ± 17.00 (61)	56.08 ± 23.61 (61)	45.46 ± 24.33 (61)	34.51 ± 25.23 (61)
Group II	84.11 ± 2.15 (55)	66.07 ± 20.90 (55)	53.62 ± 26.24 (55)	42.25 ± 26.57 (55)	66.82 ± 21.46 (55)	58.78 ± 25.47 (55)	47.56 ± 25.93 (55)	35.18 ± 24.66 (55)
Group III	82.72 ± 3.69 (57)	76.53 ± 11.71 (57)	56.14 ± 19.59 (57)	35.53 ± 23.99 (57)	71.32 ± 16.44 (57)	57.77 ± 24.17 (57)	39.77 ± 28.34 (57)	22.72 ± 24.18 (57)
F value between groups	3.9*	0.77	0.38	0.56	1.26	0.18	0.87	3.91*

* $P < 0.05$. Figures in paranthesis deonte number of observations.

G_1 & G_2 homogenous
G_2 & G_3 homogenous
G_1 & G_3 heterogenous

G_1 & G_2 homogenous
G_1 & G_3 beterogenous
G_2 & G_3 heterogenous

Table 3: Comparison of the estimated total spermatozoa available for ejaculation and sperm output based on different ejaculation frequencies for a period of 90 days.

Reserve in cauda epididymis at the start of experiment ($x 10^9$)	Total Estimated sperm production for 90 days ($x 10^9$)	Total spermatozoa available for ejaculation for 90 days ($x 10^9$)	Total output of spermatozoa for 90 days			Difference between III & IV ($x 10^9$)	Difference between III & V ($x 10^9$)	Difference between III & VI ($x 10^9$)
			Group I ($x 10^9$)	Group II ($x 10^9$)	Group III ($x 10^9$)			
I	II	III	IV	V	VI	VII	VIII	IX
17.28	341.51	358.79	124.11	150.99	150.55	234.68	207.80	208.24

colour could be attributed to a drop in sperm cell concentration which in turn resulted in the yellowish colour of seminal plasma becoming prominent. Though there was no significant drop in volume with increasing ejaculation frequency, there was significant drop in sperm cell concentration. This is in confirmity with the findings in ram (Kastyak, 1962).

The very fact that important seminal attributes such as volume, pH, motility and percentage of dead and abnormal spermatozoa were unaffected, clearly points out that there is no deterioration of semen quality with increasing ejaculation frequency. The sperm viability on incubation for 30 minutes at 46.5^{0}C and sperm motility on preservation at 5^{0}C for 72 hrs. clearly indicate that livability of sperms are not affected by increased ejaculation frequency. Moreover, libido of bucks was also unaffected by increasing the frequency of ejaculation from one to three times daily. Good fertility obtained with the semen from bucks ejaculated thrice daily in a limited study also confirms this finding. The total spermatozoa available for ejaculation (x 10^9) for 90 days of study was estimated to be 358.79 (Joseph and Nair, 1988), which is far in excess of spermatozoan harvest (x 10^9) of 150.54 for 90 days in bucks which were ejaculated 3 times daily.

Since the total number of sperms harvested from group II and group III bucks are almost same, there does not seem to be any definite advantage on increasing the frequency of collection from 2 to 3 times daily (Table 3). This is in confirmity with the finding of Sharma *et al*, (1969) in rams. But more number of spermatozoa can be harvested for A.I. by increasing the frequency of collection from one to two times daily without deterioration of semen quality. Hence, collection frequency of two times daily is recommended for adoption in cross-bred bucks.

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REFERENCES

Arthur, G.H. (1962): Veterinary Reproduction and Obstetrics. 5th Ed. The English Language Book Society, Bailliere, Tindall, London, pp. 453-454.

Beck, G.H. and Salisbery, G.W. (1943): Rapid methods for estimating the quality of bull semen. J. Dairy Sci. **26**: 483-494.

Joseph, M. and Nair, K.P. (1988): Daily sperm production and epididymal sperm reserves in Alpine-Malabari cross-bred bucks. Indian J. Anim. Reprod. **9** (1): 30-32.

Kastyak, L.C. (1962): The effect of different ejaculation frequencies on quality and quantity of ram semen. Zesz. nauk. Wyzsz: Szkol. roln. olsztynie., **12**: 67-68.

Prasad, S.P., Roy, A. and Pandey (1970): Effect of daily semen collection for eight weeks on semen quality of Barbari bucks. Agra. Univ. J. Res. (Sci.), **19**: 61-66.

Roberts, S.J. (1971): Veterinary obstetrics and genital diseases. Published by the author, Ithaca, New York, pp. 435-436.

Sharma, R.P., Tiwari, S.B. and Roy, A. (1969): Effect of frequency of semen collection from ram on seminal attributes and fertility. Indian J. Anim. Sci., **39**: 15-20.

Snedecor, G.W. and Cochran, W.G. (1967): Statistical Methods. 6th Ed., Oxford and IBH Pub. Co., New Delhi, pp. 93-289.

Tiwari, S.R.; Sharma R.P. and Roy, A. (1968): Effect of frequency of collection on seminal attributes and fertility in goat. Indian J. Vet. Sci., **38**: 607-615.

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Age At First Fertile Heat In Sahiwal Cross-bred Heifers With Three Levels Of Exotic Inheritance

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ABSTRACT

In a study of 133 cross-bred females divided into three groups of exotic inheritance, results indicated that Jersey X Sahiwal half-breds had better reproductive performance, regarding age at first fertile heat vis-a-vis J X S with 62.5 per cent and 75 per cent level of exotic inheritance. The effect of period and farm on age at first fertile heat was highly significant.

* * *

The present study deals with performance of age at first fertile heat in Jersey X Sahiwal cross-bred heifers with three different levels of exotic inheritance.

Materials and Methods

The data on Jersey X Sahiwal cross-bred heifers with different levels of exotic inheritance - 50 per cent, 62.5 per cent and 75 per cent, maintained at Cattle Breeding Farms of Veterinary College and Agriculture College, Nagpur was studied. The data of last 15 years (1971 to 1986) was grouped into three periods of 5 years each: P_1 (1971-1976), P_2 (1977-1981) and P_3 (1982-1986).

A total of 133 cross-bred females were studied and divided into three groups according to their exotic inheritance: (1) 50 per cent - 81 animals, (2) 62.5 per cent - 25 animals and (3) 75 per cent - 27 animals. The age at first fertile heat of cross-bred heifers was calculated on the basis of first successful service.

The data was analysed to study the effect of level of exotic inheritance, the period and the farm in Sahiwal cross-breds on their age at first fertile heat by applying least square analysis of variance design.

Results and Discussion

The over-all average age at first fertile heat for J X S cross-breds with 50 per cent, 62.5 per cent and 75 per cent level of exotic inheritance was found to be 896.56 ± 34.38, 1011.88 ± 62.28 and 924.18 ± 65.16 days respectively.

The average age at first fertile heat for all three periods, irrespective of inheritance was found to be 646.57 ± 54.81, 834.81 ± 42.41 and 1055.07 ± 35.70 days in J X S cross-bred heifers. The average period for age at first fertile heat in Agricultural College Dairy Farm and Veterinary College Farm was found to be 1035.55 ± 48.05 and 862.80 ± 31.81 days respectively.

The least square analysis of variance to test the differences among means for these three levels of Jersey inheritance revealed highly significant difference ($P < 0.01$). The results indicated highest average age at first fertile heat for 62.5 per cent exotic inheritance (1011.88 ± 62.28 days) followed by 75 per cent exotic inheritance (924.18 ± 65.16 days) with the lowest average age at first fertile heat in half-breds (896.56 ± 34.38 days). The superiority of half-breds over 75 per cent exotic inheritance, in the present findings is

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entirely in agreement with the findings of Taneja and Chawla (1978) in Brown-Swiss X Sahiwal cross-bred heifers and Kale (1978) in Sahiwal X HF cross-bred heifers.

The average age at first fertile heat in half-breds (896.56 ± 34.38 days) is in partial confirmity with Thakur *et al* (1981) who reported average age at first fertile heat in HF X Sahiwal cross-breds as 28.05 ± 1.30 months, but is higher than those reported by D'Souza *et al*, (1978) in Friesian X Gir half-breds (778.4 ± 13.5 days) and Sharma *et al* (1986) in Brown Swiss X Ongole half-breds (706.53 ± 25.07 days). Highest average age (1055.07 ± 35.70 days) was recorded for P_3 period as compared to lowest (646.57 ± 54.81 days) in P_1 period. The least square analysis of variance indicated the highly significant ($P < 0.01$) effect of period on age at first fertile heat. There was also highly significant ($P < 0.01$) effect of farm on age at first fertile heat. The results indicated that the differences are due to variations in farm managemental practices.

The over-all findings relating to significant effect of levels of inheritance, periods and farms on age at first fertile heat, in the present studies are in total agreement with Kaul *et al*, (1973) who recorded that grades, farms and periods had a significant effect on age at first fertile heat.

The interaction between levels of inheritance and farms was found to be significant, whereas that between levels of inheritance and periods as well as the interaction between periods and farms was non-significant.

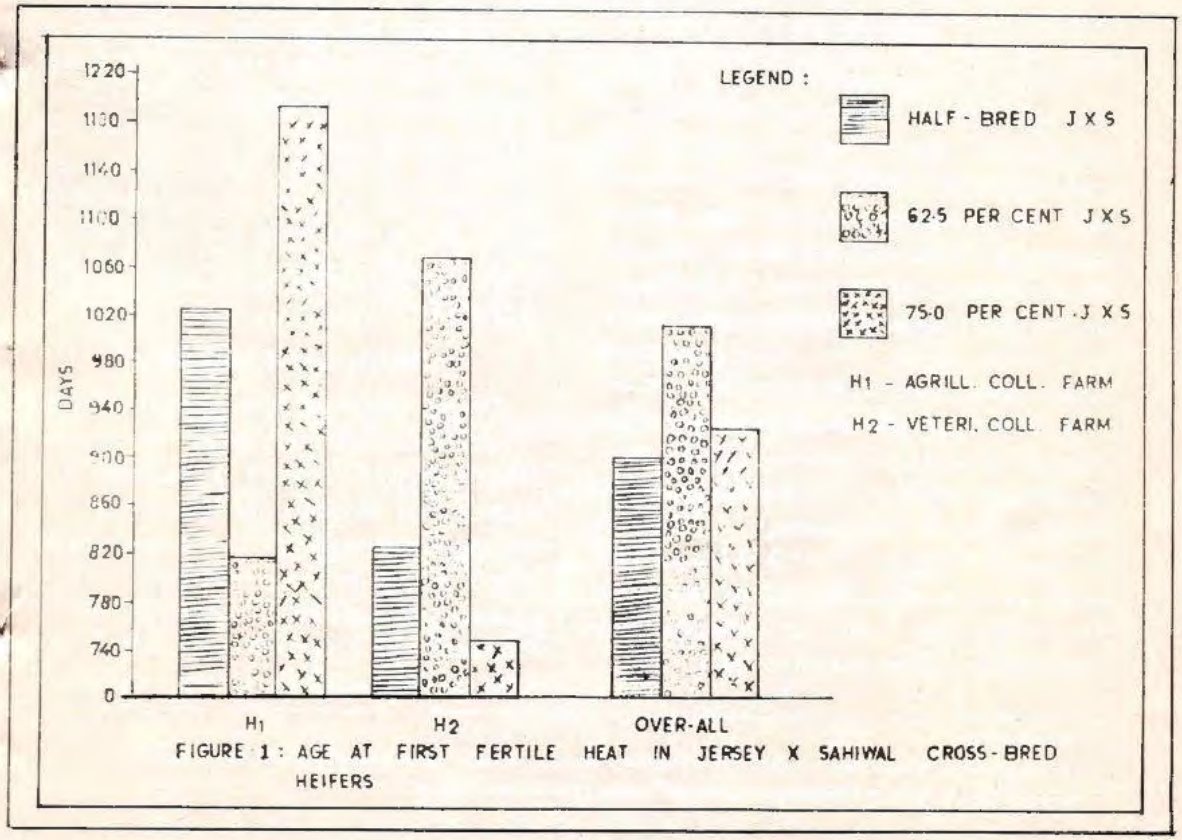

FIGURE 1 : AGE AT FIRST FERTILE HEAT IN JERSEY X SAHIWAL CROSS-BRED HEIFERS

REFERENCES

D'Souza, C.; Bhat, P.N. and Mukundan, G. (1978): Studies on growth, reproduction and production traits in Gir and its half-bred with Friesian. Indian J. Dairy Sci. 31 (4): 395-397.

Kale, A.M. (1978): A study of some economic traits of cross-bred cows in India. Ph.D. Thesis, P.K.V., Akola. PP 102-109.

Kaul, S.K.; Taneja, V.K. and Bhat, P.N. (1973): Studies in cross-bred cattle. IV Age at first fertile service. Indian. J. Anim. Prod. 4 (1): 9-16.

Sharma, G.P.; Reddy, C.E.; Reddy, T.S.; Satyanarana, A. and Murthy, A.S. (1986): Breeds of Ongole in cross with Brown-Swiss. Indian Vet. J. 63: 919-922.

Taneja, V.K. and Chawla, D.S. (1978): Heterosis for economic traits in Brown-Swiss X Sahiwal crosses. Indian J. Dairy Sci. 31: 208-213.

Thakur, G.N., Katpatal, B.G. and Kaushik, S.N. (1981): Age at first fertile service in Holstein X Sahiwal cross-breds. Indian J. Anim. Sci. 51 (1): 1-4

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Effect Of Beta-Carotene On Certain Aspects Of Reproduction In Dairy Heifers. 2. Effect On Ovulation

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ABSTRACT

Effect of supplementation of beta-carotene on time of ovulation and incidence of anovulatory oestrus was studied in 20 crossbred Jersey heifers. All the heifers were kept on beta-carotene free basic ration containing concentrate and paddy straw. In addition to basic ration, vitamin-A 60,000 i.u. was fed daily to beta-carotene deficient heifers (control) while the beta-carotene supplemented heifers (experimental) were fed with vitamin A 20,000 i.u. plus beta-carotene 100 mg. The mean time of ovulation was significantly longer ($P < 0.05$) in control heifers (18.45 ± 0.67 hours) than in experimental heifers (16.00 ± 0.71 hours). The incidence of anovulatory oestrus was 36.66 and 14.28 per cent in control and experimental heifers, respectively.

* * *

Although beta-carotene is converted to vitamin A in the animal system, there is high concentration of beta-carotene but no vitamin A in the corpus luteum of cattle (Schultz *et al*, 1973). This shows that beta-carotene might play a specific role in the ovarian functions of cattle. The present study was undertaken to know the effect of beta-carotene on ovulation in dairy heifers.

Materials and Methods

Twenty crossbred Jersey heifers aged 2 - $3^1/_2$ years with their body weight varying from 130-190 kg were included in the study. The animals were divided at random into control and experimental groups, each comprising 10 heifers. All the heifers were kept on a beta-carotene free basic ration which consisted of concentrate (@ 3 kg/heifer/day) and paddy straw (ad lib). Each heifer of the control group

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received a daily supplement of 60,000 i.u. vitamin A (Vitablend - Glaxo) while that of the experimental group received 20,000 i.u. vitamin A plus 100 mg beta-carotene (Dry Beta-carotene/ Roche/ 10% water soluble. F. Hoffmann-La Roche & Co. Ltd., Basle, Switzerland) daily for 10 months. As the conversion rate of beta-carotene to vitamin A is 1:400 (Hemken and Bemel, 1982), the total equivalent vitamin A supplement in the heifers of both the groups was the same. Other managerial conditions were uniform for all the animals.

A total of 58 oestruses comprising 30 and 28 in the control and experimental heifers, respectively were studied. Starting at 4 hours after the end of oestrus, the ovaries of the animals were examined per rectum till ovulation, at an interval of 4 hours for 3 days between 6.00 a.m. and 10.00 p.m. The ovulation was recorded based on the presence of the post-ovulatory depression at the site of previously identified graafian follicle in the ovary. The period from the end of oestrus to the time at which the depression was first felt was recorded as the time of ovulation. In case of anovulation, the animals were re-examined after 2 days for confirmation of the failure of ovulation. The statistical analysis of the data was carried out as per Snedecor and Cochran (1967) for interpretation.

Results and Discussion

The time of ovulation (Table 1) observed in the experimental group of heifers (16.00 ± 0.71 hours) was close to that observed by Sharma *et al*, (1968) in dairy cattle with standard feeding. The significantly ($P < 0.05$) longer time of ovulation recorded in the control heifers than in the experimental heifers is in agreement with the observations of Lotthammer (1979) and Tekpetey (1985). On the contrary, Wang *et al*, (1982) and Stolla *et al*, (1987) did not find any effect of beta-carotene on the time of ovulation. Schams *et al*, (1977) stated that beta-carotene deficiency had no effect on the preovulatory LH peak, but the interval between LH peak and ovulation was significantly longer in beta-carotene deficient heifers. The higher incidence of anovulatory oestrus recorded in the heifers of the control group (36.66%) than in those of the experimental group (14.28%) might be due to reasons other than deficiency of LH.

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Table 1: Time of ovulation and incidence of anovulation in heifers

Groups	No. of animals	Total No. of oestruses	Time of ovulation (hours)		Value of 't'	Anovulatory oestrus (%)
			Range	Mean ± SE		
Control	10	30	12.0-22.0	18.45±0.67 (19)	2.47*	36.66 (11)
Experimental	10	28	8.0-20.5	16.0±0.71 (24)		14.28 (4)

* $P < 0.05$. Figures in paranthesis indicate number of oestrus.

REFERENCES

Hemken, R.W. and Bremel, D.H. (1982): Possible role of beta-carotene in improving fertility in dairy cattel. J. Dairy Sci., 65 (7): 1069-1073.

Lotthammer, K.H. (1979): Importance of beta-carotene for the fertility of dairy cattle. Feedstuffs, **51** (43): 16-50.

Schams, D., Hoffmann, B. and Lotthammer, K.H. (1977): Investigations on the specific effect of beta-carotene, unrelated to vitamin A, on fertility of cattle. Part 4. Effect on hormonal parameters during the oestrous cycle. Deutsche Tieraztliche Wochenschrift, **84** (8): 307-310. (Anim. Breed. Abstr., **47**: 4212.)

Schultz, G., Ahlswede, G. and Grunert, E. (1973): B-carotingehalt in corpora lutea von rindern vei unterschiedlichen haltungsbedingungen. Zuchthygiene, **8**: 89. (Cited by Lotthammer, K.H., 1979).

Sharma, O.P., Singh, B.P. and Tomar, N.S. (1968): Studies on oestrous cycle in Hariana cows. Indian Vet. J., **45** (12): 1014-1022.

Snedecor, G.W. and Cochran, W.G. (1967): Statistical Methods 6th Edn. Oxford and IBH Publishing Co., Calcutta.

Stolla, R., Porzig, R. and Leidl. W. (1987): Effects of feeding beta-carotene on the fertility of cattle. 2. Effects on fertility. Berliner und Munchener Tierarztliche Wochenschrift, **100** (3): 90-95. (Nutr. Abstr. & Rev., **57**: 4598).

Tekpety, F.R. (1985): Effect of beta-carotene on the reproductive performance of Holstein heifers and cows. Dissertation Abstracts International, B (Science and Engineering), **46** (6): 1757. (Anim. Breed. Abstr., **54**: 5158).

Wang, J.Y.; Larson, L.L. and Owen, F.G. (1982): Effect of beta-carotene supplementation on reproductive performance of dairy heifers. Theriogenology, **18** (4): 461-470.

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Studies On Serum Alkaline Phosphatase And Protein In Various Reproductive States in Cow*

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ABSTRACT

Mean serum alkaline phosphatase (AKP) value at any stage of gestation was not statistically different from the mean value at oestrus. The mean AKP value gradually decreased with the advancement of gestation till 1 to 2 days post partum and then increased rapidly.

Serum total proteins showed an increasing trend from oestrus to 3rd trimester of gestation, followed by a significant decrease just prior to parturition and a further decrease during post partum stage. Beta globulin showed significant increase in pregnancy while other fractions showed non-significant changes.

* * *

Information on the alkaline phosphatase and proteins in serum of cattle is not only scanty but contradictory also. The present investigations were planned to elaborate the levels of serum AKP and proteins in various reproductive states viz. oestrus, pregnancy and puerperium.

Materials and Methods

Serum AKP and total proteins were estimated from blood samples obtained from 46 non-descript cows belonging to the various physiological reproductive states, while serum samples from 16 cows were used for electrophoretic studies (Table 1 and 2). AKP was estimated by the modified Bodansky (1933) method outlined by Oser (1971), using

* Part of M.V.Sc. Thesis of the senior author.

fresh serum samples. Total proteins were estimated by Greenberg (1929) method and electrophoresis was done by agar gel electrophoretic method as described by Varley (1969). Data were analysed as per Steel and Torrie (1980).

Results and Discussion

The mean value of AKP increased from oestrus to 1st trimester of pregnancy followed by progressive decline till post-partum (Table 1). The values then again exhibited increasing trend from post-partum to early lactation ($P < 0.05$). Sharma (1986) has reported significant increase in AKP activity in 1st trimester of pregnancy, and ascribed it to the greater need of phosphate for implantation to occur.

Although there was progressive fall in the mean AKP values from 1st trimester to post partum, significant fall ($P< 0.05$) occurred only from 1st to 2nd trimester of pregnancy. Contrary to this, in women, Anagonstopoulos and Matsudaria (1958) and Yvonne *et al*, (1964) reported that serum AKP values increased during 2nd and 3rd trimester of pregnancy, and this increase could be due to the role of placenta in secretion of additional AKP. Tissue specific iso-enzyme characterization may clarify the specific role of AKP during various stages of pregnancy in cow. The possibility of any relationship between AKP and sex hormones cannot be ruled out. Significant increase ($P < 0.05$) in the mean AKP activity from post partum to early lactation, could be ascribed to meet the greater demand of phosphorus by the body.

The mean value of total proteins increased from oestrus to 1st trimester of gestation and further increased significantly ($P < 0.05$) from 1st trimester to 2nd trimester of gestation. The increase from 2nd to 3rd trimester of gestation was non-significant. There was very sharp and significant ($P < 0.05$) decline in mean level of total proteins, a day or two before parturition.

Increase in the level of serum total proteins with the advancement of gestation could be due to the hike in estrogen. Increase in the beta and gamma globulin contents of serum protein during gestation (Table 2) could be the reason of increase in total proteins. Wayman *et al*, (1951) and Bugalia *et al* (1983) reported that in nymphomaniac cows levels of total proteins and gamma globulin content were higher and ascribed them to the higher levels of estrogens.

Sharp decline in serum total proteins levels a day or two before and after parturition was probably due to the drain of immune fractions of gamma globulins in the formation of colostrum through mammary glands. Similar findings have been reported by Larson *et al*, (1954), Larson and Kendal (1957) and Gopal Krishna Rao *et al*, (1981). The progressive increase in beta and gamma globulin fractions in serum at late pregnancy has significant and vital physiological role. Anti-bodies present in the gamma globulin fraction of serum protein are utilised by the neonates after birth, through colostrum via mammary glands.

Slight decrease in the mean percent value of albumin and alpha globulin fractions of serum protein during gestation may not be an absolute decrease but relative to proportional increase in gamma globulins.

Table 1: Blood serum Alkaline Phosphatase and Total Proteins.

Reproductive state	No. of cows	Alkaline phosphatase (B.U. %) Mean±S.E.	Total proteins (g%) Mean±S.E.
Oestrus	8	2.34^{bc}±0.27	6.79^{a}±0.21
1st trimester gestation	6	2.97^{cd}±0.26	7.35^{a}±0.31
2nd trimester gestation	8	2.02^{b}±0.19	8.53^{bc}±0.43
3rd trimester gestation	8	1.99^{ab}±0.31	9.56^{c}±0.33
Ante partum (within 48 hours)	4	1.40^{ab}±0.19	7.54^{a}±0.31
Post partum (within 48 hours)	4	1.17^{a}±0.03	6.88^{a}±0.65
Early Lactation (between days 15 to 60 of post partum)	8	3.45^{d}±0.26	8.56^{b}±0.15

Note: Figures in the column with different superscripts differ significantly ($P < 0.05$).

Table 2: Sub-fractions of serum protein.

Protein Fraction	Mean ± S.E. (%)	
	Oestrus (8 animals)	Gestation (8 animals)
Albumin	50.40±1.86	45.50±2.33
Alpha globulin	17.80±1.16	15.20±0.58
Beta globulin	10.80±0.96	15.40*±1.03
Gamma globulin	21.00±1.34	24.00±1.05

* Significant at 5% level.

REFERENCES

Anagnostopoulos, C. and Matsudaria, H. (1958): Proc. Internat. Symp. on enzyme chemistry, Tokyo-Tyota, Pergamon Press, pp. 166.

Bodansky, A. (1933): J. Biol. Chem. **101**: 93.

Bugalia, N.S., Purohit, S.K. and Kohli, I.S. (1983): Indian Vet. J. **60** (6): 445-448.

Gopal Krishna Rao, D.; Amba Prasad, A.B.; Jayaramakrishna, V. and Satyanarayana Rao, K. (1981): Indian Vet. J. 53 (12): 943.

Greenberg, D.M. (1929): J. Biol. Chem., **82**: 545.

Larson, B.L.; Rolleri, R.D. and Kendal, K.A. (1954): J. Dairy Sci. 37: 662.

Larson, B.L. and Kendal, K.L. (1957): J. Dairy Sci. **40**: 559.

Oser, L. Bernard (1971): Hawk's Physiological Chemistry, 14th Edn. Tata McGraw Hill Pub. Co. Limited, New Delhi.

Sharma, R.P. (1986): M.V.Sc. Thesis, Sukhadia University, Udaipur-313 001.

Steel Robert, G.D. and Torrie, J.H. (1980): Principles and Procedures of Statistics. 2nd edn. International student Edition. McGraw Hill Pub. Co. Kogakusha Limited.

Varley, H. (1969): Practical Clinical Biochemistry, 4th edn. pp 253, ELBS, The White Friars Press Limited.

Wayman, O.; Asdell, S.A. and Itahca, M.Y. (1951): J. Dairy Sci. **34**: 495.

Yvonne McMaster, Ruth Tennant, John, S.C. and Frank, C.M. (1964): J. Obst. Gynae. **71**: 735.

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Detecting Heat And Early Pregnancy By Total Sugar Content Of Cervico-Vaginal Mucus In Jersey Cows

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ABSTRACT

Smaples of cervico-vaginal mucus were collected from 30 healthy and normally cycling Jersey cows and their total sugar content determined during early heat, mid heat and late heat stages of oestrous phase and on day 1, 3, 6, 9, 12, 15, 18, 21, 24, 27, 29 and 30 of non-oestrous phase. These animals were inseminated artificially and considered to be pregnant on 30 days non-return basis. Significant differences were recorded in the total sugar content of cervico-vaginal mucus of oestrous and non-oestrous phase of both pregnant and non-pregnant animals. The values were also significantly higher during the oestrous phase than in the non-oestrous phase. It was concluded that this parameter can form a basis of diagnossis of an early pregnancy - a value exceeding 150 mg/100 ml indicating a positivie state and a value less than 113 mg/100 ml a negative state of pregnancy. It may also help in detecting heat, a value less than 56 mg/100 ml confirming a positive oestrus.

* * *

A cow is normally recognised in estrus by visual signs of heat but many animals do not exhibit these signs conspicously as a result of which it becomes difficult to ascertain conclusively whether the cow is in heat or not. Similarly, the conventional method of rectal palpation for diagnosing early pregnancy can not be adopted reliably before two months of gestation and the other methods like radio-immuno assay of milk/plasma have limited applicability under field conditions due to high cost of equipment and sophistication as well as non-availability of highly trained technical staff. Developing of suitable tests for confirming heat and early diagnosis of pregnancy by 30-35 days will, therefore, be of immense practical value to the livestock farmers. Some workers (Kurzrok & Birnberg, 1958; Sokolovskaya *et al.*, 1962; Glasser, 1967; Berchtold & Bestedt, 1970) have suggested that certain carbohydrate compounds like fructose, glucosamine and reducible sugars of cervico-vaginal mucus can serve as 'Biochemical Markers' for detecting positive heat or ovulation and/or early state of pregnancy in some farm animals. The present investigation was, therefore, conducted to study the changes in the total sugar content (total carbohydrate levels) of the cervico-vaginal mucus of Jersey cows during different phases of estrous cycle and early pregnancy and to assess if this parameter can help us in detecting the positive state of estrus and early pregnancy.

Materials and Methods

The present study was conducted on 30 healthy and normally cycling Jersey cows of Indo-New Zealand Livestock Improvement Project of Himachal Pradesh Krishi Vishva Vidyalaya, Palampur. Previous history of their reproductive cycles was studied from

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farm records and the animals expected to come in heat were marked and examined for visual signs of heat at least four times a day at 5 A.M., 11 A.M., 5 P.M. and 11 P.M. (O' Farrel, 1978). The suspected animals were also checked by rectal palpation and if the os was just opening and the Graffian follicle was mature, the animal was taken to be in early heat. Samples of cervico-vaginal mucus were collected during early heat (first 4-6 hr after onset of heat), mid heat (next 8-10 hr), late heat (next 4-6 hr till cessation of heat) stages of estrous phase and on day 1, 3, 6, 9, 12, 15, 18, 21, 24, 27, 29 and 30 stages of non-estrous phase using modified sterilised cotton-swab technique of Kotter and Artner (1953). The cows were considered pregnant on 30 days non-return basis. Pregnancy was further confirmed by rectal palpation of the foetus after a period of 3 months and/or by actual calving records.

Total sugar content (carbohydrate level) of mucus samples was determined colorimetrically by phenol-sulphuric acid method of Roughan and Batt (1968). The absorption maxima was recorded in a Bosch & Lomb colorimeter (Spectronic 20) at 495 nm using pure D-glucose (Sigma) as a standard and the sugar content expressed as mg glucose/100 ml of mucus. Statistical analysis was done as per Snedecor and Cochran (1967).

Results and Discussion

Out of 30 cows studied, 14 repeated earlier than 30 days hence were non-pregnant. The remaining 16 were treated as pregnant.

The total sugar content (mg/100 ml) of cervico-vaginal mucus of experimental animals varied from 25.12 to 202.00 in individual samples with average values ranging from 36.34 ± 5.017 to 163.61 ± 8.232 (Tables 1, 2). A lower level was recorded during estrous phase than during non-estrous phase in both pregnant and non-pregnant groups. In pregnant group during estrous phase the values ranged from 50.07 ± 8.443 to 61.98 ± 10.959 (mean 56.05 ± 2.218) and during non-estrous phase from 141.14 ± 6.382 to 163.61 ± 8.232 (mean 149.54 ± 1.466). The corresponding values in non-pregnant group were 36.34 ± 5.017 - 54.97 ± 18.679 (mean 42.89 ± 1.466) and from 100.39 ± 11.533 - 128.08 ± 4.038 (mean 113.19 ± 2.030). The total sugar content was higher in pregnant group than in the non-pregnant group both during estrous and non-estrous phases. Statistical analysis revealed significant ($P < 0.05$) differences between the average values of total carbohydrates in pregnant and non-pregnant groups both during estrous and non-estrous phases. Significant ($P < 0.05$) difference was also observed between the estrous and non-estrous phases of respective groups. During estrous phase of each group, lowest values were recorded during early heat followed by mid heat and highest during late heat. During non-estrous phase, pregnant group showed an increasing trend while the non-pregnant group showed a different pattern. Similar increasing trends have also been reported by Sokolovskaya *et al*, (1962) and Berchtold and Bostedt (1970) in the total carbohydrate levels and fructose content of cervical mucus of pregnant cows. It is concluded that this parameter can form a basis of diagnosis of an early pregnancy, a value of more than 150 mg/100 ml during non-estrous phase indicating a positive state and a value of less than 113 mg/100 ml as negative state of pregnancy. It may also help in detecting accurate heat and a value of less than 56 mg/100 ml will confirm a positive estrus.

Table 1: Total carbohydrates (mg/100 ml) of genital secretions of cows during estrous and non-estrous phases of the estrous cycle.

Group	Cow No.	Estrous phase $\bar{X} \pm SE$	Non-estrous phase $\bar{X} \pm SE$	Significant (0.05)
PREGNANT	25	50.07 ± 8.443	141.14 ± 6.382	
	26	52.57 ± 9.846	144.99 ± 5.934	
	33	53.12 ± 9.784	150.44 ± 6.690	
	50	59.53 ± 10.974	153.92 ± 6.560	
	57	53.62 ± 9.147	149.33 ± 6.467	
	60	52.53 ± 10.065	148.02 ± 6.135	
	69	57.65 ± 11.247	163.61 ± 8.232	
	89	61.98 ± 10.959	154.35 ± 5.132	
	111	57.47 ± 11.375	146.97 ± 6.956	
	128	59.27 ± 11.741	150.94 ± 6.765	
	167	56.95 ± 12.649	151.70 ± 6.839	
	169	55.85 ± 10.391	148.55 ± 7.579	
	208	58.67 ± 11.160	144.68 ± 5.993	
	212	53.34 ± 9.015	143.48 ± 6.860	
	361	57.48 ± 12.071	148.59 ± 6.456	
	366	56.72 ± 10.497	151.99 ± 6.397	
	$\bar{X} \pm SE$	56.05 ± 2.218	149.54 ± 1.466	S
NON-PREGNANT	7	39.82 ± 9.924	104.01 ± 11.246	
	38	41.54 ± 9.797	113.34 ± 9.250	
	79	45.33 ± 12.280	113.46 ± 5.044	
	95	54.97 ± 18.679	128.08 ± 4.038	
	101	49.47 ± 14.524	116.98 ± 11.355	
	120	43.98 ± 14.193	121.18 ± 4.500	
	139	38.56 ± 9.432	123.92 ± 4.698	
	159	39.34 ± 6.169	100.39 ± 11.533	
	181	36.34 ± 5.017	104.91 ± 8.274	
	187	39.07 ± 6.643	112.94 ± 3.668	
	203	40.26 ± 5.668	120.47 ± 4.469	
	277	51.51 ± 15.324	115.18 ± 5.460	
	295	37.83 ± 7.265	105.60 ± 8.946	
	354	42.10 ± 6.342	104.15 ± 9.304	
	$\bar{X} \pm SE$	42.89 ± 1.466	113.19 ± 2.030	S

Table 2: Total carbohydrates (mg/100 ml) of genital secretions of cows during different stages of estrous cycle and early pregnancy in pregnant and non-pregnant groups.

Phase	Stage	Pregnant $\bar{X} \pm SE$	Non-pregnant $\bar{X} \pm SE$	Significant (0.05)
ESTRUS	EH	39.22 ± 0.582	24.48 ± 0.662	S
	MH	53.36 ± 0.683	38.16 ± 0.615	S
	LH	75.57 ± 1.301	62.03 ± 3.785	S
	X ± SE	56.05 ± 2.218 (39.22 - 75.57)*	42.89 ± 1.466 (24.48 - 62.03)*	S
NON-ESTRUS	Day 1	118.14 ± 1.565	102.14 ± 2.366	S
	Day 3	121.73 ± 1.308	107.10 ± 1.915	S
	Day 6	128.53 ± 1.203	111.19 ± 1.746	S
	Day 9	133.20 ± 1.174	117.94 ± 1.591	S
	Day 12	138.28 ± 1.282	122.22 ± 1.465	S
	Day 15	143.84 ± 1.220	126.08 ± 1.322	S
	Day 18	149.43 ± 1.532	111.67 ± 7.842	S
	Day 21	156.45 ± 1.836	97.89 ± 13.896	S
	Day 24	166.04 ± 0.258	116.80 ± 19.363	S
	Day 27	173.09 ± 1.614	114.12 ± 25.377	S
	Day 29	181.50 ± 3.674	142.48 ± 1.969	S
	Day 30	183.00 ± 1.844	145.27 ± 1.274	S
	$\bar{X} \pm SE$	149.54 ± 3.251 (118.14 - 183.00)*	113.19 ± 2.030 (97.89 - 145.27)*	S

* Range in parenthesis.

REFERENCES

Berchtold, M. and Bostedt, H. (1970): On the usefulness of cervical secretions for pregnancy diagnosis in cattle. Berl. Munch. Tierarztl. Wschr. **83**: 20.

Glasser, R. (1967): On the usefulness of the cervical mucus for pregnancy diagnosis in sheep. Anim. Breed. Abstr. **36** (4): 3741.

Kotter, A. and Artner, J. (1953): The swab sample as diagnostic aid in early diagnosis of pregnancy disorders. Wiene. Klin. Wochenschi. **65** (23): 489.

Kurzrok, R. and Birnlerg, C. (1958): The presence of glucosamine in cervical mucus as a test for the date of ovulation. Internat. J. Fertil. **3** (1): 80.

O' Farrel, K. (1978): Heat detection - an observation problem. Farm and Food Res. **9** (4): 95.

Roughan, P.G. and Batt, R.D. (1968): Quantitative analysis of sulpholipid (sulfo-quinovosyl diglyceride) and galactolipids (monogalactosyl and digalactosyl diglycerides) in plant tissues. Anal. Biochem. **22**: 74.

Snedecor, G.W. and Cochran, W.G. (1967): Statistical Methods 6th Edn. Oxford & IBH Publishing Co., New Delhi, 593.

Sokolovskaya, I.I.; Drozdova, L.P.; Gorokhov, L.N. and Kurganov, V.A. (1962): The content of total nitrogen and reducing elements in the cervical secretion of cows. Vestnik Sel'Skokhoz. Nauki. **7** (5): 64.

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Blood Plasma Levels Of Iodine, Calcium, Inorganic Phosphorus, Copper And Iron In Postpartum Anoestrous Crossbred Cows

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ABSTRACT

The blood plasma levels of protein bound iodine, calcium, inorganic phosphorus, copper, iron and calcium: inorganic phosphorus ratio in anoestrous crossbred cows were observed as 2.789 ± 0.12 μg/dl, 9.667 ± 0.28 mg/dl, 6.225 ± 0.02 mg/dl, 138.47 ± 11.20 μg/dl, 194.30 ± 8.35 μg/dl and 1.5:1 respectively, which were significantly lower than the levels in normally cycling cows.

* * *

Anoestrus is the most common single cause of infertility in cattle and buffaloes which may be caused by various factors, one of them being deficiencies of certain minerals in the blood. Some work has been reported in the literature of analysis of blood minerals (Schmidt, 1966; Dindorkar and Kohli 1979 and Samad *et al*, 1980). The present investigation was planned to study the levels of protein bound iodine, calcium, inorganic phosphorus, copper, iron and the ratio of calcium:inorganic phosphorus, in postpartum anoestrous crossbred cows and to compare them with the levels in normally cycling cows.

Materials and Methods

21 postpartum anoestrous crossbred cows were selected for the experiment. Blood was collected in the early morning hours by jugular veinipuncture in glass test tubes containing EDTA (30 mg in each) as anti-coagulant. It was centrifuged at 3000 r.p.m. for 15 minutes and clear plasma siphoned off and stored in glass stoppered vials at -20°C till analysed.

The plasma analysis was done by standard methods for protein bound iodine (Zak and Baginski, 1970), calcium (Spandrio, 1964), inorganic phosphorus (Goldenberg and Fernandez, 1966), copper (Gubler *et al*, 1952), and iron (Henry *et al*, 1958). Statistical analysis was done as per Snedecor and Cochran (1975).

Results and Discussion

The protein bound iodine value was in accordance with the values reported by Schmidt (1966) and Krishna Kumar (1982) in anoestrous cows (Table 1). It was significantly positively correlated ($P < 0.01$) with iron. The calcium level was higher than the levels reported by Samad *et al* (1980), but was lower than that reported by Dindorkar and Kohli (1979). It was significantly positively correlated with inorganic phosphorus which is in corroboration with the report of Reisshauer (1971). The inorganic phosphorus level was similar to the ones reported by Dindorkar and Kohli (1979) and Samad *et al* (1980).

The copper level was similar to that reported by Kumar (1982) and positively correlated with iron. Copper being a known constituent of haemoglobin synthesis, as such it is justified. The iron level was higher than the level reported by Bartko (1960) and a positive correlation of iron was observed with protein bound iodine and copper.

The mean plasma levels of all the four minerals were significantly lower than the

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levels reported in normally cycling cows, which could be a cause for the anoestrous condition in these cows.

The Ca:P ratio was in agreement with the ratio reported by Becze and Pasztor (1960) who recorded an abnormal Ca:P ratio in anoestrous cows.

Table 1: Mean blood plasma values of different minerals and their S.Es. in post-partum anoestrous crossbred cows.

S.No.	Mineral	Mean	S.E.
1.	Protein bound iodine μg/dl	2.789	±0.12*
2.	Calcium mg/dl	9.667	±0.25*
3.	Inorganic phosphorus mg/dl	6.225	±0.02*
4.	Copper μg/dl	138.470	±11.20*
5.	Iron μg/dl	194.300	±8.35*
6.	Calcium : Inorganic phosphorus ratio	1.55:1.0	

* Significant at 1% level.

REFERENCES

Bartko, P. (1960): Iron metabolism in cattle I. Variations in serum iron in healthy cattle. Vet. Cas. **9**: 125-134.

Becze, J. and Pasztor, L. (1960): Bovine sterility associated with faulty management and nutrition. Mag. Allator Lapja. 15: 296-299 (Fide: Vet. Bull 572).

Dindorkar, C.V. and Kohli, I.S. (1979): Variation in blood serum inorganic phosphorus, calcium and magnesium values of cattle having regular oestrous cycle and those in anoestrous. Indian J. Anim. Hlth. **18** (2): 25-27.

Goldenberg, H. and Fernandez, A. (1966): Clin. Chem. **12**: 871.

Gubler, C.J.; Lahey, M.E.; Ashenbrucker, H.; Cartwright, E. and Wintrobe, M.M. (1952): A method for the determination of copper in whole blood, red blood cells and plasma. J. Biol. Chem. **196**: 209.

Henry, R.J.; Sobel, C. and Chiamori, N. (1958): Clin. Chim. Acta. **3**: 523.

Krishna Kumar (1982): Investigations on different blood plasma constituents in various stages of reproduction, infertility and obstetrical conditions of crossbred cows. M.V.Sc. thesis. G.B. Pant University, Pantnagar.

Reisshauer, K. (1971): Clinico-chemical studies concerning the problem of bovine reproductive disorders. Wo chenschrift, **78** (19): 512-516. (Fide: Vet. Bull. 2905).

Samad, A.; Ali, M. and Rahman, A. (1980): Studies on certain blood constituents of anoestrous cattle. Indian Vet. J. **52** (2): 135-138.

Schmidt, K. (1966): Infertility of ovarian origin in Egyptian water buffaloes. Zuchthyg, **1**: 125-128 and 146-155 (Fide: Vet. Bull. 3464).

Snedecor, G.W. and Cochran, W.G. (1976): Statistical methods. 6th Ed. Oxford and I.B.H. Pub. Co., New Delhi.

Spandrio, L. (1964): In: Curtis, N. ch. and Roth, M. (Eds.). Clinical Biochemistry Principles and Methods. Vol. II Water decrucyter, Berlin.

Zak, B. and Baginski, E.S. (1970): Protein bound iodine. In: Standley, S.; Alex, R. and Sonnenwirth, C.S. (Eds.) Gradwhol's clinical laboratory methods and diagnosis 7th Edn. C.V. Mosby Coy. pp. 222-224.

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Effect Of Lugol's Solution On The Bovine Endometrium

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ABSTRACT

Twelve repeat breeder cows in two groups of six each were infused with either 1:20 lugol's solution or with 1:10 lugol's solution. Endometrial histology before infusion, 24 hours after infusion and 48 hours after infusion were compared. Infusion of lugols solution had marked effect on endometrial histology and was characterized by edema, neutrophilic infiltration, vascular congestion and haemorrhage. Infusion of lugol's solution at 1:10 concentration had more marked effect than that at 1:20 concentration.

* * *

Lugol's solution has been extensively used for a long time to treat chronic endometritis and repeat breeder cows. The concentration of lugol's solution employed for intrauterine therapy has been variable, with concentrations ranging from 0.5 to 10.0 per cent most commonly recommended (Roberts, 1971). The drug however, when used intrauterine causes more or less intense irritation of the bovine endometrium (Roberts, 1956; Grunnert *et al*, 1973; Seguin *et al*, 1974).

In view of the extensive use of lugol's solution for intrauterine therapy, a preliminary investigation was designed to study its effect on the endometrial histology of repeat breeder cows.

Materials and Methods

The present investigation was carried out on twelve apparently healthy repeat breeder cows at the Animal Farm, H.A.U., Hissar. The cows which failed to conceive to at least five inseminations and had regular cycles with no apparent abnormality, formed the material for lugol's infusion and biopsy. They were divided into two groups of six cows each. Biopsy of the endometrium was obtained from each of the cows on the day of estrus just before infusion, at 24 hours and again at 48 hours following infusion. Six of the repeaters were infused with 40 ml of 1:20 lugol's solution and another six with 40 ml of 1:10 lugol's solution.

Uterine biopsy was obtained with trocar and cannula type uterine biopsy catheter as per the technique described by Sinha (1980). The biopsies were immediately preserved in formal saline, processed by routine paraffin technique and stained with hematoxylin and eosin.

Results and Discussion

Biopsy of the endometrium obtained just before infusion was typical of the picture seen at oestrus. The endometrium was seen lined with all psuedo-stratified epithelium. There was mild to moderate oedema of the stroma and moderate hyperaemia with slight extravasation of erythrocytes. The uterine glands were straight with large lumina. Histological observations made in the present study concur with the reported appearance of normal bovine endometrium during estrus (Cole, 1930; Skjerven, 1956; Studer and Morrow, 1978).

Twenty four hours post-infusion of 1:20 logol's solution, the endometrial histology was characterized by mild degenerative changes in the surface epithelium, moderate

to severe oedema, congestion of blood vessels, haemorrhage and moderate neutrophilia. Several authors have also reported a moderate neutrophilic infiltration of the bovine endometrium at 24 hours post-oestrus (Skjerven, 1956; Studer and Morrow, 1978). At 48 hours post-infusion, the stromal oedema and the extent of haemorrhage had considerably reduced as compared to that observed at 24 hours post-infusion. However, the neutrophilic infiltration continued to be present.

At 24 hours post-infusion with 1:10 lugol's solution, the endometrial histology showed extensive infiltration of neutrophils, marked oedema, diffused vascularity, haemorrhage, severe congestion of blood vessels and necrosis of surface epithelium. These changes are similar to the changes reported to occur in an acute inflammatory reaction (Boyd, 1953). At 48 hours, the vascularity and oedema had reduced. However, there were fibroblasts in the superficial and deeper stromal layers.

Nikahara *et al*, (1977) have noted a direct relationship between the amount of lugol's solution used for intra-uterine therapy and the area of endometrial inflammatory response. Seguin *et al* (1974) have also reported marked alteration in endometrial histo-morphology at 24 hours post-infusion of 2 per cent lugol's solution. Besides its antiseptic properties, lugol's solution stimulates uterine tone and motility and mobilizes neutrophils (Roberts, 1971). Vandeplasche (1982) considered the beneficial effects of lugol's solution as similar to the effect of a curettage.

REFERENCES

Boyd, W. (1953): Text book of Pathology. 6th Edn. Lea and Febiger, Philadelphia.

Cole, W.H. (1930): A study of the mucosa of the genital tract of cow with special reference to the cyclic changes. Am. J. Anat. **46**: 261-301.

Grunnert, E., Schultz, L.C. and Esser, J. (1973): The effect of intrauterine injections of Iodine solution on the duration of the oestrous cycle in the cows. J. Reprod. Fertil. **33**: 497-499.

Nikahara, T.; Domeki, I. and Yamauchi, M. (1977): Local effct of intrauterine injection of iodine solution on the life span of the corpus luteum of the cow. J. Reprod. Fertil. **36**: 425-435.

Roberts, S.J. (1956): An evaluation of uterine infusions for the treatment of infertility in cattle. Cornell Vet. **46**: 21-35.

Roberts, S.J. (1971): Veterinary Obstetrics and Genital Diseases. Edward Bros, Inc. Ann. Arobos, Michigan, P. 479.

Seguin, B.E.; Morrow, D.A. and Oxender, W.D. (1974): Intrauterine therapy in the cow. J. Amer. Vet. Med. Ass. **164**: 609-612.

Sinha, A.K. (1980): Cytomorphological and cytochemical studies of bovine endometrium in relation to fertility. Ph.D. thesis. HAU, Hissar, India.

Skejerven,O. (1956): Endometrial biopsy studies in reproductively normally cattle-chemical, histochemical and histological observations during the oestrous cycle. Acta. Endocrinol. **22** (26): 1-101.

Studer, E. and Morrow, D.A. (1978): Post-partum evaluation of bovine reproductive potential: comparisnn of findings from genital tract examination per-rectum, uterine culture endometrial biopsy. J. Am. Vet. Med. Assn. **172**: 489-494.

Vendeplassche, M. (1982): Reproductive efficiency in cattle: A guidline for project in developing countries. FAO animal production and health paper. Rome. P. 56.

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Reproductive Disorders In Bovine Due To Leptospiral Infection

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ABSTRACT

Fifty-one sera samples from cows and buffaloes that suffered abortion, foetal mummification, still birth and pemature birth were subjected to mirscopic agglutination test against six sero groups: Autumnalis, Canicola, Grippotyphosa, Hebdomadis, Icterohaemorrhagiae and Pomona. Twelve sera samples that showed a titre of 1:80 and above were considered positive for leptospiral infection. In abortion group, positive titres were recorded in all stages of gestation period. Antibodies to Canicola were observed in mummified foetus and premature birth. None of the sera screened from buffaloes showed significant titre.

* * *

Bovine leptospirosis cnstituted a major problem in cattle industry on par with Brucellosis (WHO, 1959). Leptospirosis caused considerable economic loss as a result of abortion, in tropical and sub-tropical countries (Ellis, 1984). In pregnant cow, localisation of leptospires persisted in the uterus upto 142 days post-infection (Thiermann, 1982). Localisation may in turn lead to foetal infection with resultant abortion at any stage from the fourth month to term, still birth and pre-mature birth of weak calves (Ellis, 1984). In India, association of leptospirosis in such conditions had not been adequately investigated.

Material and Methods

Serum samples from 45 cows and six buffaloes that attended Madras Veterinary College Hospital, affected with abortion, foetal mummification, still-birth and premature birth were screened by microscopic agglutination test (Wolff, 1954) against six leptospiral antigens representing six serogroups: Autumnalis; Canicola; Grippotyphosa; Hebdomadis; Icterohaemorrhagiae and Pomona.

The stage of gestation at which abortion occurred was fixed, based on the breeding history of the animal as well as by the standard crown-rump (C-R) measurement of the foetus.

Seven to ten day old cultures of leptospires grown in EMJH medium were inactivated by addition of formaldehyde solution to a final concentration of 0.2 percent V/V (Turner, 1968) and these were used as antigen for the test. Titre value of 1:80 and above was considered positive for leptospiral infection based on the work of Ratnam *et al.*, (1980).

Results and Discussion

Fourteen of the 51 sera samples showed positive titre (1:80 and above), of which 71.4% belonged to abortion, 21.4% to premature birth and 7.2% to mummified foetus. Among the six serogroups, Canicola was most prevalent, followed equally by Autumnalis and Grippotyphosa and least by Pomona in the reproductive disorders studied (Table 1). However, the predominance of sero group differed in different places: Hardjo, in Australia (Elder and Ward, 1978); Autumnalis, Grippotyphosa and Pomona in Tamilnadu (Ratnam *et al*, 1980); Pomona, Shermani,

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Canicola and Hebdomadis in Karnataka State (Rao and Kesayamurthy, 1982).

Michna (1970) in his review of leptospirosis ascribed abortions in cattle to Canicola, Icterohaemorrhagiae, Grippotyphosa and Hebdomadis serogroups. In India, Pomona and Autumnalis (Somasundara Rao and Surendran, 1970), and Hebdomadis and Grippotyphosa (Sivadas *et al*, 1970) were reported to be associated with abortion in cattle. The antibody titres of cows that abort due to leptospirosis usually peak before tha abortion. Therefore, examining paired serum sample seldom provides more information than a single serum sample (Clyde, 1985). In this work, single serum examination was conducted from aborted animals taken within 24 hours. A titre of 1:80 observed to both Autumnalis and Grippotyphosa in one cow and Canicola and Pomona in another cow indicated cross reactions. Numerous investigators reported cross reactions in sera due to Leptospirosis. Multiple titres that were more than one, serum dilution lower than the highest titre in the serum were not recorded as contributing to serological prevalence but were recorded as contributing to cross reaction patterns (Hatway and Little, 1981).

Of the 8 cows which aborted and showed positive titres, 3 were in first, 2 in second and 3 in the last trimester of gestation period. Damude *et al* (1979) observed abortions in the second trimester in cases of Autumnalis infection, while with serovar Hardjo infections, abortions were diagnosed at all stages from the fourth month through to term and circumstantial evidence indicated that it may cause embryonic death (Ellis, 1983). Canicola infection confined itself only to the last 3 months of gestation. 3 sera samples out of 4 from cows delivered prematurely and one from mummified foetus condition, gave positive titres. It was of interest to note that Canicola sero group was associated in all the premature birth and foetal mummification cases. The clinical signs in pregnant cattle naturally infected with leptospira included abortion, foetal mummification, still birth and premature birth of weak calves and birth of full term healthy calves (Ellis *et al*, 1986). The results obtained concur with the report in the conditions studied.

Table 1: Distribution of postive titres of Leptospiral sero groups during various Reproductive conditions in cows.

S. No.	CONDITIONS	SERO GROUPS					
		A	C	G	H	I	P
1.	Abortion	3	2	3	-	-	2
2.	Premature birth	-	3	-	-	-	-
3.	Mummified foetus	-	1	-	-	-	-

A = Autumnalis
C = Canicola
G = Grippotyphosa
H = Hebdomadis
I = Icterohaemorrhagiae
P = Pomona

REFERENCES

Clyde A. Kirkbride, (1985): Managing an out break of livestock abortion - 2: diagnosis and Control of bovine abortion. Vet. Med.: 70-77.

Damude, D.F.; Jones, C.J. and Myery, D.M. (1979): A study of leptospirosis among animals in Barbados W.I. Trans. Roy. Soc. Trop. Med and Hyg. 73: 161-168.

Ellis, W.A. (1983): Recent development in bovine Leptospirosis. The Vet. Annu. 23rd issue scientechnica. cited in Prev. Vet. Med. 1984. **12**: 411-413.

Ellis, W.A. (1984): Bovine leptospirosis in the tropics: Prevalence, Pothogenisis and control. Prev. Vet. Med. 2: 411-421.

Ellis, W.A.; O'Brien, J.J.; Neill, S.D. and Bryson, D.G. (1986): Bovine Leptospirosis. Experimental serovar hardjo infection. Vet. Microbiol. **11**: 293-299.

Elder, J.K. and Ward, W.H. (1978): The prevalence and distribution of leptospiral titres in cattle and pigs in Queensland. Aust. Vet. J. **54**: 297-300.

Hathway, S.C. and Little, T.W.A. (1981): Prevalence and clinical significance of Leptospiral antibodies in pigs in England. Vet. Rec. **108**: 224-228.

Michna, S.W. (1970): Leptospirosis. Vet. Rec. **86**: 484-496.

Rao, A.S. and Kesavamurthy, B.S. (1982): Serological evidence of leptospiral infection in buffaloes. Indian. J. Comp. Microbiol. Immunol. and infec. Dis. **3**: 147-152.

Ratnam, S.; Sundararaj, T. and Subramnian, S. (1980): Serological evidence of Leptospirosis among cattle. Proc. Fourth National Congress of Med. Microbiol. Vol. IV: 104-107.

Sivadas, C.G.; Ramachandran, K.M.; Ragan, A.; Nair M.K. and Mariamma, K.I. (1970): Leptospiral abortion among Livestock in Kerala. Kerala J. Vet. Sci. **1**: 55-59.

Somasundara Rao, G. and Surendran, N.S. (1970): Incidence and serotype of vovine leptospira in Andhra Pradesh. Indian Vet. J. **47**: 296.

Thiermann, A.B. (1982): Experimental leptospiral infection in pregnant cattle with organisms of the Hebdomadis serogroup. Am. J. Vet. Res. **43**: 780-784.

Turner, L.M. (1968): Leptospirosis II. Serology. Trans. Roy Soc. of Trop. Med. and Hyg. **62**: 880.

W.H.O. (1959): Techn. Rep. Sero. No. 169. Pub. W.H.O., Geneva.

Wolff, J.W. (1954): The laboratory diagnosis of Leptospirosis. Pub. Springfield, Illinois Charles C. Thomas.

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Studies On Reproductive Status Of Rural Buffaloes In Summer

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Anoestrous is the major reproductive disorder in buffaloes, especially during summer months. Various workers have studied the reproductive patterns of buffaloes (Rao and Murari, 1956; Kohli and Malik, 1960; Hedge and Rai, 1972; Rao and Rao, 1970; Roy *et al*, 1972; Kodagali *et al*, 1973; Chauhan *et al*, 1981; Singh and Singh, 1982 and Singh *et al*, 1983). The present study, based on frequent rectal examinations, has been made to elucidate patterns of reproduction in rural buffaloes and also to record the incidence of summer anoestrous in buffaloes.

Data for the study were obtained during a two-week period (June 23 to July 7) from 439 buffaloes of villages Jodhan and Mansooran, District Ludhiana. All buffaloes were normal in physical health and their parities varied from 0 to 6. Approximate dates of last calving, exhibition of oestrus and natural service of each animal were recorded. Rectal examinations were also carried out to

diagnose the reproductive status of the animal. Normal cycling buffaloes were showing physical signs of estrus which could be easily detected by a bull. Subestrous buffaloes were exhibiting 'silent' estrus and on rectal palpation either a normal corpus luteum (C.L.) or a regressing/regressed C.L. concomitant with the occurrence of a maturing/mature/ ovulated follicle could be palpated on the ovary. True anestrous buffaloes were those which had 3 months or longer post-partum interval, but did not show estrus. On rectal examination no palpable C.L. or large follicle could be palpated on their ovaries.

It was observed that out of 439 buffaloes examined, 256 (58.31%) were found pregnant and 13 (2.96%) were in the early post-partum period. 27.56% of the buffaloes were having smooth, inactive ovaries and were in true anestrous condition. 39 (8.88%) buffaloes had functional C.L. on their ovaries and were exhibiting regular reproductive cycles.

To study the pattern of calving all the year round, all the pregnant (n=256) and early calved buffaloes with a postpartum interval of less than three months (n=13) were pooled into one group (Table 1).

The calving pattern in buffaloes during various months of the year was unevenly distributed with majority (83%) of calvings occurring during July through January. This is because buffaloes being seasonally polyestrous, exhibit regular estrous cycles only during favourable months (September to March), hence a significant majority conceive during these months. These results are in tune with those of Singh and Singh (1982) which were based on 2526 calvings in buffaloes.

Among 173 non-pregnant buffaloes, 134 (77.46%) were anestrous and had no functinal C.L. or large follicles on their ovaries. Of these, 13 (7.51%) had the shorter post-partum interval (K_3 months), while 121 (69.94%) calved before three months or longer, and therefore, were considered true anestrous buffaloes. In a previous study on 1945 buffaloes, Singh *et al* (1984) also observed the highest incidence of anestrus in June and July. Moreover, in the present study, 10.40% of the non-pregnant buffaloes exhibited signs of estrus during May and June, and were impregnated. 12.14% showed latent heat signs and could not be detected in estrus. However, on rectal palpation they were found to exhibit regular estrous cycles.

Thus, it could be concluded that a majority of rural buffaloes bear summer stress during pregnancy period, whereas in non-pregnant buffaloes, summer season leads to anestrous condition.

Table 1: Frequency of buffaloes in early postpartum period and various stages of pregnancy in the end of June.

Months postpartum	2-3	1-2	0-1	10+	9+	8+	7+	6+	5+	4+	3+	2+
No. buffaloes	0	4	9	15	36	46	42	37	35	25	19	11
(%)	(0)	(1.48)	(3.45)	(5.57)	(13.38)	(17.10)	(15.61)	(13.75)	(13.00)	(9.29)	(7.06)	(4.09)
Expected month of calving	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Febr.	March

REFERENCES

Chauhan, F.S.; Takkar, O.P.; Singh, Mehar and Tiwana, M.S. (1981): Seasonal variation, biochemical profile and treatment of anestrus in buffaloes. Indian J. Anim. Reprod. 1: 31-36.

Hedge, B.P. and Rai, A.V. (1972): Studies on reproductin in Murrah buffaloes in coastal Mysore. Indian Vet. J. 49: 112.

Kodagali, S.B.; Bhavsar, B.K. and Kavani, F.S. (1973): Breeding behaviour in Suri buffaloes. Indian J. Dairy Sci. 26: 280.

Kohli, M.L. and Malik, D.D. (1960): Breeding season in Murrah Buffaloes. Indian J. Dairy Sci. 13: 157-162.

Rao, A.V.N. and Rao, C.S. (1970): Oestrus in village herds of Indian water buffaloes. Indian Vet. J. 47: 742-746.

Rao, C.K. and Murari, T. (1956): Studies on reproduction in the Indian buffalo. A preliminary note. Indian Vet. J. 33: 54-57.

Roy, D.J.; Bhattacharya, A.R. and Luktuke, S.N. (1972): Oestrus and ovarian activities of buffaloes in different months. Indian Vet. J. 49: 54-60.

Singh, G.B.; Singh, Gurdial (1982): Female buffalo infertility (non-infectious). Proc. 2nd Internat. World Buff. Prod. Casertta, Italy, Sept. 28 - Oct. 2, 1982.

Singh, Gurdial; Singh, G.B. and Bains, G.S. (1984): Studies on incidence of anestrus in village buffaloes. Indian J. Animal Res. (submitted).

Singh, Gurdial, Singh, G.B. and Sharma, R.D. (1983): Studies on initiation of ovarian activity following summer seasons in village buffaloes. Indian J. Anim. Reprod. 3: 23-24.

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Changes In Serum And Uterine Lochial Acid Phosphatase Activity And Serum Total Free Amino Acids Levels During Involution Of Uterus In Post-Parturient Buffaloes

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Involution of uterus after parturition has a bearing on post-parturient cycles which affect the calving intervals. Consideration of biochemical parameters as criteria for involution of uterus may reveal the physiological status of the uterus. Studies on biochemical aspect of involution of uterus in the bovines are lacking except for the reports of Kendell and Harshbargar (1962) on serum acid phosphatase activity and Half Penny *et al* (1969) and Verbeke *et al* (1972) on plasma amino-acids. Hence, an attempt was made to determine the progress of involution of uterus in buffaloes based on biochemical parameters like serum and lochial acid phosphatase activity and total free amino acids levels.

Materials and Methods

Ten pregnant Murrah buffaloes belonging to the Dairy Ecxperimental Station, College of Veterinary Science, Tirupati were utilised in this experiment. Six non-lactating and cycling animals were taken as controls. Blood was collected daily for 10 days before the expected date of parturition and at four days intervals from Day 2 to Day 42 after parturition. About 20 ml of lochia was collected on post-partum Day 2, directly from the uterus by scooping with hand protected by a sterile plastic glove. The collection of lochia on post-partum Day 6 was made by introducing 10 mm diameter bard rubber

tubing through cervix, attached with a syringe at the other end. The lochia was stored in the freezing chamber of the refrigerator. The serum and lochial acid phosphatase activity was estimated as per Schinowara *et al* (1942), while serum total free amino acids were determined as per Danielson (1933) and Sahyun (1939).

Results and Discussion

A significant ($P < 0.05$) decline in the levels of serum acid phosphatase activity was noticed from pre-partum Day 6 (0.62 B.U./100 ml) to post-partum Day 6 (0.34 B.U/100 ml) and increased gradually thereafter reaching nearly the pre-partum (0.62 B.U/100 ml) and control level (0.67 B.U/100 ml), respectively. Lysosomal acid phosphatase was reported to be involved in the degradation of intra-cellular and extra-cellular components during post-partum involution of the rat uterus (David and Anton, 1969). The decline of serum acid phosphatase activity from pre-partum Day 6 to Post-partum Day 6, almost agreed with the observations of Kendell and Harshbargar (1962) in dairy cows. The decrease in the enzyme levels during this early post-partum period might be attributed to the inhibitory action of higher concentration of circulating estrogen which is well supported by Saba (1964) who recorded an increase in the plasma estrogen levels from 0.05 μg to 0.15 μg/100 ml on pre-partum Day 10 to Day of parturition in cows.

The serum phosphatase enzyme may be retained in the myometrial cells during involution as observed in the involuting mammary gland (Greenbaum *et al*, 1965). After completion of involution, the excess enzyme may be released in circulation as there is little function for it at that stage. Hence, the serum acid phosphatase levels might have been lowered during maximal involution period and elevated gradually towards its end.

The acid phosphatase in the lochia collected on post-partum Day 2 averaged 0.39 B.U/100 ml and the levels rose to 0.51 B.U/100 ml on post-partum Day 6. The increased loss of acid phosphatase through lochia from post-partum Day 2 to Day 6 is suggestive of cytoplasmic lysis. The lysed material with the debris containing lysosomes is excreted through lochia (Rasbech, 1950).

The serum total free amino acids levels at pre-partum and post-partum period did not differ significantly. However, a decline was noticed from post-partum Day 30 (6.9 mg/100 ml) when compared to pre-partum Day 6 (7.71 mg/100 ml) and control values (8.30 mg/100 ml). The free amino acids released by hydrolysis of uterine muscle protein and connective tissues might have been added to the amino-acid pool of the body and utilised for energy or for synthesis of milk proteins by the mammary gland and liver. The decrease in the total free amino-acids levels in the serum beginning from post-partum Day 30 might be due to the utilization of amino-acids for increased milk production as per Venkayya (1964), who reported that the milk production in Murrah buffaloes reached a peak 6.4 ± 0.51 weeks after parturition.

REFERENCES

Danielson, E. (1933): J. Biol. Chem. 101: 505. Blood analysis. In: Hawk's physiological Chemistry. Bernard L. Oser (Ed). 1979. 14th edn. Tata Mc Graw Hill Publ. Co., New Delhi. pp 974-1152.

David, E. and Anton, E. (1969): Lysosomes in uterine involution intracytoplasmic degradation of myofilaments and collagen. J. Germitol. **24**: 55-59 Cited. Biol. Abstr. **51**: 83710.

Greenbaum, A.L.; Slater, T.F. and Wang, D.Y. (1965): Lysosomal enzyme changes in enforced mammary gland involution. Biochem. J. 97: 518.

Half Penny, A.F.; Rook, J.A.F. and Smith, G.H. (1969): Variations with energy nutrition in the concentration of amino acids of the blood plasma in the dairy cow. Brit. J. Nutr. **23**: 547-557. Cited. Biol. Abstr. **51**: 27105.

Kendell, K.A. and Harshbargar, K.E. (1962): Serum phosphatase levels in parturient dairy cows. J. Anim. Sci. **21**: 1025.

Rasbech, N.O. (1950): The normal involution of uterus in the cow. Nord. Vet. Med. **2**: 655-687. Cited. Biol. Abstr. **25**: 30699.

Saba, N. (1964): Estrogenic activity in plasma of pregnant cows. J. Endocrin. **29**: 205-206.

Sahyun (1939): J. Lab. Clin. Med. 24: 548. Blood analysis. In: Hawk's Physiological Chemistry. Bernard L. Oser (Ed). 1979. 14th edn. Tata McGraw Hill Publ. Co., New Delhi.

Schinowara, Jones and Reinhard (1942): J. Biol. Chem. **142**: 921. Blood analysis. In: Hawk's Physiological Chemistry. Bernard L. Oser (Ed). 1979. 14th edn. Tata McGraw Hill Publ. Co., New Delhi.

Venkataratnam, G. and Venkayya, D. (1964): Some observations in the production characteristics of Murrah buffaloes. Maximum initial milk yield. Indian Vet. J. **41**: 205-211.

Verbeke, R., Roets, E. and Peters, G. (1972): Variations in the concentrations of free amino acids in the plasma of dairy cows at parturition. J. Dairy Res. **39**: 355-364.

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Comparative Studies Of Parturition In Equines

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ABSTRACT

Comparative studies on equine parturition were made in 35 horse mares; 48 horse mares breeding mule foals; 12 donkey mares and 18 Poney mares. Besides data on gestation period, foaling time and birth weight in respect of 568 mares is presented. Most mares foaled at night. Variation between horse mares, Poney mares and Donkey mares was insignificant.

* * *

Parturition in mares has been studied by Fleming (1978), William (1940), Arthur (1964), Rossdale (1966), Rossdale and Short (1967), Jeffcott (1972) and Jean Renton (1984). These studies give an evidence of slight variations in parturition between breeds. Parturition in mares is extremely rapid and a normal term foal shows little or no evidence of prepartum stress. Parturition problems such as dystocia are very rare. Signs like presence of colostrum in udder, "Waxing of teats" reduction in the viscosity of cervical mucous, increased relaxation of cervix indicate foaling. It has not yet been possible to establish with authenticity that equine foetus controls its birth via an increased maturation of foetal hypothalamus - pituitary - adrenal axis (Rossdale and Ricket 1974).

Vandeplassche (1957), Roberts (1971), Arthur (1975), and Jeffcott and Rossdale (1979) reported that during later half of gestation around 200 to 300 days and even upto the time of first stage labour, the foetus lay in ventral position with the forelimbs and poll flexed or partly flexed. Near the end of pregnancy, the uterus becomes remarkably soft in texture and the foetus is relatively quiescent and well forward into the abdomen. During the first stage of labour, the foetal movements are confined to flexion and extension of neck and forelimbs but at parturition the head and limbs gradually extend and forelimbs, head and neck rotate so that the dorsal position and cranial extension are achieved. From this position with the forelimbs and muzzle engaged in the cervical canal, delivery is quickly effected. The trunk and hind limbs come into dorsal position during second stage of labour.

Table 1: Gestation, Birth, Weight and Foaling time in Equines.

S. No.	Category	Progeny	Gestation (Days)			Birth weight (Kg)			Foaling time (stage two only) Mts.		
			Mean	SE	CV	Mean	SE	CV	Mean	SE	CV
1	Horse	149(M)	336.2 ±	.63	2.9	40.83 ±	.38	6.06	7.76 ±	.08	10.27
	producing	144(F)	333.9 ±	.75	3.7	39.23 ±	.41	6.74	7.73 ±	.09	11.33
	Mares.	293(OV)	335.1 ±	.82	3.4	40.3 ±	.42	7.1	7.68 ±	.06	10.33
2	Poney	10(M)	331.2 ±	.6	2.1	26.6 ±	.13	3.4	6.3 ±	.12	17.30
	producing	8(F)	329.8 ±	.32	2.4	24.5 ±	.18	5.4	7.1 ±	.16	14.57
	Mares	18(OV)	330.2 ±	.41	2.4	25.9 ±	.14	5.5	6.7 ±	.11	14.92
3	Mule	79(M)	335.31 ±	3.98	2.6	37.43 ±	.31	7.85	7.85 ±	.12	13.41
	producing	78(F)	335.11 ±	0.67	1.17	36.35 ±	.21	5.11	8.13 ±	.10	11.39
	Mares	157(OV)	335.24 ±	0.56	2.09	36.83 ±	.14	4.82	8.00 ±	.08	11.71
4	Mule	120(M)	333.82 ±	0.88	2.84	31.63 ±	.18	3.47	9.08 ±	.17	14.57
	producing	106(F)	331.73 ±	1.03	2.21	30.57 ±	.13	5.48	8.67 ±	.17	17.30
	Mares	226(OV)	332.33 ±	.62	2.31	30.99 ±	.14	5.58	8.74 ±	.11	14.92
5	Donkey	75(M)	357.06 ±	1.39	3.18	30.24 ±	.31	7.96	14.11 ±	.41	22.29
	producing	67(F)	357.48 ±	1.62	3.01	29.92 ±	.36	8.51	14.14 ±	.36	17.74
	Mares	142(OV)	357.23 ±	0.66	1.95	30.10 ±	.15	5.39	14.12 ±	.18	13.72

Rossdale *et al* (1979) observed that prostaglandins are important in the process of labour in Mare. Levels of prostaglandin $F_{2\alpha}$ increase in maternal circulation in the last week of pregnancy and during labour. Also the synthetic prostaglandins F analogue (Fluprostenol) induces parturition at term. During first stage, there is increased production of prostaglandin $F_{2\alpha}$ lasting for about 20 to 30 min, followed by explosive rise of prostaglandin production which helps in causing powerful uterine contractions. Barnes *et al* (1975; 1978) have shown that even though little change in maternal plasma progestogen levels preceeds parturition, concentration in the umbilical circulation falls significantly 24-48 hrs before delivery. Plasma oxytocin titre increases during second stage labour (Allen *et al*, 1973) probably as a result of the stretching of cervix and vagina as the foetus enters the birth canal. In addition it is known that exogenous oxytocin rapidly raises PGFM concentration and initiates foaling. Prostaglandins and oxytocin jointly bring about rhythmix uterine contractions of second stage ensuring birth of the foal.

In the present paper an attempt has been made to compare the process of parturition in Equines based on observation in 35 horse mares (HB) producing horse foals and 48 horse mare producing Mule foals (MB). Observations on 12 donkey mares producing donkey foals and 18 poney mares producing ponies have also been included for comparison. The observations on Donkey mares and ponies are from local population of upper Assam while those of horse mares are from one of the Equine breeding studs. Data on gestation period, foaling time and birth weight have also been included for additional 568 horse mares (214 producing horse foals, 354 mule foals and 130 donkey mares).

The ages of mares ranged from 4-21 yrs with previous pregnancies ranging from 0-12. The horse mares included were mostly Indian with exception of a few heavy mares from France and Argentina. All the donkey mares and poney mares were kept under natural conditions and foaling was in open fields (controlled area) while the horse mares were under controlled stable conditions and foaled in foaling boxes. The length of gestation ranged between 331 days to 335 days for horse mares, 330-333 days for poney mares and 355-359 days for donkey mares. Male foals had significantly longer gestation period (Table 1).

Preparatory Stages of Parturition (Terminal stages of Pregnancy): The mammary glands development was seen 3-4 weeks before parturition. They enlarged, became tense and swollen. The teats begin to swell rapidly during last 48-60 hrs of parturition and their tips are directed, downwards. Majority of mares formed a small bead of wax like material (pre-colostrum) a few hrs before. This was a clear indication of foaling within 12-24 hrs. Mammary development in older mares was abrupt, while in barren or maiden mares it was a slow process covering 3-4 weeks. There was no visible difference between poney mares and horse mares carrying horse foals or mule foals. Donkey mares however differed from horse mares, in that there was no wax like secretion till the time of foaling and the mammary development was seen during two weeks before parturition. Few older mares, both horse and donkey, showed running of milk through teats about 2-8 hrs before parturition, thus the foals of such mares suffered loss of colostrum.

All the donkey mares but only few horse/poney mares developed subcutanous odema of the ventral abdomen during advanced pregnancy. Relaxation of sacrosciatic ligament or sacro-iliac ligament could not be noticed except in five horse mares and 2 poney mares. This may be due to

the thick/heavy musculature. Jeen Renton (1984) has also observed that slackening of ligament is not reliable in horses. No enlargement or any other visible change could be noticed in vulval lips till 2-3 days prior to parturition. However, the vulva got swollen and enlarged in almost all mares 24 hrs prior to parturition. Thus, vulval enlargement is an indicator of parturition. Rectal palpation in 12 mares expecting parturition revealed that all the foal foetuses were in ventral position, except one which seems to have turned before start of labour. This mare parturated 41 hrs after rectal palpation.

Time of Foaling:- All the mares observed, except two, foaled during night (dark hours) and majority between 21.00 to 23.50 hrs. One mare foaled at 07.00 hrs and the other at 09.00 hrs. Both these mares were however in older age group. Of the 12 donkey mares, 9 foaled between 01.00 hrs and 05.00 hrs. Foaling in poney mares was between 20.00 to 24.00 hrs. Time taken for foaling varied between 40 to 130 mts. It was shorter in poney mares and longest in donkey mares. The second and third stage foaling was completed in 10-66 mts with maximum time required for first stage.

Stages of Parturition:- The act of parturition was observed in two phases. Terminal stages were recorded in day light while actual foaling was closely observed from 20.00 hrs onwards. Larger mares (those delivering horse foals) took longer time and poney mares, the shortest time for parturition. Donkey mares however took longest time (Table 2).

First Stage:- This is characterised by relaxation of cervix, start of uterine contractions and dilation of cervix. The mares evinced increased restlessness and spasmodic abdominal pain which was due to vigorous movement of foetus. Mares moved in loose boxes with tail raised or holding it to the side of vulva. Patchy sweating was seen in majority of cases alongwith colicy pains. Mares passed soft to liquidy faeces. Sweating was prominant in horse mares and scanty in poney mares. Only one donkey mare had profuse sweating while others did not show any sweating.

Under natural conditions, mares about to foal sought solitude and gave birth only during darkness. No sooner the cervix was dilated, chorio-allantois placenta became

Table 2: Time required for various stages of labour in Equines (in minutes)

S. No.	Category	Stages of Labour (mts)			Time taken by Foal to stand up (mts.)	Total time required for Parturition (mts.)
		First	Second	Third		
1.	Horse breeding mares	15	7.68	39	13	75
2.	Mule breeding mares	12	8.4	28	15	70
3.	Poney breeding mares	10	6.7	15	10	60
4.	Donkey breeding mares	25	14.12	45	25	85

separated. Myometrial contractions propelled the foetus towards dilating cervix, the foal turned upside down and one foreleg with intact chorio-allantois was forced in the cervical canal, rupturing the membrane with the fluid gushing out. The foetus was forced out in the cervical canal with continued myometrial contractions. Once the foal's head entered pelvis, the pelvic reflexes are initiated, causing straining of abdomen. This stage was similar in all the mares. Left foreleg remained in advanced position in all cases. However in three donkey mares, the right foreleg was in advanced position. In one donkey mare, the rupture of chorio-allantois took more then ten minutes. This mare was in debilitated condition and anaemic.

Total time taken for first stage varied between 10 to 30 mts (Mean 23 mts).

Second Stage:- This stage included the events from rupture of allanto-chorion and escape of allantoic fluid to birth of foetus. As soon as the allanto-chorion was ruptured, almost all the mares lay down on their side, evidently for pressing the abdomen. Three horse mares and one donkey mare gave birth while standing. The amniotic sac appeared at lips of vulva. Mares started powerful straining efforts. Some mares produced involuntary grunting sounds. With the muscular contractions, expulsion of foal started. In all the cases, one limb was in advance of the other by 4-5 cm. Maiden and young mares had some difficulty in getting the foetal head out of birth canal. Straining efforts continued in all cases till hips of foetus were expelled and thereafter stopped abruptly. Hind limbs still remained in vagina, probably to protect it against ballooning and intrusion of infections. The foals remained lying on the ground in natural position which helped draining of foetal blood present in placenta to the foal's circulation. All the horse mares were helped in removing the amnion but in case of poney and donkey mares it was natural. The foals rapidly tore through and escaped from amnion. Rupture of umbilical cord was in a variety of ways. In horse mares, it was done by the assistant (cutting the umbilical cord) while in donkey and poney mares, it ruptured either by movement of foals legs or when the foal tried to get up. A clear fluid was seen running through the nostrils of three horse foals and five mule foals, but almost all the foals foamed from mouth. Hind limbs automatically slipped in all cases in a period of 5-15 mts (except in two cases). Two mares took some pause after expulsion of thorax of foal, resulting in longer period for stage two, total time for which varied from 4 to 23 mts. After expulsion of foal, the mares took some rest and then got up. Once the mare got on its feet, the maternal instinct and behaviural changes such as licking, nuzzling and nudging the foal, started.Rossdale (1966) observed that rest period in thorough breds was more than that in poney mares.

Third Stage:- It covers expulsion of placenta. The expulsion of foetal memberanes is rapid in equines and retention is very rare. Once allanto-chorion is detached, it acts as foreign body and the myometrial contraction alone throws it out. The pelvic reflexes start once again when membranous mass reaches the pelvis. The equine placenta is expelled inside out with foetal surface of the allanto-chorion being outer most. All the mares threw the placenta without any extra effort. Total time ranged between 5 to 46 mts.

Newly Born Foal:- Immediately after delivery, the foals started breathing. Two foals started breathing before fully breaking through the amnion. The visible mucous membrane appeared congested at birth but soon became bright pink. Almost all foals lay in resting position till the mares started licking or moved away by the attendant. Seven foals however got up without any stimulation from

dam. Time taken for foal to get up was 5-13 mts. The foals were unsteady but started locating udder.

It is concluded that Horse, Poney and Donkey mares show very little variation in the entire process of parturition.

REFERENCES

Allen, W.E.; Chard, T. and Forsling, M.L. (1973): Peripheral plasma level of oxytecin and vasopressin in the mare during parturition. J. Endocrin. **57**: 157-176.

Arthur, G.H. (1964): Wright's Veterinary Obstetrics 3rd Edn. Balliere Tindall London.

Arthur, G.H. (1975): Vet. Reproduction & Obstetrics 4th Edn. Balliere-Tindall London.

Barnes, R.J.; Nathavielsz, P.W.; Rossdale, P.E.; Comline, R.S. and Silver, M. (1975): Plasma Progestagens & Oestrogens in foetus and mother in late pregnancy J. Reprod. Fertil. Suppl. **23**: 613-623.

Barnes, R.J.; Comline, R.S.; Jeffcott, L.B.; Mitchell, M.D.; Rossdale, P.D. and Silver, M. (1978): Foetal & maternal plasma concentration of 13, 14 dihydro 15 exo prostaglandin F in the mare during late preg and at parturition, J. Endocrin. **78**: 201-215.

Fleming, G. (1978): A Text book of Veterinary Obstetrict Ist Edn. Balliere Tindall London PP 209-243.

Jeen Ronton (1984): Parturition in Mare. Practice **16** (1).

Jeffcott, L.B. (1972): Observation on parturition in crossbred poney mares - Equine Vet. J. **4** (4): 209.

Jeffcott, L.B. and Rossdale, P.D. (1979): A radiographic study of the foetus in late pregnancy and during foaling. J. Reprod. Fertil. Suppl. **27**: 563-509.

Roberts, S.J. (1971): Vet. Obstetrics and Genital diseases 2nd Edn.

Rossdale, P.D. (1966): A clinical and laboratory assessment of the health status of new born Thoroughbred foal Fellowship Thesis RCVS London.

Rossdale, P.D. and Ricketts, S.W. (1974): The practice of Equine Stud farm medicine Pub. Bailliere-Tindall London.

Rossdale, P.D. and Short, R.V. (1967): The time of foaling in thoroughbred mares - J. Reprod. Fertil. **13**: 341-43.

Rossadale, P.D.; Pashen, R.L. and Jeffcott, L.B. (1979): Studies on the use of analogue (fluprestenol) to induce foaling. J. Reprod. Fertil. Suppl. **27**: 521-29.

Vandeplassche, M. (1957): The normal and abnormal presentation, Position and posture of foal foetus during gestation and parturition. Meded Veeartsah Rijksuniv Gent **1**: 36.

Williams, W.L. (1940): Veterinary Obstetrics 3rd Edn. Ithace N.Y.

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Pelvic Dimensions During Pre And Post-Partum Period In Goats

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ABSTRACT

Changes in the pelvic dimensions during pregnancy and after parturition were studied in 41 non-descript goats. The mean pelvic outlet/inlet areas were 63.57 ± 1.26/168.76 ± 2.56 cm^2 on the day of service. Both the areas did not show any significant change upto 16 weeks of gestation. Thereafter, a linear increase in both the areas was observed. The total increase in the pelvic outlet/inlet areas was 0.93 cm^2/1.87 cm^2 upto parturition. Following parturition, the areas started decreasing and reached to almost pre-pregnancy status within 3 weeks post-partum.

* * *

An increase in the pelvic dimensions with advancement of pregnancy is reported in women (Baired, 1952) and cattle (Ben David, 1964). Such informations are meagre in goats. Changes in the pelvic outlet and inlet areas

during pre and post-partum period in non-descript goats were recorded in the present investigation.

Materials and Methods

A pelvimeter (Chinchkar and Velhankar, 1983) with minor modifications was used to measure the area of pelvic inlet and outlet in 41 does. The pelvimeter was used to measure the distance between the external angles of ilia (a) and the perpendicular distance between the coxo-femoral joint and the highest point of the croup (c). The distance between the lateral ischial tuberosities (b) was measured by vernier callipers. The transverse diameter of outlet (d) was calculated by formula : 1/4(a+b) + 1.29 and the vertical diameter (e) by 3/4(c) + 1.35. The pelvic outlet area was the product of "d" and "e". Similarly, the transverse diameter of inlet (f) was calculated by the formula 12.2/10 (d) + 2.51 and the vertical diameter (g) by 13/10 (e) + 3.51. The pelvic inlet area was the product of "f" and "g".

The pelvic measurements were recorded at monthly interval upto 4 months of pregnancy and then at weekly interval upto the day of parturition and after parturition till the readings were constant.

Results and Discussion

The mean pelvic outlet and inlet areas on the day of service were 63.57 ± 1.26 and 168.76 ± 2.56 cm^2 respectively (Fig. 1). Both the areas did not show any significant change upto 16th week of gestation. A linear increase in both the pelvic areas was observed after 16th week of gestation till the maximum values reached on the day of parturition (64.86 ± 1.29 and 171.41 ± 2.65 cm^2, respectively). Following parturition, the areas started decreasing and reached to pre-pregnancy status 3 weeks post-partum i.e. 63.60 ± 1.26 cm^2 (outlet) and 169.09 ± 2.5 cm^2 (inlet).

The comparable informations on the pelvic changes in goats during pregnancy were not available. However, several workers reported in cattle that there is a gradual increase in the pelvic dimensions in mid-pregnancy with significant rise at the time of calving (Ben David, 1964; Reddy, 1972 and Verma, 1981).

Relaxin, a hormone secreted during pregnancy is responsible for widening the birth canal by softening or relaxing the fibro-cartilaginous ligament of the pubic symphysis. It acts on connective tissue primarily by inducing an enzymatie depolymerization of such colloidal compounds of joints as glyeosaminoglycans and collagen (Mc Donald, 1980).

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REFERENCES

Baired, D. (1952): The cause and prevention of difficult labour. Amer. J. Obst. Gyn. 63: 1200 (Cf Chinchkar and Velhankar, 1983).

Ben David, B. (1964): Obstetric measurements of the pelvis in Israeli Friesian heifers during pregnancy as compared to those of their calves at the time of parturition. Refuah vet., 21: 49 (Vet. Bull., 35: 409).

Chinchkar, S.R. and Velhankar, D.P. (1983): Biometrics of Pelvis in Bannur ewes and Surti does. Indian J. Anim. Reprod. 4: 41.

Mc Donald, L.E. (1980): Veterinary Endocrinology and Reproduction. 3rd edn., Pub. Lea and Fibiger, Philadelphia.

Reddy, K.P. (1977): Pelvimetry in crossbred cows. M.V.Sc. Thesis, Madras University, Madras.

Verma, S.K. (1981): Studies on pelvic conformation during pregnancy, parturition and puerperium in crossbred cows. M.V.Sc. Thesis, J.N.K.V.V., Jabalpur-482 004.

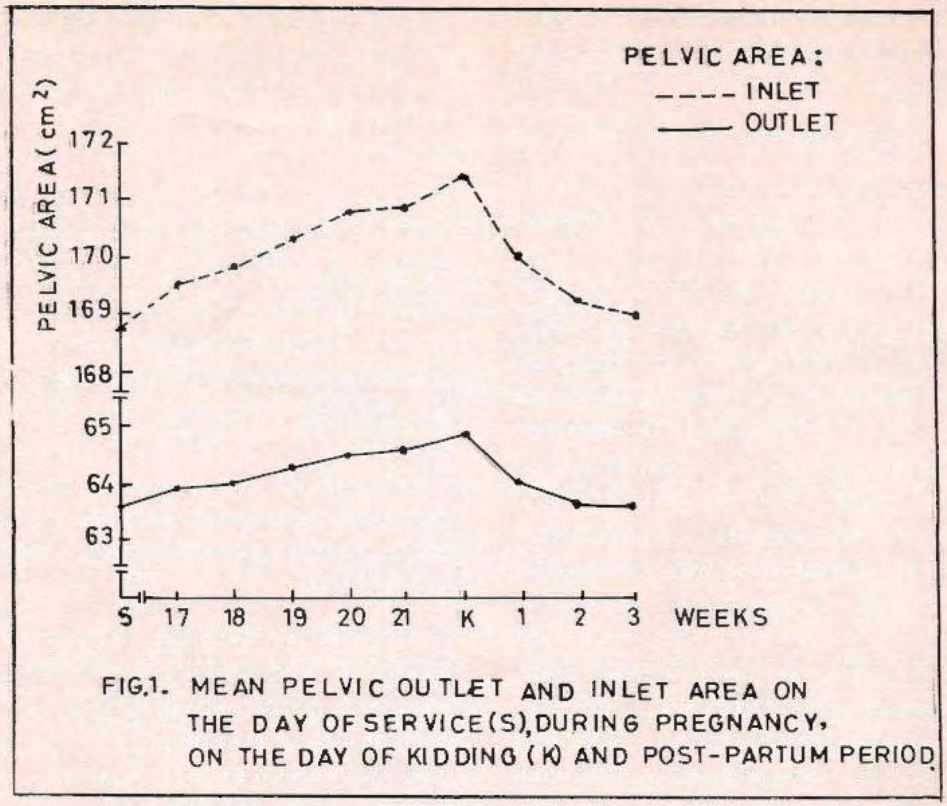

FIG.1. MEAN PELVIC OUTLET AND INLET AREA ON THE DAY OF SERVICE(S), DURING PREGNANCY, ON THE DAY OF KIDDING (K) AND POST-PARTUM PERIOD

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Impact Of Artificial Insemination On Livestock Breeding In Vidarbha

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ABSTRACT

Studies on impact of Artificial Insemination were done with Akola district as a model. Various findings are presented and discussed for improvement of A.I. technique in the field.

* * *

In advanced countries of the world artificial insemination is now generally accepted as a normal method of breeding quality cattle. The technique came to India in the year 1944 and paved the way for its successful use in the country as a whole in the decades that followed. Large scale expansion of Artificial Insemination came in India with the launching of Intensive Cattle Development Programme and All India Coordinated Research Project of ICAR.

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The initial development of the technique was rapid in India, however the subsequent progress has not been commensurate with the efforts put in chiefly because there was no proper appreciation of the far reaching consequences of the technique for bovine improvement and the necessity of meeting the challenge by providing the organisation to look after the day to day needs and also for solving the problems arising from large scale field application of the technique.

Present studies were undertaken to know the extent of usefulness of A.I. in Vidarbha region of Maharashtra State under field conditions and possible handicaps, with a view to help in future planning or modifications in the existing set up, techniques and practices if necessary.

Materials and Methods

Akola being the centre of Vidarbha region, was selected as a model for this study.

There are 13 block veterinary dispensaries and 55 Aid centres supplied with chilled semen thrice a week in Akola district. Data was collected from 68 centres. The parameters studied were :

1. Utility of A.I. service in livestock production.
2. Trend of A.I. in rural areas over the past decade.
3. Conception Rate (C.R.) in cows and buffaloes subjected to A.I.

The relevant data of a decade (1964-1974) from Key village centres (KVC) and Artificial Insemination Sub-centres (AIC) in Akola district, was studied and analysed.

Results and Discussion

25,095 females were bred by A.I. in Akola district during the ten year period, of which maximum of 10,469 (41.71%) were at K.V.C. Akola followed by 8,075 (32.17%) at K.V.C., Washim. Further 1,689 (6.73%); 1,358 (5.41%); 789 (3.14%); 763 (3.04%); 571 (2.27%); 488 (1.94%); 487 (1.94%) and 406 (1.61%) females were bred at A.I. subcentres Akot, Barshi Takali, Risod, Karanja Murtizapur, Manora, Mangrulpir and Balapur respectively (Table 1).

Two KVCs Akola and Washim accounted for 73.89% of the animals bred by A.I. as against 46.11% pooled data of all the eight A.I. subcentres. This might be due to the relative impact created by the Key village centres with independent technicians working for A.I. work in these locations.

The total bovine female population of breedable age in Akola district was 2.27 lacs, of which only 12% was bred by A.I. and the remaining mostly by stray breeding bulls of questionable and low genetic make up. The low response to A.I. appeared to be due to lack of initiation and motivation of the cattle owners regarding the qualitative advantages of breeding their animals with superior germ plasm. Similar observations are reported by Andreev (1941), Lagerlof *et al* (1963) and Satishchandra (1970).

The traditional management practices adopted such as sending all cows of the village for grazing with stray bulls roaming with the herd, lack of proper heat detection programme and high incidence of weak heat, pose a major hurdle to the progress of A.I. in rural areas. This was apparent from the relatively better response of urbanised rural areas of Akot and Washim. This is in full agreement with the findings of Kaikini and Pargaonkar (1977).

The relatively low percentage of animals inseminated in subcentres (Table 1) was possibly due to operational and organisational difficulties. The meagre progress may be due to A.I. entrusted as an additional work to the technicians in charge of

these institutions. Another reason was lack of the livestock owners for resorting to A.I. The variation in the continuity of the inputs for A.I. activity may add to the lower response.

Out of the total animals inseminated, 53.14 percent were buffaloes and 46.80 percent were cows. The increase in the percentage of buffalo inseminations was probably because of non-availability of good Murrha buffalo bulls for natural service and preference of livestock owners for the high yielding Murrha breed, besides popularity of buffalo breeding in this home tract of Berari (Nagpuri) buffaloes.

Semen Supply: Out of the total need of all these centres in the district, only 14.2% semen was utilised for A.I. and the rest was discarded (85.80%). The considerable waste of valuable germ plasm is a serious matter. The difficulty, can only be solved by motivation of the cultivators for taking to A.I. Programme. Scrub bulls must be castrated so that breeding can be done by A.I. alone. An Act to control Artificial Insemination in the province is essential for such cases (Watson, 1948).

Buffalo bull semen utilisation: The utilisation percentage in respect of buffalo bull semen was better mainly because of non-availability of good quality Murrha bull. Probably, acute scarcity of buffalo bulls directed the cultivators to adopt A.I. technique. The higher utilisation percentage of buffalo bull semen showed that the cultivators of this area were more inclined to buffalo breeding.

Animals Inseminated: The inseminations done by Exotic, Hariana and Buffalo bull semen were 2,140; 9,619 and 13,336 respectively, which are very low (Ozin, 1938; Anon, 1948).

Conception Rate (C.R.): A little over half the total number of animals inseminated were examined for pregnancy diagnosis (56.25%). The follow-up percentage was lesser and it was felt that for undertaking the complete follow-up a separate staff was required. This is in accordance with the opinion expressed by Lagerlof *et al* (1963). On the other hand, the livestock owners were also not found to be vigilant for getting their cows examined for pregnancy diagnosis, which is in partial agreement with Satishchandra (1970).

The overall C.R. (44.61%) was greater than 42% recorded by Vorobiev and Schneerson (1933) and lesser than 92.67% recorded by Altara and Adriano (1938), 70% recorded by Bhattacharya and Prabhu (1953) and 62% recorded by Povuna *et al* (1968). Lower C.R. might be due to the lack of skill of the technicians working with the institute, together with smaller number of cases followed up after A.I. Besides, the non-synchronisation of insemination and ovulation timings might have contributed to low C.R. These findings are in full agreement with Henderson (1939).

Suggestions for improvement of A.I. in the field:

1. Supply of semen doses may be regulated according to the requirement of each individual centre, instead of supplying at a uniform rate on adhoc basis to all centres.

2. Sincere, vigorous and continuous extension efforts are most essential to motivate the cultivators to take to A.I. programme for producing high yielding cross bred cows and buffaloes.

3. Buffalo still continues to be the main animal for milk production. Intensive efforts for genetic improvement of buffaloes are essential.

4. A careful and intensive follow-up programme is essential.

5. Separate technical staff be entrusted with intensive A.I. and gynaec health control work.

6. Continuous periodical training be imparted to A.I. Technicians for improving their technical efficiency and conception rate of the cases handled by them and

7. Organisation of periodical gynaecological health control camps with the technical participation of Animal Reproduction specialists of Agricultural Universities.

Table 1: Utilisation and Fertility of the Semen Doses at the Key Village Centres and A.I. Sub centres of Akola District (1964-74)

Centres	Utilization of Diluted semen (%)	Breedable females inseminated (%	Conception Rate (Percent).			
			Exotic	Haryana	Buffalo	Overall
Key Village Centres						
1. Washim	10.82	38.61	28.11	47.55	38.86	41.91
2. Akola	19.84	47.75	46.69	41.89	40.52	41.22
Sub-Centres						
1. Akot	20.01	11.41	81.25	79.85	65.38	24.00
2. Barshi-Takali	23.48	7.27	47.82	58.67	58.70	56.49
3. Risod	10.76	3.49	36.84	45.45	39.66	40.68
4. Karanja	15.76	4.95	31.84	34.26	32.88	36.59
5. Murtizapur	7.19	0.67	29.03	46.22	37.30	41.30
6. Manora	7.87	2.23	36.36	6.94	64.40	66.37
7. Mangrulpir	8.55	2.59	76.20	93.75	70.83	78.20
8. Balapur	13.11	2.93	32.92	41.12	24.88	31.14

REFERENCES

Altara, I. and Adriano, P. (1938): The use of artificial insemination in combating sterility of cattle. Anim. Breed. Abstr. **6** (3): 203.

Andreev, E.L. (1941): The quality of artificial insemination in cattle. Anim. Breed. Abstr. **11** (1): 24.

Anon. (1948): Annual report for 1947 for the Central Committee for the supervision and application of Artificial Insemination in Netherland. Anim. Breed. Abstr. **16**: No. 1395.

Bhattacharya, P. and Prabhu, S.S. (1953): Field application of Artificial Insemination in Cattle II. Indian J. Vet. Sci. and A.H. **24** (2): 71.

Henderson, J.A. (1939): Artificial Insemination under field condition. Cornel Vet. **29**: 139-143, Anim. Breed. Abstr. **8** (4): 367.

Kaikini, A.S. and Pargaonkar, D.R. (1977): Studies on oestrus and oestrus cycle in non descript village cattle maintained for cross breeding. Proc. 1st Asian Cong. Fertil. Steril., Bombay, February 19-24, 1977.

Lagerlof, N.; Palsson, E. and Settergren, I. (1963): Report to the Government of India on Artificial Insemination and sexual health control. Anim. Breed. Abstr. 32: No. 1026.
Morey, S.V. (1972): Studies on the impact of Key Village Centre running at the village Borgaon Manju M.Sc. (Agri) Thesis. Punjabrao Krishi Vidyapeeth, Akola.
Ozin, F.V. (1983): The organisation of artificial insemination of cattle on collective farms. Anim. Breed. Abstr. 6 (4): 293.
Pavuna, H.; Simunic, B. and Ljujic, A. (1968): The development and state of artificial insemination of cattle in Yugoslavia (1946-66). VIC Congr. Reprod. Insem. Artifi. Paris, 1968. Resumes,: 199. Anim. Breed. Abstr. 37: No. 417.
Satishchandera (1970): Socio-economic factors affecting Artificial Insemination c.f. Morey, S.V.; (1972).
Vorobjev, S.M. and Schneerson, M.S. (1933): Results of Artificial insemination on farm No. 2 of the institue Proc. Leninger. Inst. Dairy Cattle Breed. 1: 100-106. Anim. Breed. Abstr. 2: 112.
Watson, W.P. (1948): Artificial insemination at home and abroad. Canad. J. Comp. Med. 12: 4-7.

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Temporary Engorgement Of Teat (TET) - Its Relationship With Occurrence Of Estrus In Buffaloes.

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ABSTRACT

811 graded Murrah buffaloes were studied for a peculiar phenomenon exhibited by majority of them with engorgement of the teats prior to the onset of real heat. The proestrus behaviour termed as 'TET' phenomenon is used by most animal owners as an important tool for detection of incoming estrus. Day of occurrence of this phenomenon, its duration and relationship with the onset of estrus and number of calvings were studied in details.

* * *

While investigating certain aspects of reproductive failures in buffaloes which were located in organised private Khatals in and around Calcutta and belonged to owners who maintained them on commercial basis for daily sale of whole milk, it was reported by the buffalo owners that there is temporary engorgement of teats (TET) in majority of their incoming estrus buffaloes. Perusal of available literature indicate only one record by Sheokand *et al*, (1982). As the 'TET' phenomenon was found to be of major importance in the detection of incoming estrus in buffaloes as reported by the buffalo owners, it was planned to study in details the day of occurrence of this phenomenon, its duration and relationship with the onset of estrus and number of calvings.

Materials and Methods

The study comprised of 811 buffaloes, out of which 507 were from suburb of Calcutta (Group A) and 304 from thickly populated central areas of Calcutta City (Group B) Group A buffalo cows were mostly maintained under loose housing system and enjoyed the facilities of open space, few hours grazing and pools for wallowing. Group B buffalo cows were tethered and crowded in very limited space in improvised sheds. The animals enjoyed no facilities for wallowing, free movement and grazing except sprinkling

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of cold water once or twice daily before each milking. Statistical analysis of data was done as per Snedecor and Cochran (1967). The mean values of the percentages of different parameters were converted in the angle values for analysis of variance.

Results and Discussion

Of the 811 buffalo cows, 80.72% from Group A, 82.18% from Group B and overall 81.45% buffaloes exhibited TET phenomenon (Table 1). Considering the animals of Group A and Group B together, the TET phenomenon remained on an average for 3.86 ± 0.67 days and estrus appeared on an average of 8.45 ± 1.16 days after disappearance of this phenomenon, in 655 buffalo cows (Table 2).

The exhibition of TET phenomenon in 99, 104, 122 & 135 buffalo cows representing first, second, third and fourth lactation were on an average 102.0, 95.5, 84.2 & 76.5 days after

Table 1: Frequency distribution of TET occurrence in buffaloes.

Group.	Khatal Numbers	Number of Observations.	Number of Animals with TET Phenomenon	Percentage of Animals exhibiting TET Phenomenon
	1	77	61	79.22
	2	88	73	82.95
	3	110	83	75.45
A	4	78	63	80.76
	5	102	81	79.41
	6	52	45	86.53
Group total with Mean & Standard Deviation.	6	507	406	Mean = 80.72 ± 3.75
	7	42	33	78.57
	8	60	45	75.00
	9	58	46	79.31
B	10	51	48	94.11
	11	41	35	85.36
	12	52	42	80.76
Group total with Mean & Standard Deviation.	6	304	249	Mean = 82.18 ± 6.74
Overall with Mean and Standard Deviation.	12	811	655	Mean = 81.45 ± 5.25

parturition respectively. The average duration of this phenomenon and interval of estrus occurrence after disappearance of this phenomenon in the above four lactations were 3.2, 2.8, 3.4, 3.0 and 7.2, 7.9, 9.2, 9.6 days respectively (Table 3). The interval of its occurrence after parturition decreasd with the increase in the number of lactations, while the interval time of occurrence of post-partum estrus after disappearance of the TET phenomenon showed a reverse trend.

Analysis of variance of the occurrence and duration of TET phenomenon did not reveal any significant difference between the two groups and between the Khatals (Table 4).

During investigation, most of the buffalo owner paid great importance to consider this

Table 2: Relationship of disappearance of TET phenomenon and appearance of estrus.

Group.	Khatal Number	Number of Observations.	Duration of TET Phenomenon (Average days)	Interval time of estrus after disappearance of TET phenomenon (Average days)
A	1	61	4.6	9.2
	2	73	3.8	7.5
	3	83	3.0	10.2
	4	63	4.8	8.1
	5	81	3.3	8.6
	6	45	3.8	9.0
Group total with Mean & Standard Deviation.	6	406	Mean = 3.88 ± 0.70	Mean = 8.76 ± 0.93
B	7	33	3.6	7.6
	8	45	4.0	5.8
	9	46	5.0	8.4
	10	48	4.2	9.8
	11	35	3.0	8.2
	12	42	3.3	9.1
Group total with Mean & Standard Deviation.	6	294	Mean = 3.85 ± 0.71	Mean = 8.15 ± 1.37
Overall with Mean and Standard Deviation.	12	655	Mean = 3.86 ± 0.67	Mean = 8.45 ± 1.16

phenomenon as a criteria for detection of incoming estrus in their buffaloes. Sheokand *et al* (1982) studied this phenomenon in Murrah buffaloes and reported its occurrence in 80% young and 100% old buffalo cows. Our findings are more or less in tune with their reports. Janakiraman (1978) studied proestrus behaviour in buffaloes and reported that 3-5 days before the onset of real heat, some buffaloes exhibited heat like activity showing uterine discharge and uterine tone. He further reported an increase in the circulating levels of prolaction FSH and FSH/LH ratio during the proestrus period. His report, however did not indicate any observation on TET phenomenon during proestrus behaviour in buffaloes. Further studies are, therefore, considered necessary to determine the scientific basis of the TET phenomenon in buffaloes in view of its importance imparted by the owners for detection of incoming estrus in their buffaloes.

Table 3: Lactation-wise occurrence of TET phenomenon.

Sequence of Lactations	Number of Observations.	Time interval of occurrence of TET phenomenon after parturition (Average days)	Duration of TET Phenomenon. (Average days)	Time interval of appearance of post-partum estrus after disappearance of TET Phenomenon (Average days)
First Lactation	99	102.0	3.2	7.2
Second Lactation	104	95.5	2.8	7.9
Third Lactation	122	84.2	3.4	9.2
Fourth Lactation	135	76.5	3.0	9.6
		Mean = 89.55 ± 11.39	Mean = 3.10 ± 0.25	Mean = 8.47 ± 1.11

Table 4: Analysis of variance of occurrence and duration of TET phenomenon.

Source of variation	Degrees of Freedom	Mean Squares.	
		Occurrence of TET Phenomenon	Duration of TET Phenomenon
Total	11		
Groups	1	6.08 N.S.	0.01 N.S.
Khatals	5	19.00 N.S.	0.96 N.S.
Error.	5	20.01 N.S.	1.22

N.S. = Non-Significant

REFERENCES

Janakiraman, K. (1978): Progress report of AICRP project in buffalo endocrinology Unit, Anand.

Sheokand, B.S., Dhanda, O.P. and Kapoor, M. (1982): Indian J. Anim. Reprod. 2 (1): 8-11.

Snedecor, G.W.; and Cochran, W.G. (1967): Statistical Methods 6th Edn. Oxford and IBH publishing Co., Calcutta.

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A Note On The Occurrence Of Uterine Polyps In A Sahiwal Cow

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Uterine polyps are very uncommon in bovines. Jones and Hunt (1983) reported it to be common in cat, rodents and man. Because of its rare occurrence the authors are placing on record a case of uterine polyps in Sahiwal cow which they had encountered during routine necropsy.

A Sahiwal cow No. 108, aged $4^1/_2$ years of Cattle Breeding Farm, Nagpur Veterinary College, Nagpur was brought to the Pathology Department for necropsy. (PM No. 224/88). The animal had calved on 18.12.88 at 13 hours for the first time in her life. A full term female calf weighing 22 Kgs was born. The placenta was expelled at 21 hours on the same day. There was prolapse of the uterus during mid-night. The uterus was badly damaged and torn at many places. The animal died at about 0200 hours on 19.12.88.

During necropsy, eyes appeared sunken. In pelvic cavity about 800 gms blood clots were seen. The prolapsed uterus was badly injured at many places as if it was trampled. On opening the uterine cavity, remnants of placenta were not seen in the left horn which was carrying the foetus. Cauliflower like whitish creamy growths were seen in the mucosa in between the colyledons which were projecting into the lumen (Fig. 1). The growths appeared freely movable in the

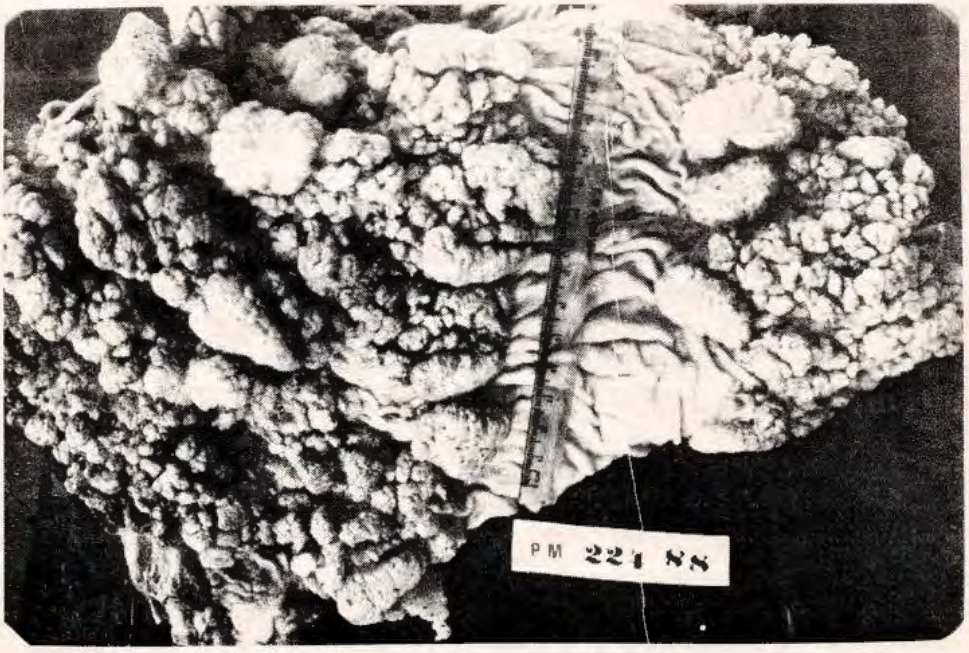

Fig.1. Gross photograph of uterine polyps in a Sahiwal Cow.

mucosa when handled. The right horn appeared normal. The pelvic lymph node appeared enlarged and edematous. Sub-endocardium of left ventricle showed extensive haemorrhages. The cause of death was attributed to be traumatic shock.

On histo-pathological examination, uterus showed thickening of submucosa due to large amount of fibrous connective tissue and fully formed blood vessels. Uterine glands appeared to be normal. The mucosa showed numerous papillomatous projections lined by tall/cuboidal cells which were foamy and were projecting in the uterine lumen (Fig. 2). Muscular and serosal layers were not affected. Pelvic lymph node was edematous and evidence of any metastasis was not detected.

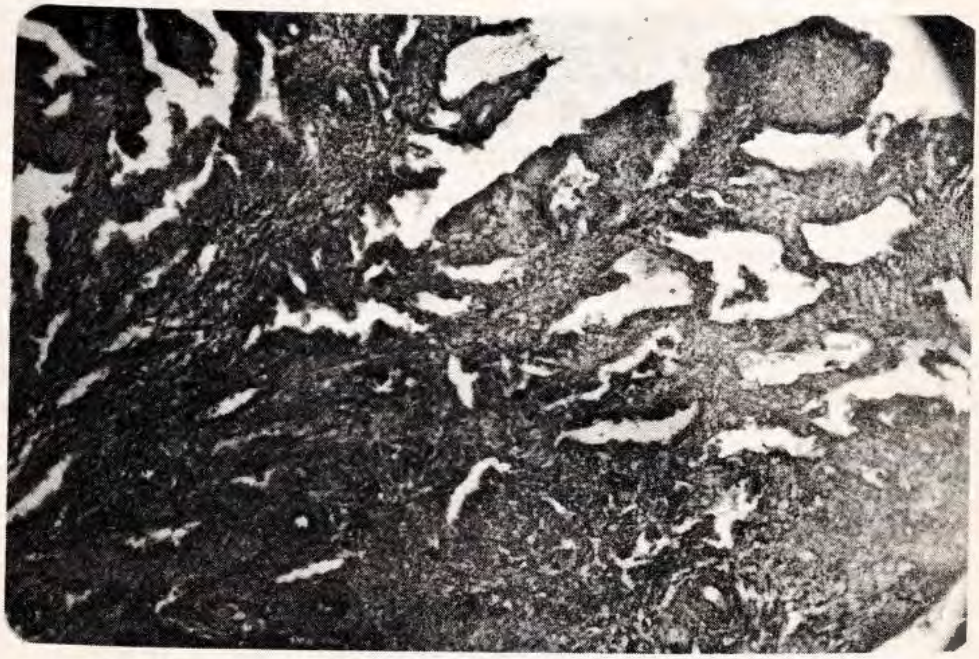

Fig.2. Microphotograph showing uterine polyps in a Sahiwal Cow H.E. X 100.

REFERENCE

Jones, T.C. and Hunt, R.D. (1983): Veterinary Pathology, 5th Edn. Lea and Febiger, Philadelphia. Pp. 1537.

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A Note On Recurrence Of Uterine Torsion In A Cow With Didelphic Uterus

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Torsion of uterus in bovines is considered as a complication of late first stage or early second stage of parturition and occasionally of advanced pregnancy (Vasishta, 1983). Various factors like physical, anatomical and hormonal (Arthur *et al*, 1982; Roberts, 1971)

have been put forth to predispose this condition. It has also been postulated that imbalance caused by non pregnant horn helps rotation of uterus. The present note records the recurrence of uterine torsion in a cow having didelphic uterus.

A 4 year old cross bred cow with didelphic uterus was reported to suffer from uterine torsion (Dhaliwal, *et al*, 1988). The same animal was again presented to the veterinary clinics with colicky symptoms at 7 months of gestation. Enquiries from the owner revealed that she was naturally served and had abdominal pain since past ten hours. In the previous gestation when the animal had suffered from uterine torsion, there was presence of abdominal pain for the last 3 days but there was neither relaxation of pelvic ligaments nor let down of milk. Per vaginal examination had shown a cervix with blind pouch and a vaginal fold turning towards right. (Dhaliwal *et al*, 1988).

During the present parturition, the general and specific examination coincided with the findings as in the previous gestation i.e., there was colicky pain, no relaxation of pelvic ligaments and let down of milk was also absent. The animal was partially off feed since the previous day. Post-cervical right side uterine torsion was diagnosed by P.V. examination. Complete detorsion of the uterus was achieved in a single roll by Schaffer's method (Roberts, 1971). Cervix was completely open and a dead male calf was extracted with mild traction.

Asymmetry and imbalance caused due to smaller size of the non pregnant horn is one of the several causes put forth for the occurrence of uterine torsion (Sloss & Dufty, 1980). However, in the present case the assumption that the pregnant horn rolls towards and over the non pregnant horn (Gloor, 1973 and Frerking *et al*, 1975) holds to the contrary as there was no non-pregnant horn. This shows that the uterine torsion can occur even in cases having only the pregnant horn.

REFERENCES

Arthur, G.H.; Noakes, D.E. and Pearson, H. (1982): Veterinary Reproduction and Obstetrics. The English Language Book Society and Bailliere Tindall, London.

Dhaliwal, G.S.; Sharma, R.D.; Singla, V.K. and Prabhakar, S. (1988): Torsion of didelphic uterus in a cow. Indian J. Animal Reprod. 9 (1): 71.

Frerking, H.; Achnelt, E.; Geyer, K.; Baumann, C.; Feldmann, K. and Ahlers, D. (1975): Cited by Sloss, V. and Dufty, J.H. In : Handbook of Bovine Obstetrics, Williams and Wilkins, Baltimore.

Gloor, H.G. (1973): Cited by Sloss, V. and Dufty, J.H. In : Handbook of Bovine Obstetrics, Williams and Wilkins, Baltimore.

Roberts, S.J. (1971): Veterinary Obstetrics and Genital Diseases. 2nd Ed. Scientific Book Agency, Calcutta.

Sloss, V. and Dufty, J.H. (1980): Handbook of Bovine Obstetrics. Williams and Wilkins, Baltimore.

Vasishta, N.K. (1983): Torsion of uterus in buffaloes in relation to incidence, etiology and treatment. M.V.Sc. Thesis, Punjab Agricultural University, Ludhiana.

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A Note On Oestrous Cycle Characteristics In Surti And Marwari Goats*

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Some studies on oestrous cycle characteristics are available in goats (Singh and Senger, 1979; Singh *et al*, 1979; Wani 1980). Information on Surti and Marwari goats is not available. As such, the present study was undertaken to establish duration of oestrus, oestrous cycle and its relationship with the seasonality.

A herd comprising of 52 Marwari and 31 Surti goats were maintained under stall-fed conditions. The daily ration of these animals included 250 gms of concentrates, 5 gms of mineral mixture, 25 gms of crushed maize and 1.5 kg green fodder with weekly supplementation of 3 ml shark liver oil as growth promotor. The animals were vaccinated regularly against Enterotoxemia, F.M.D. and H.S. infections.

The goats were checked daily for oestrus at 0800 hrs and 1800 hrs with the help of a teaser buck. The records, consisting of oestrous behaviour, length of oestrous cycle and duration of oestrus were duly maintained for all the goats. Three seasons namely winter (Nov.-Feb.) Summer (March-June) and Monsoon (July-Oct.) were taken into consideration to study the effect of seasonality on the oestrous characteristics in goats.

Earlier studies in Jamnapari, Barbari, Black Bengal and Beetal goats reported 10 to 14% short cycles (less than 10 days), 50% medium cycles (10-20 days) and 31 to 40% long cycles (more than 28 days) (Singh and Senger, 1979). In the present study, the Surti breed revealed more number of short cycles (52.63%) as compared to Marwari goats who exhibited larger number (55.77%) of medium cycles (Table 1). The medium cycle length (19-22 days) in our study is quite comparable to the normal cycle length (19-20 days) reported for Angora goats (Rensnusy, 1971). The mean oestrus duration was reported to vary between 12 to 60 hrs in Barbari (Sahni and Roy, 1967) and 24 to 48 hrs in Jamnapari goats (Khan, 1980). The present study revealed 35 hrs to 54 hrs mean oestrus duration for Surti and Marwari goats (Table 1).

The ambient temperature and photoperiodicity are positively correlated with mating in goats (Phillips, 1943). In some previous investigations, Assam goats reported to have peak breeding season in May (Rajkonwar and Borgohain, 1978), whereas two breeding seasons - Summer (May to July) and Monsoon (Sept. to Nov.) were observed in Barbari and Jamnapari goats (Singh and Senger 1979). The present study recorded more number of cycles in Summer and Monsoon for Surti breed as compared to Marwari goats who exhibited maximum number of cycles in Summer season (Table 2).

* Part of research work presented to 76th Indian Science Congress Session, Madurai, Jan. 7-12 1989.

Table 1: Variation of oestrous cycle length and oestrus duration in Surti and Marwari goats.

Breed		Oestrous cycle length (days)	Oestrus duration (Hrs)	Oestrus length (days)	Oestrus duration (Hrs)	Oestrous cycle (days)	Oestrus duration (Hrs)
SURTI	$\bar{X}$	9.2	36.23	19.67	54.67	42.83	42.0
	SE	0.76	7.09	0.41	20.63	7.52	8.70
	n	14	14	7	7	10	10
	%	52.63	52.63	15.79	15.79	31.58	31.58
MARWARI	$\bar{X}$	9.23	36.23	20.03	53.76	31.6	49.7
	SE	1.07	7.79	0.17	2.95	3.02	6.39
	n	13	13	29	29	10	10
	%	25.00	25.00	55.77	55.77	19.23	19.23

Table 2: Occurrence of oestrus during different seasons in Marwari and Surti goats.

Breed	Winter	Summer	Monsoon	Total
Surti	22.89%	37.34%	39.75%	
n	19	37	33	83
Marwari	16.15%	45.96%	37.89%	
n	26	24	61	161

REFERENCES

Jindal, S.K. (1984): Goat Production. Pub. Cosmo Publications, New Delhi.

Khan, B.U. (1980): Agri. Res 1:65 Cf. Jindal, S.K. (1984).

Phillips, R.W. (1943): Am. J. Vet. Res. 360.

Rajkonwar, C.K. and Borgohain, B.N. (1978): A note on incidence and signs of oestrus in local does of Assam. Indian J. Anim. Sci. **48** (10): 758-759.

Sahni, K.L. and Roy, A. (1967): A study on the sexual activity of Barbari goats and conception rate through artificial insemination. Indian J. Vet. Sci. 37: 269-270.

Singh, S.M. and Senger, O.P.S. (1979): Studies on the combining ability of desirable characters of important goat breeds for meat and milk separately and in combination. Final technical report. PL-480 Research Project on goats.

Van Rensnusy, S.J. (1971): Onderstep. J. Vet. Res. 38: 1 Cf. Jindal, S.K. (1984).

Wani, G.M. (1980): Augmentation of Reproduction and fertility in sheep and goats. Annual report, C.I.R.G., Makhdoom, Mathura, Pp. 41-43.

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Post-Partum Oestrous Interval In Jakhrana Goats

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Post-partum oestrous interval has been reported in a number of Indian goat breeds (Sahni and Roy, 1967; Prasad, 1979; Wani *et al*, 1980; Singh *et al*, 1986; Prakash and Khan, 1988). The present communication report about post-partum oestrous interval in Jakhrana goat.

Sixty-nine Jakhrana goats after normal kidding were kept under identical conditions at the Institute. Kids were allowed to suckle their mothers at eight hours interval during first week of their birth. Afterwards they were allowed to suckle during morning and evening till 90 days of age. Oestrus was detected twice daily by using an approned buck. The data was analysed. The average post-partum oestrous interval was 129.83 ± 8.02 days, ranging from 6 to 263 days. This is longer than post-partum oestrous interval reported in Barbari goats by Prasad (1979) and shorter than those of Jamunapari goats reported by Wani *et al*, (1980).

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We thank Dr. N.K. Bhattacharyya, Director of the Institute for providing facilities.

REFERENCES

Prakash, B. and Khan, B.U. (1988): Post-partum oestrus in Barbari goats. In: abstract, National Symposium and IV Annual Conference of Society of Animal Physiologists of India held at, C.I.R.G., Makhdoom, Farah (Mathura), U.P. India. (24-26, Sept. 1988). 7.19, Pp-65.

Prasad, S.P. (1979): A note on the characteristics of post-partum oestrus in Barbari nannies. Indian. J. Anim. Sci. **49** (7): 583-585.

Sahni, K.L. and Roy, A. (1967): A study on the sexual activity of the Barbari goats (capra hircus) and conception rate through Artificial insemination. Indian. J. Vet. Sci. **37** (4): 269-276.

Singh, D.K.; Singh, R.A.; Sinha, M.P. and Singh, C.S.P. (1986): Postpartum oestrus in Black Bengal goats. Indian J. Anim. Sci. **56** (2): 232-234.

Wani, G.M.; Sinha, N.K. and Sahni, K.L. (1980): Note on post partum oestrus in Jamunapari does. Indian J. Anim. Sci. **50** (8): 663-665.

IJAR:10:2:175-176:1989

A Note On The Treatment Of Anoestrum In Swine

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The literature on the use of prostaglandins for the treatment of anoestrum in swine is scanty and hence an attempt was made to study the effect of the same.

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Three crossbred (Desi X Large White Yorkshire) gilts aged 9 months belonging to the All India Co-ordinated Research Project (ICAR) on pigs, Tirupathi were found to be in anoestrum.

Liv-52 granules 20 g on alternate days for a week and 1 tablet of Cyclomin-7 once in three days for 10 days per animal were given orally. No symptoms of heat were noticed. On the 11th day, 1000 I.U. of Folligon (Intervet) was given I.M. Even then heat symptoms were not evinced. Finally, after 20 days from the beginning of the treatment 2 ml of Estrumate (I.C.I.) was given I.M. One gilt on the 5th day and 2 gilts on the 7th day of the treatment exhibited standing heat and were bred by natural service, out of which only 2 gilts have conceived.

From these studies it may be inferred that prostaglandin combined with Folligon would have helped in bringing the animals to heat. The beneficial effect of Liv-52 granules as well as that of Cyclomin-7 cannot be ignored, since these would have helped in preparing the animals for coming into heat.

Acknowledgement

The authors wish to thank the Scientist, A.I.C.R.P. (ICAR) on Pigs for the facilities provided.

REFERENCES

King, G.J.; Walton, J.S. and Bosu, W.T.K. (1982): Potential treatments for anoestrum in gilts and sows. Canad. Vet. J. 23: 288-290.

Schilling, E. and Cerne, F. (1972): Induction of estrum in prepubertal gilts and anoestrum sows by PMS/HCG combination. Vet. Rec. 91: 471-474.

CASE REPORTS

IJAR:10:2:176-178:1989

Dicephalus Monster In A Murrah Buffalo - A Case Report

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ABSTRACT

The present communication records a case of dicephalus monster in a Murrah buffalo.

* * *

Roberts (1971) has reported duplication of cranial as well as caudal parts of foetus. Duplication of cranial portion of foetus occurs more commonly than that of caudal parts. The present report embodies duplication of cranial portion of foetus in a Murrah buffalo.

Case History: A Murrah buffalo of 10 years age was presented to the Veterinary Polyclinic on 4.10.1988. History revealed that it had two previous normal calvings and was bred by natural service. No history of any monstrosity

1. Assistant Professor. 2. Professor. 3. Associate Professor.

was reported either from the dam or sire used for other buffaloes. The buffalo delivered a monster in the third parturition. Slight assistance was required for expulsion of foetus, otherwise the parturition was normal and foetus was delivered in anterior presentation.

Examination of the foetus: The monster was a well developed live male foetus (Fig. 1). There were two heads united at neck ends. The skin was intact except at third thoracic vertebra with a rent covered by a thin membrane. The two heads were well developed and eyes, nostrils, muzzle and muffle in each were normal. There was only one abdomen and pelvis. The fore and hind limbs were normal. The scrotal pouch was empty as testes were not descended. The umbilicus was intact and two separate umbilical cords were united in umbilicus.

The monster was alive for 15 hrs. after birth. Post-mortem examination revealed complete bifurcation of cranial portion upto the first intercostal space. Cervical vertebrae were well developed in both neck regions. Two developed brains were present in each skull giving rise to respective spinal cords. The spinal cords were united at first to second thoracic vertebrae. Thereafter there was only one spinal cord. Intervertebral crest was not fully developed. The dorsal route of spinal cord after cauda equina was not prominantly noted unlike ventral route. All the thoracic, abdominal and pelvic organs were of a single foetus, normal and well developed.

Discussion

Incidence of monstrosity is well documented. Monstrosity of foetus by duplication of either cranial or caudal parts is due to defects in ovum, zygote or embryonic development. Sane *et al*, (1982) have recorded a case of 'Acephalus Acardiacus', monstrosity of duplication of cranial portion with absence of brains and heart in foetus. Roberts (1971) has recorded the features of "Dicephalus Dipus Dibrachius" monster having two fore limbs, two hind limbs with partial duplication of spine and one or two tails. The present case is having similar features.

Fig. 1: Dicephalus monster.

REFERENCES

Roberts, S.J. (1971): 'Veterinary obstetrics and genital diseases'. 2nd edition. CBS Publishers and distributors. Page 73.
Sane, C.R.; Luktuke, S.N.; Deshpande, B.R.; Kaikini, A.S.; Velhankar, D.P.; Hukeri, V.B. and Kodagali, S.B. (1982): 'Reproduction in farm animals'. Ist edn. Pub. Varghese Publishing House, Bombay. Fig. 26a.

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Cyclopia (A Monster) In A Goat - A Case Report.

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Monsters (non-genetic anomalies) occur due to abnormal foetal development. Cyclopia or Cebocephalus, a monster occurs in sheep, pig or cattle (Binns *et al*, 1959). However, in goats such incidences are meagre. Etiological agents (Teratogens) for this condition may be numerous, such as environmental factors, nutritional deficiencies and drugs or chemicals. These teratogens affect specific tissue or organ at particular stage of development. This condition is characterized by a single orbit. It may contain both the eyes placed centrally or containing ill developed global tissue. Global tissue may be absent also. Eye lids are either absent or rudimentary in nature. There is no nasal structure. Upper Jaw is ill developed, whereas lower jaw is highly developed and placed dorsally (Roberts, 1971).

Case Report: A naturally bred pluriparous Barbari goat was brought with the history of onset of labour pains for 40 hours. Its water bag ruptured within two hours of onset of labour pains. Animal was dull with anorexia and both vulvar lips were oedematous. As per breeding date, animal was due for kidding.

On clinical examination, cervix was found to be completely relaxed. Forelimbs along with some portion of placenta were hanging out of vulva. It was diagnosed as a case of dystokia. Lubricated hand was passed through the vagina to locate the presentation of the foetus. A little traction was applied to take out the foetus which was in dorso-sacral position with head in vagina. Foetus was dead but morphologically normal (Fig. 1).

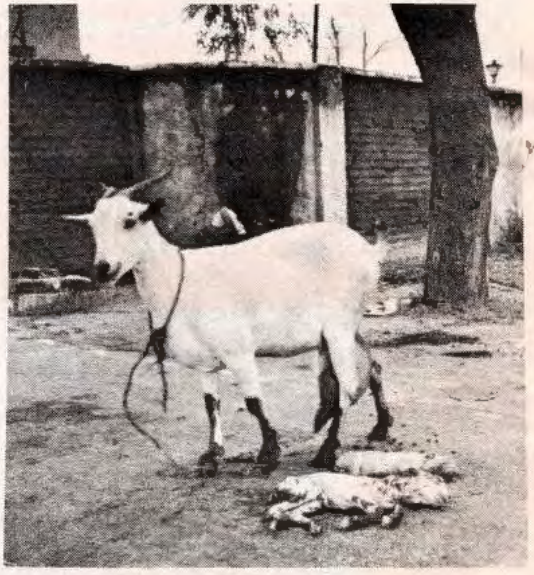

Fig. 1: Goat with dead foetus and cyclopia.

Examination by vaginal speculum revealed the presence of another foetus in vagina. This foetus was also taken out. It was a normal sized foetus with developmental defects in head region (Fig. 2). It was a monster termed as cyclopia in which both the eyes were placed centrally in one orbit, giving the appearance

of single eye. It was devoid of nose. Lower jaw was highly developed in comparison to ill developed upper jaw. This type of monster is reported due to arrest of normal tissue development leading to this condition (Roberts, 1971).

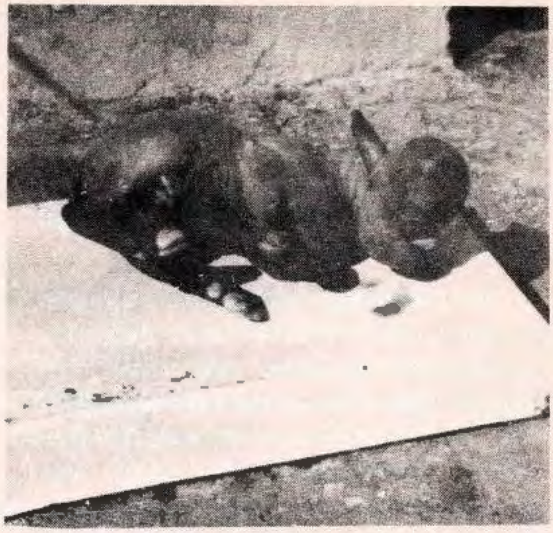

Fig. 2. Cyclopia - A Monster in goat foetus.

Acknowledgements

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

REFERENCES

Binns, W.; Thacker, E.J.; James, L.F. and Huffman, W.T. (1959): A congenital Cyclopian-Type Malformation of lambs. Jour. Amer. Vet. Med. Assoc. 134 (4): 180.

Roberts, S.J. (1971): Vet. Obstetrics and Genital Diseases, 2nd Ed. CBS Publishers and Distributors. New Delhi, India. Pp-62.

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Ovarian Teratoma In An Alsatian Bitch

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Teratoma are tumours comprised of multiple tissues foreign to the organ in which they arise. They are rare in all species of animals (Smith *et al*, 1972).

Review of the literature revealed only a few reports of ovarian teratoma in the dog, even though the dog has been extensively studied both as experimental animal and as pet, (Clayton, 1975; Crane *et al*, 1975). Cotchin (1954) recorded only one teratoma in his reveiw of 2,361 canine neoplasms. Hence, a rare case of canine teratoma is reported.

Case History: A 20 month old Alsatian female of C.I.D. Dog Squad, Nagpur was routinely brought to the Hospital with symptoms of variable appetite and weight loss. The bitch had no history either of pregnancy or pseudo-pregnancy. Abdominal palpation revealed moderate splenomegaly and a fluctuating mass, size of tennis ball. Body temperature was fluctuating and ranged between 101-103^{0}F. Haematological examination revealed only mild leukocytosis.

In order to regularise the breeding cycle FSH (Folligon - Inter-care) was administered @ 200 I.U. I/M daily for ten days. The animal was closely observed for development of oestrus. However, she did not evince oestrus even after 20 days post-treatment and was then declared unfit for breeding. The animal was then put to work.

After about a month, the case was again brought to the Hospital with acute distension of abdomen, dyspnoea and fever. The abdomen was tense. A clinical diagnosis of acute peritonitis was made and the case treated accordingly. Prognosis was unfavourable. The bitch died the same night and a diagnostic post-mortem performed.

P.M. Findings: Peritoneal cavity was containing large volume of sanguinous pus-splenomegaly. Uterine horns were excessively thin. Right ovary was identifiable and was completely enclosed within a thin capsule of mesovarium. Large mass was observed in the abdomen. The tissue was irregularly lobulated, firm to hard on palpation and had numerous large surface blood vessels. The cut surface was mottled red. Mineralization was prominent.

Histo-pathological examination revealed large amount of fibrous connective tissue arranged in a zig-zag manner, with numerous cystic cavities lined by squamous cells (Fig. 1). Large number of lymphocytes and histiocytes were seen in other areas. Tubular structures lined by cuboidal cells and fibroblasts lined by squamous stratified epithelium and fully formed blood vessels, few nerve bundles were also seen. Numerous thin walled cysts with albuminoid material in the cavity were seen. On the basis of histo-pathological findings, it was classified as teratoma.

Discussion

In the present case multiple structures of all three germ layers histologically resembling several different organ systems were

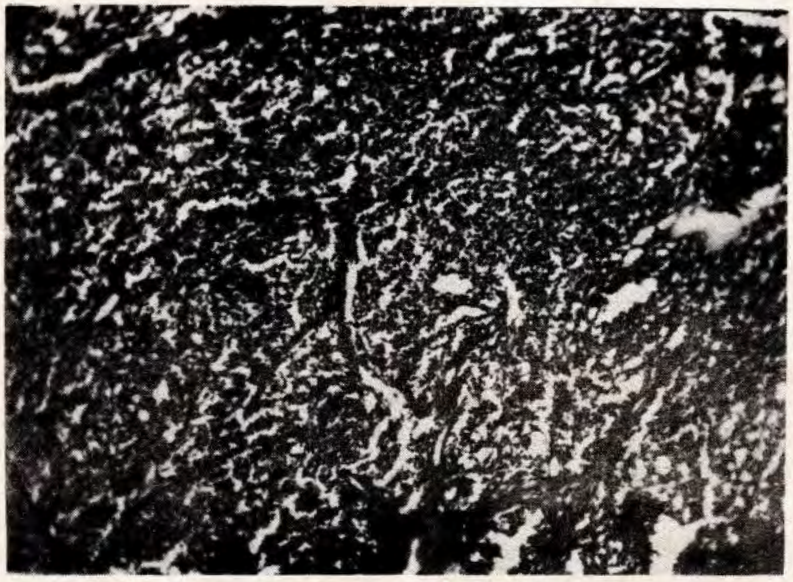

Fig. 1: Section of ovary showing lymphocytic infiltration in the fibrous stroma. Cells laden with melanin pigment are also seen.

recognised. Thus a diagnosis of benign teratoma was unavoidable, especially in the absence of any other tumours. This is in agreement with Crane *et al* (1975), who reported that teratomas are tumours comprised of tissue from more than one primary embryonic germ layer. Recent cytogenetic evidence indicates that the benign ovarian teratoma arises from faulty meiosis in reproductive germ cell that leads to a parthenogenetic tumour. According to Smith *et al* (1972) teratoma represent neoplastic postnatal growth of primary germ layers that were sequestered from the primitive streak area during embryogenesis. Patnaik *et al*, (1976) indicated that in a young animal teratoma with anaplastic features should not be treated as benign and guarded prognosis given. However, in the present case no metastasis was recorded.

Acknowledgements

The authors are grateful to Associate Dean, Nagpur Veterinary College, Nagpur for providing necessary facilities.

REFERENCES

Clayton, M.M. (1975): A canine ovarian teratoma. Vet. Rec. **96**: 567-568.

Cotchin, E. (1954): Further observations on neoplasm in dogs, with particular reference to site of origin and malignancy. Brit. Vet. J. **110**: 218-230.

Crane, Stepher W.; Barclay Slocum; Edward A.; Hoover and George P. Wilson III, Columbus (1975): Malignant ovarian teratoma in a bitch. J. Amer. Vet. Med. Assn. **167**: 72-74.

Patnaik, A.K.; Schaer, M.; Parks, J. and Liu, S.K. (1976): Metostasizing ovarian teratocarcinoma in dogs. J. Small Anim. Pract. **17**: 235-246.

Smith, H.A.; Jones, T.C. and Hunt, R.D. (1972): Veterinary Pathology 4th edn. p. 270, Pub. Lea and Febiger, Philadelphia.

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Cystic Ovarian Disease In A Lion (Felis Leo)

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Cystic ovarian disease characterised by one or more anovulatory follicular cysts in one or both the ovaries persisting for about a week with aberrations in sexual behaviour have been cited amongst all domestic animals (Bierschwal *et al*, 1975 and Roberts, 1982). Several reports suggest that cystic ovarian disease is frequently due to an inherited weak hormone constitution (Bane, 1964 and Casida and Chapman, 1957). Asdell (1946) referred some aspects on reproductive traits of lion.

It is evident that literature on cystic ovarian disease and other aspects of the same in domestic animals is plenty while such pathological reports are meagre in carnivores, particularly in lions. Hence, the rare findings are presented hereunder.

Case Report: An African lion of Nehru Zoological Park, Hyderabad aged about 3 years, suffering from Cystic Ovarian Disease, died a natural death. The genitalia along with uterus and ovaries were collected immediately after death and were preserved in 10% buffered formalin. 5-6 micron thick paraffin sections were stained with Haematoxylin and Eosin and Van Gieson's stain. Gross measurements of the genitalia were taken.

Macroscopic observations of genitalia (Fig. 1): Length of cervix - 3 cm; Circumference of

Fig. 1: Cystic ovary of a Lion.

cervix - 5 cm; Length of body of uterus - 6 cm; Length of right and left horns - 16 cm; Circumference of left horn - 11 cm; Circumference of right horn - 12 cm.

Shape of the left ovary was oblong, whereas the right ovary was oval having unilocular cystic follicle and its circumference was about 16 cm (small egg size).

When uterus was incised, about 100 ml of slimy fluid gushed out of the uterine lumen.

Microscopic Findings (Fig. 2): The histopathological sections of the uterus revealed a marked atrophy of myometrium with cystic dilation of endometrial glands. Cut section of ovary revealed absence of luteal tissue and ovum.

The characteristic pathognomy of endometrium and cystic ovary, coupled with failure of the lion to settle for pregnancy suggests the condition to be a cystic ovarian disease which is similar to earlier reports for other animals (Roberts, 1982).

Acknowledgements

The authors wish to thank the Nehru Zoological Park authorities for sparing the specimen and to the Principal, C.V.Sc., Rajendranagar for providing the necessary help.

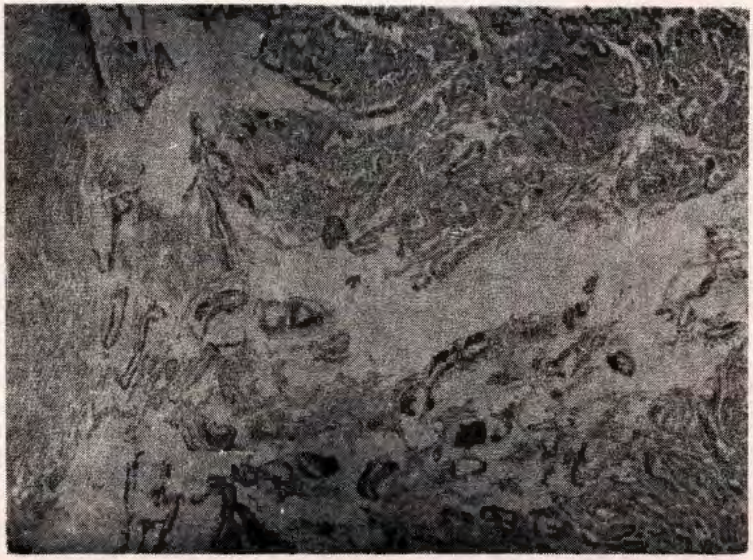

Fig. 2: Cystic dilatation of endometrial glands.

REFERENCES

Asdell, S.A. (1946): Patterns of mammalian reproduction. Comstock Publishing Co., Inc., Itheaca, New York. p. 176.

Bierschwal, C.J.; H.A. Garverick; C.E. Martin; R.S. Youngquest; T.C. Cantley and M.D. Brown (1975): J. Anim. Sci. **41**: 1660-1665.

Bane, A. (1964): Brit. Vet. J. **120**: 431-441.

Casida, L.E. and Chapman, A.B. (1951): J. Dairy Sci. **34**: 1200-1205.

Roberts, S.J. (1982): Veterinary Obstetrics and Genital Diseases. CBS Publishers and Distributors, New Delhi, India.

CLINICAL ARTICLES

IJAR:10:2:183-184:1989

Efficacy Of "Receptal" (GnRH) Treatment For Various Ovarian Disorders In Bovines.

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Anoestrum, delayed ovulation, Repeat Breeders, Cystic ovaries and low conception rate are day to day fertility problems in the field causing a great economic loss to the farmers. Various Hormones, minerals, Vitamins and non-hormonal chemicals have been tried to treat these conditions with varied response (Mari and Takahashi, 1978 and El Hariri *et al*, 1980). The Gonadotrophin Releasing Hormone (GnRH) was found to be effective in treating anestrum (Rao and Rao, 1984; Pattabiraman *et al*, 1986) and improvement of conception rate (Rao and Rao, 1984).

The present study was conducted to find out the effect of "Receptal" in treating cystic ovaries, improvement of conception rate (C.R.) in normal and Heat Synchronized group of animals.

Materials and Methods

Eighty one cows and 15 heifers of different breeds (Friesian Holsteins, Jersey, Simmental and Brahman) maintained in well established commercial farms under good management conditions in Zambia, Central Africa were included in the investigation during 1983-84. According to the conditions diagnosed, the animals were divided into four groups.

Group I consisted of 32 anoestrus cows, 4 to 10 yrs of age showing anoestrum for 7 to 10 months after normal parturition. Palpation revealed inactive ovaries with no CL or follicles without any abnormalities. The cases were examined twice at 10 days interval to establish the true anoestrum condition.

Group II comprised of 11 cystic ovary cases with a history of irregular heats and not conceiving after 5 to 12 inseminations. Gynaeco-clinical examination revealed unilateral or bilateral cystic ovarian condition.

Group III contained 38 repeat breeders with a history of repeated heats at regular intervals but not conceived even after 5 to 9 inseminations. Ovaries and uterus did not reveal any palpable abnormalities.

Group IV comprised of 15 health heifers, 2-3 yrs age with a record of regular cycling and presence of functional CL, selected for Heat Synchronization Programme. A dose of 5 cc of Iliren ($PGF_{2}\alpha$ analogue Hoechst, West

Germany) was given to all the heifers to induce estrum.

Receptal Treatment: The animals in Group I, II and III were given 5 cc of Receptal (GnRH analogue Hoechst West Germany) I.M. injection in the neck region. Close observations were kept on treated animals for signs of heat. Animals in all the groups which came in heat were given 2.5 cc of Receptal$^{(R)}$ at the time of insemination. Gynaec examinations were carried out 45 days after inseminations to confirm pregnancy.

Results and Discussions

Fifty percent of 32 anoestrus animals treated in Group I showed estrum within 8 to 14 days and remaining cows showed estrum 30 days after the treatment. The results agree with the other reports (Kodagali *et al*, 1981; Rao and Rao, 1984; Pattabiraman *et al*, 1986).

Out of 32 cows inseminated, 19 animals were confirmed pregnant giving 59.37% conception rate. The good percentage of conception in anestrum cows could be due to fixed time ovulation (within 24 hrs) brought about by the administration of Receptal at the time of A.I.

Out of the 11 cows with cystic ovaries treated with Receptal$^{(R)}$ in group II, 6 cows came in heat 21 to 25 days after treatment and were given 2.5 cc Receptal I/U to enhance the pregnancy. 3 animals came in heat 14 to 16 days after treatment and were given 2.5 cc Receptal I/U.

The remaining two animals came in heat on 12th day after treatment but continued to show irregular estrum. Out of 11 animals, 9 were confirmed pregnant giving 81% conception rate. Out of 38 Repeat-breeders administered in group III with 2.5 cc Receptal$^{(R)}$ at the time of A.I., 23 animals conceived within 1 to 2 A.I. The overall conception rate was 60%.

Out of 15 heifers put on Heat Synchronization programme in group IV given 2.5 cc Receptal$^{(R)}$ at the time of A.I., 11 heifers conceived giving 73.33% conception rate. Usually the heifers have a lower conception rate at first breeding. The high conception rate may be due to fixed time of ovulation with the use of Receptal$^{(R)}$.

Treatment with Receptal$^{(R)}$: GnRH analogue in 32 anoestrus cows resulted in 19 conceptions with a C.R. of 59.37%. Of the 11 cystic ovary cases treated, 9 responded and conceived (81%). Of the 38 repeat-breeders treated, 23 animals were confirmed pregnant (60%). Out of 15 heifers in Heat Synchronization programme, 11 conceived with C.R. 73.33%.

Receptal can be used beneficially to treat anoestrum, cystic ovaries, repeat-breeding cases and for heat synchronization programme to enhance conception rate.

Aeknowledgements

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REFERENCES

Mari, J. and Takahashi, T. (1978): Jap. J. Anim. Reprod. **24**: 137.

El. Hariri M.N., . Awad, H.H. and Gadaly M.A. (1980): J. Egypt Vet. Med. Assn. **40**: 89.

Kodagali, S.B.; Deshpande, B.R. and Sane, C.R. (1981): Indian Vet. J. **58**: 487.

Nasr, M.J.; Sharaway, S.M.; El-Azad, M.A. and Labib, E.M. (1983): The Blue Book 32.91 Hoechst, West Germany.

Rao, A.R. and Rao, K.S. (1984): Indian Vet. J. **61**: 813.

S.R. Pattabiraman, C. Veerapandian and S.A. Quayam (1986): Indian Vet. J. **63**: 409-413.

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Use Of Prostaglandin F2 Alpha In The Treatment Of Subestrus In Crossbred Cows

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ABSTRACT

Investigation was done on 40 subestrus crossbred cows using PGF_2 alpha by three different routes of administration between day 7 to 16 of estrous cycle, after confirming presence of corpus luteum. In PGF_2 alpha group treated with 25 mg Dinofertin I.M., 90% cows manifested estrus at an average post-treatment interval of 93.80 hours with 50% C.R. In the group treated with 10 mg Dinofertin I.U., 90% cows manifested heat at an average post treatment interval of 72.80 hours with 50% C.R. while in the intra-vulvo-submucosal treatment group with 10 mg dose, heat manifestation was 100% at an average post-treatment interval of 79 hours with 60% C.R. and this route was found best for induction of estrus and conception rate in subestrus crossbred cows.

* * *

Rowson *et al*, (1972) found that Prostaglandin F_2 alpha and its analogues have a luteolytic effect between day 5 to 17 of the bovine cycle. The luteolytic effect of prostaglandin has been used to advantage in the synchronization and treatment of different fertility disturbances. An attempt has been made to overcome subestrus and to evaluate efficacy of Prostaglandin F_2 alpha (Dinofertin) as remedial measure on induction time, type of estrus, number of cows responding to treatment, number of cows to be detected by visual symtoms/teaser bulls and the conception rate (C.R.) in induced heats in the present study.

Materials and Methods

Forty normal cycling crossbred cows between the age of 3 to 5 years, in which behavioural signs of estrus were not manifested 90 days post-partum and gynaecoclinical examination of the animals revealed presence of corpus luteum in one of the ovaries, were included in the study and randomly divided into four groups. Ten subestrus cows (Group I) acted as control and group II, III and IV were treatment groups with ten subestrus cows in each.

Group II cows were administered 25 mg Dinofertin each i/ m; Group III, each 10 mg i/u and group IV each with 10 mg by intra-vulvo-submucosal (i/vsm) route as single injections between day 7 to 16 of estrous cycle, after confirming presence of C.L. Oestrus detection was done by the teaser bull in addition to visual observations, twice daily (morning and evening). Rectal palpation was also done for estrus detection during the anticipatory period, with fixed time insemination at hours 72 and 96 post-treatment and also at drug induced estrus at the optimum time, with good quality chilled liquid semen as per Almquist (1969). Pregnancy diagnosis was done 60 days post-insemination by rectal palpation.

Results and Discussion

It is evident that best results were obtained with Dinofertin given by the i/vsm route (Table I). However, the results of i/u route are

Table 1: Comparative efficacy of Dinofertin for estrus induction by three routes of administration

Group	No. of subestrus crossbred cows	No. of cows responded to treatment	Estrus induction time (hours)		Type of estrus			Estrus		Per cent concep-tion upto third A.I.
			Range	Average	Intense	Inter-mediate	Weak	Visual	Teaser	
I	10	Control	Control	Control	0(0.0)	1(10.0)	9(90.0)	0(0.0)	1(10.0)	30.0
II (i/m)	10	9(90.0)	80-120	93.80	4(40.0)	4(40.0)	2(20.0)	7(70.0)	2(20.0)	50.0
III (i/u)	10	9(90.0)	60-96	72.80	4(40.0)	5(50.0)	1(10.0)	8(80.0)	1(10.0)	50.0
IV (i/vsm)	10	10(100.0)	60-110	79.00	5(50.0)	4(40.0)	1(10.0)	9(90.0)	1(10.0)	60.0

Figures in parantheses indicate per cent observation.

slightly variable than the former. Less induction time by i/vsm route was probably due to less distance between the site of deposition and action of PGF_2 alpha. This assumption gains support from the fact that improved response was observed by increasing its dose by this route (Ono *et al*, 1982). In the present study 10 mg Dinofertin appeared as sufficient to cause complete luteolysis and bringing the cow in estrus at about 79 hours. The results of i/u route were also good. The estrus induction was lowest (72.80 hours) by this route of administration. The i/m route showed comparatively poor response among the three routes of treatment. The more induction time and dose in this group may be due to more distance between the site of deposition and action of PGF_2 alpha. However, Dinofertin gave better results in all three treatment groups than the control group and hence is advisable for better induction of estrus and conception rate in subestrus crossbred cows.

The observations made in the present study closely agree with the findings of Nakama *et al*, (1978); Sugie *et al*, (1978); Kudlack and Vinkler (1980); Donaldson *et al*, (1982) and Chauhan and Kossy (1982). Thus PGF_2 alpha may prove a useful tool in the management of subestrus in crossbred cows.

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REFERENCES

Almquist, J.O. (1969): Cited by Perry, E.J. (1969): The artificial Insemination of Farm Animals. 4th Ed. Oxford and IBH Publishing Co. New Delhi, p. 128-135.

Chauhan, F.S. and Kossy, B.M. (1982): Recent advances in hormonal therapy of bovine reproductive disorders: a review. Vet. Bull. **54**: 991-1009.

Donaldson, L.E.; Glaphin, S.P. and Green, G.A. (1982): Comparison of two dose rates and two managemental systems for synchronization of estrus in cattle. Am. J. Vet. Res. **43**: 1873-1875.

Kudlack, E. and Vinkler, A. (1980): Estrus synchronizaton in cows under large scale condition. Veterinaritivi **30** (1): 12-14 (Anim. Breed. Abstr. **48**: 4600).

Nakama, S.; Imori, T.; Nuya, S.; Yanagiya, G.; Inaba, T.; Uchida, A.; Matsunaga, H.; Matsumoto, K.; Okano, T. and Handa, S. (1978): Experimental induction of estrus and ovulation in PGF_2 alpha or its analogue, Japanese J. Anim. Sci. **24** (4): 161-168.

Rowson, L.E.A.; Tervit, R. and Brand, A. (1972): Synchronization of estrus in cattle by means of prostaglandin F_2 alpha Proc. VIIth Int. Congr. Anim. Reprod. Art. Ins. Munich II, 865-867.

Sugie, T.; Soma, T. and Mizuochi, K. (1978): Synchronization of estrus in cows by intramuscular injection of prostaglandin F_2 alpha Bulletin of National Institute of Animal Industr. Japan. **41**: 1-8.

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Effect Of Therapeutic Preparations On Post-Partum Conception Rate In Ewes

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The production potential in female is reduced when there is increase in the interval of post-parturient oestrus and subsequent fertility. The high fertility in sheep after lambing depends on the early and proper involution of the uterus. Post partum oestrus in exotic breeds has been reported to be 35.4 days (Hafez, 1980) whereas there is great variation among the native breeds. A lot of work have been carried out for enhanced rate of uterine regression with the use of corticosteroids etc. in cows and buffaloes but no such study has been reported in sheep. In view of the absence of information on the use of certain therapeutic preparations for early post partum breeding in sheep, the present experiment was designed and undertaken.

Muzaffarnagri ewes, maintained at this Institute under selective and pure breeding programmes for improvement in mutton production were taken in this study. A total of clinically normal 47 ewes which lambed in March-April (spring season) were used in this experiment. Their body weights were recorded after lambing. The ewes were divided into four groups keeping their lambing orders similar in each group. Lambing order ranged from third to fifth. The treatment was based on their clinical symptoms and not microbial involvement.

Group I *Furea bolus(S.K. and F)*: It contains nitrofurazolidine and has anti-inflammatory action also, was used @ one bolus per ewe intrauterine (i/u) after dissolving in 10 ml. distilled water on 4th, 7th and 10th day of lambing.

Group II: *Terramycin liquid (Pfizer) + Tonophosphan (Hoechst) 20% solution*: Tonophosphan is sodium salt of 4-dimethylamine-2 methylphenyl phosphinic acid which stimulates smooth muscle of the uterus and terramycin liquid is an antibiotic. T.M. liquid 5 ml i/u and Tonophosphan 5 ml i/m was given to each animal on 4th and 7th day of lambing, whereas on the 10th day only 2.5 ml Tonophosphan per ewe was injected i/m.

Group III: *Terramycin liquid + Hostacortin-H (Hoechst)*: Hostacortin-H is a corticosteroid preparation. A dose of 5 ml terramycin liquid i/u and 30 mg Hostocortin-H i/m was given to each ewe on 4th, 7th and 10th day of lambing.

Group IV: *Control group*: The animals under this group were not given any treatment and kept as control.

Heat detection was done in all the ewes twice a day (morning and evening) after 15 days of lambing with the help of teasers. The ewes in heat were weighed and bred (natural) twice in one oestrus period.

Initial body weight of dam at lambing averaged 37.36 ± 1.85, 35.22 ± 2.21, 37.70 ± 1.58 and 38.09 ± 1.43 kgs in group I-IV respectively (Table 1). The period for post partum oestrus averaged 57.4 ± 3.1, 52.5 ± 2.5, 54.2 ± 3.9 and 58.3 ± 9.5 days for the respective groups. However, the difference in body weight and post partum period was statistically nonsignificant (normal deviation test). In the three treatment groups the

Table 1: Effect of various medicines on early post partum conceptions in sheep.

Group	No. of obs.	Weight of dam (Kg)	Induction of oestrus after		Tupping %	Conception rate (%)	
			Lambing (day)	Treatment (day)		On basis of ewes available	On basis of ewes tupped
I	11	37.36 ± 1.85	57.4 ± 3.1	42.8 ± 2.8	45.45	36.3	80.0
II	11	35.22 ± 2.21	52.5 ± 2.5	41.3 ± 2.6	54.50	27.2	50.0
III	11	37.70 ± 1.58	54.2 ± 3.9	40.6 ± 4.1	54.50	27.2	50.0
IV	14	38.09 ± 1.43	58.3 ± 9.5	—	28.57	14.2	50.0

animals exhibited oestrus after 42.8 ± 2.8, 41.3 ± 2.6 and 40.6 ± 4.1 days of treatment respectively, the difference being non-significant.

Tupping percent was highest in group II & III (54.50%) followed by group I (45.5%) and least in group IV (28.6%), the difference being non-significant among all the groups. Conception rate was highest in group I (36.3%) followed by group II and III (27.2%) and group IV (14.2%) on the basis of ewes available (Table 1). Normal deviation test revealed significant difference ($P < 0.01$) between group I and IV only. Conception rate on the basis of ewes tupped was highest (80.0%) in group I followed by all other groups (50.0%), but statistically the difference was nonsignificant. There was nonsignificant difference in the birth weight of lambs born among the four groups.

The average period required for complete uterine involution leading to post partum oestrus and post partum fertile oestrus observed in the present study is similar to that of Sahni and Roy (1972) in Bikaneri sheep. Hafez (1980) reported the average number of days for lambing to first oestrus in group of lactating fall-lambing ewes as 35.4 days.

The present study indicated that with use of Furea bolus, conception rate can be improved by 15-20% in post-partum early breeding programmes in sheep.

Acknowledgement

The authors are thankful to the Director, Central Institute for Research on Goats, Makhdoom, for providing necessary facilities.

REFERENCES

Hafez, E.S.E. (1980): Reproduction in farm animals. 4th Edn. Pub. Lea and Febiger, Philadelphia.

Sahni, K.L. and Roy, A. (1972): Post partum conceptions in Bikaneri sheep. Indian J. Anim. Sci. 42: 1038.

IJAR:10:2:190-191:1989

Flushing To Induce Twinning In Deccani Sheep*

B.V. NIMBKAR, P.M. GHALSASI and V.A. SAVANGIKAR

Nimbkar Agricultural Research Institute and Maharashtra Goat and Sheep Research and Development Institute, Phaltan-415 523.

ABSTRACT

Flushing can be used as a tool to induce super ovulation where genetic potential exists. Twinning, considered to be rare, occurred in 5 out of 105 Deccani ewes when flushing was carried out by supplemental feeding of Maize, while no twins were produced by the 105 unflushed ewes.

* * *

Attempts to improve the genotype of sheep concentrates on reproductive rate and growth. Turner (1969) concluded that for Australian sheep the best way to improve reproduction rate by selection was selection for litter size alone. Twinning is known to be practically non existant in Deccani sheep, (Taneja, 1978). Enquiries with several shepherds around Phaltan also confirmed this. A maximum of two instances of twinning were reported for every 1,000 sheep taken into account. However, productivity will increase if twinning could be achieved. Twinning is known to be predominantly a genetic factor. The expression of this trait, when inherited, depends on plane of nutrition in the breeding season. It is known that extra nutrition to ewes just prior to breeding season (flushing) usually for three to four weeks increases ovulation rate (Scott, 1986; Gatenby, 1986).

Very little information is available on twinning in Deccani sheep. Even if the trait exists in the population, it is not expressed as the flocks are usually managed at a subsistance level of nutrition. Hence, it was decided to find out if flushing Deccani sheep induces twinning.

Materials and Methods

Deccani sheep flock was divided in two groups of 105 ewes each. One flock was managed with usual rangeland grazing system. The other flock was fed with an extra daily supplement of maize soaked overnight in 1% urea solution between April 8, 1989 to May 16, 1989 when these ewes were in the early breeding season. Ewes were mated with Patanwadi, Bannur or Sangamneri rams. Rams were introduced on 26th April, 1989. Type of birth and birth weights were noted.

Results and Discussion

Out of total 105 ewes, 11 each in non-flushed group and in flushed group remained empty. All births in the non-flushed group gave single lambs. In the flushed group, however, five births were twins (Table 1). Flushed ewes consumed an average of 300 g Maize (soaked in 1% urea solution overnight) per head per day during the flushing period. Since expected number of twins is zero, occurrence of five twins is highly significant. Statistical methods are not warranted for interpretation since inherent (population) variation practically does not exist.

Timing and duration of flushing in the breeding season is also indicated to be very important as the twinning is concentrated in a span of 10 days corresponding to

* Paper No. 1 presented at the Seminar on Goat Nutrition and Pasture Utilization, Avikanagar, 1989.

Table 1: Breeding data of Deccani Ewes mated in April-May, 1989.

Group	Total No. of ewes	Empty ewes	Abortions	Single births	Twins
Non-flushed	105	11	6	88	0
Flushed	105	11	5	94	5

Table 2: Distribution of mating dates of flushed and conceived ewes correlated to twin lambing

Date of Mating	No. of ewes conceived	No. of ewes with twins
9 April to 18 April	5	0
19 April to 28 April	12	0
29 April to 8 May	25	5
9 May to 19 May	14	0
19 May to 28 May	7	0
29 May onwards	26	0

Note: Flushing Period: 8 April to 16 May, 1989.
Extra feed: Average 300 g Maize soaked in 1% urea overnight.

inseminations between 29 April to 8 May, 1989. When the data is arbitrarily divided in 10 days portions on both sides of this period, it appears that maximum number of ewes, 25 in number, were on heat during this period, got successfully inseminated and out of these, 20% gave twins (Table 2). These ewes received flushing diets for 3 to 4 weeks.

Thus it is seen that twinning potential exists in Deccani breed and it can be induced to expression by flushing. Maximum benefit as indicated by the data can be derived if the correct season can be determined; if ovulation of the ewes could be synchronized during the identified period and flushing started three weeks prior to the predetermined date of ovulation. It may be concluded that flushing is effective only if started 20 days prior to ovulation. Further investigations are required to correlate flushing, superovulation and seasons.

In another experiment under uncontrolled conditions, two twins in Patanwadi and one twin in Bannur ewes were obtained by flushing in March/April, 1989.

REFERENCES

Gatenby, R.M. (1986): Sheep Production in the Tropics and sub-Tropics, Pub. Longman pp. 137.

Scott, G.E. (1986): The Sheepman's Production Handbook, Pub. Sheep Industry Development Program Inc. pp. NUTR 27.

Taneja, G.C. (1978): Sheep Husbandry in India. Pub. Orient Longman pp 27.

Turner H.N. (1969): Genetic improvement of reproduction rate in sheep. Anim. Breed. Abstr. 37: 545-563.

ISSAR NEWS

We are happy to present the Proceedings of ISSAR Conference held at Anand in November 1989, published elsewhere in this issue. The Conference was a thumping success due to the personal active interest taken by the Organising Committee Members under the dynamic leadership of Dr. V.M. Jhala, Vice-Chancellor, Gujarat Agricultural University.

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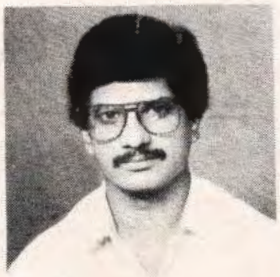


Dr. Manmohan Singh

We Congratulate Dr. Manmohan Singh on his selection and appointment in Indian Administrative Service. He had a brilliant academic career and obtained MVSc. & AH (Gynaecology & Obstetrics) of JNKVV, Jabalpur (M.P.) with Gold Medal for highest score (OGPA 4.0/4.0), under the guidance of Dr. K.G. Kharche. Earlier, he was awarded ICAR Junior Fellowship for his P.G. studies. He successfully competed for IAS Competitive Examination and was inducted in IAS from 30th August 1985 and is presently Vice-Chairman, Tirupati Urban Development Authority, Tirupati (A.P.).

We are proud of Dr. Manmohan Singh's achievments and wish him all the best of luck and every success in future.

* * *

We congratulate Dr. K. Janakiraman, Director of Research, G.A.U., Anand; Dr. K.G. Kharche, Professor and Head, Department of Gynaecology & Obstetrics, Veterinary College JNKVV Jabalpur (M.P.) and Dr. S.R. Pattabiraman, Head, Department of Clinics, Tamil Nadu University of Veterinary & Animal Sciences, Madras on their getting the coveted ISSAR Fellowship Awards, 1988.

Dr. K.G. Kharche

Dr. S.R. Pattabiraman

We congratulate and wish them more laurels in future.

* * *

Dr. A.V.N. Rao

We congratulate Dr. A.V. Narasimha Rao, Assistant Director of Animal Husbandry (Training), Govt. Dairy Farm, Visakhapatnam (A.P.) on his getting the coveted Professor Nils Lagerlof Award of ISSAR, 1988 for the best research article in Animal Reproduction.

Dr. A.V.N. Rao is also the energetic Secretary of Andhra Pradesh ISSAR Chapter and a regular contributor of quality research articles.

We wish him best luck and all success.

* * *

We congratulate Dr. M.K. Awasthi, Scientist, Raymond's Embryo Research Centre, Bilaspur (M.P.) on his getting the coveted Dr. G.B. Singh Young Scientist Award of ISSAR, 1988 for the best research article published.

We wish him best luck and every success.

* * *

We congratulate the Government of Tamil Nadu State for its progressive step in establishing a separate University of Veterinary and Animal Sciences at Madras from September 1989. We learn that this is the first full fledged State level University of Veterinary Sciences in Asia and is undoubtedly a great achievement of 20th Century in respect of education, research and extension education in Veterinary and Animal Sciences in India. It is heartening to note that Gujarat State which is the nucleus of White Revolution is shortly establishing an independant University of Animal Husbandry & Veterinary Sciences. We earnestly hop that other States in India will also take positive steps in this regard.

* * *

We are glad to learn that Dr. Richard Masillamany, Dean, Madras Veterinary College is appointed as the first Vice-Chancellor and Dr. S.A. Quayam Professor & Head, Deptt. of Gynaecology & Obstetrics, M.V.C., the First Registrar of the Tamil Nadu University of Veterinary and Animal Sciences and wish them best of luck and all success in their prestigious assignments.

* * *

Dr. K.G. Kharche is appointed Professor and Head, JNKVV Department of Gynaecology & Obstetrics, Veterinary College, Jabalpur (M.P.) w.e.f. 1st January 1990.

We congratulate Dr. Kharche and wish him many more laurels in future.

Proceedings Of National Symposium On Applied Reproduction In Farm Animals And VIIIth Annual Convention Of ISSAR, Anand 10th to 12th Nov. 1989.

The National Symposium on "Applied Reproduction in Farm Animals and 8th Annual Convention of Indian Society for the Study of Animal Reproduction (ISSAR) was organised by ISSAR Gujarat Chapter in collaboration with the Faculty of Veterinary Science and Animal Husbandry, Gujarat Agricultural University, Anand and National Dairy Development Board, Anand between 10-12 Nov. 1989.

The National Symposium was inaugurated on 10th Nov. 1989 by His Excellency Shri R.K. Trivedi, Governor of Gujarat. The inaugural function was presided over by Dr. V.M. Jhala, Vice-Chancellor, Gujarat Agricultural University. The Presidential and inaugural address delivered by Dr. V.M. Jhala and H.E. Shri R.K. Trivedi with major impact, was on following points: (1) It was found essential for farm animals reproduction specialists to work for minimising losses due to late sexual maturity, longer intercalving interval, anestrum, repeat breeding and other reproductive disorders in farm animals. (2) Adoption of artificial insemination and Embryo Transfer Technologies on large scale. (3) Adoption of modern diagnostic and research technology in diagnosis of reproductive disorders and endocrine research. (4) Study on interaction of nutrition, season and socio economics with reproductive efficiency of farm animals. (5) Critical evaluation and implementation of syllabus on Animal Reproduction at Veterinary Colleges in India. (6) Creating general awareness about the use and misuse of drugs and hormones in field practices.

The following prizes, medals, awards and fellowships were awarded to leading scientists in the field of Animal reproduction. H.E. Governor of Gujarat gave away the prizes for 1988. Dr. D.R. Pargaonkar, Secretary, ISSAR read the citations.

1. Professor Nils Lagerlof Memorial Award to Dr. A.V.N. Rao, Dr. W.M. Palmer and Dr. M.A. Shiekeldin for their best research article.
2. Dr. G.B. Singh Memorial (Young Scientist) Award to Dr. M.K. Avasthi for his best article.
3. ISSAR Fellowship (1988) Awards to
   Dr. K. Janakiraman (Gujarat)
   Dr. S.R. Pattabhiraman (Tamil Nadu)
   Dr. K.G. Kharche (Madhya Pradesh)
4. Best Chapter Award to "Gujarat State" Chapter of ISSAR.
5. Special Award to "Rajasthan State" Chapter of ISSAR.

President Dr. V.M. Jhala released the special souvenir on the occasion. A special Research Bulletin on 25 years of Research in Animal Reproduction at Gujarat Agricultural University was published and presented to delegates.

The special messages received on the occasion were read by Dr. V.M. Mehta, Organising Secretary.

Dr. C.R. Sane, Patron, ISSAR gave an account of activities of ISSAR and laid the stress on international co-operation and co-ordination in scientific research on animal reproduction.

The National Symposium was attended by 197 participating delegates including Dr. Lensch from West Germany. These delegates were from Agricultural Universities, State Animal Husbandry Department, Dairy Development Corporation, Milk Federations, Pharmaceuticals, Animal Insurance and Research Institutes.

The scientific papers received for the symposium were classified into following categories.

(i) Lead papers and Guest lectures	-	9
(ii) Oral presentations	-	165
(iii) Poster presentation	-	25

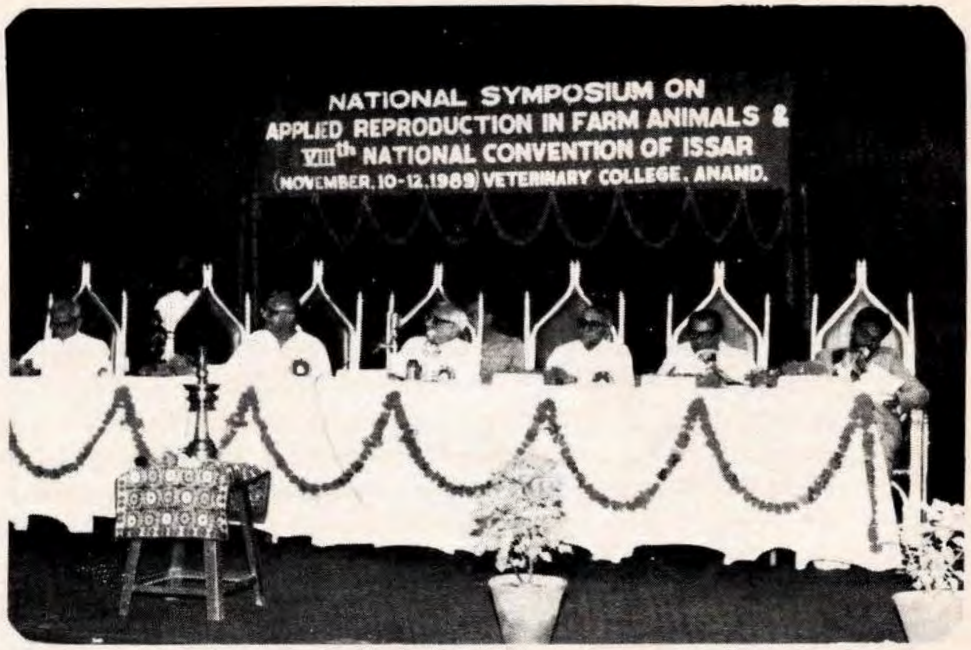
The discussions on above scientific papers were made through 10 scientific sessions, poster session and Dr. C.R. Sane Oration lecture .The special business session was conducted on 11th Nov. 1989 and several resolutions were passed. The Symposium ended with a valedictory function presided over by Dr. V.M. Jhala, Vice-Chancellor of Gujarat Agricultural University. A special momento was awarded to Dr. V.M. Mehta, Organising Secretary for special painstaking efforts made by his team in making symposium successful. Ten special prizes (Rs. 101/-)were awarded to young scientists below 35 years of age for their best presentations of paper in each session. Dr. S.K. Singla, Dr. A.J. Dhami, Dr. (Miss) S.R. Kelkar, Dr. Sailendra Tiwari, Mrs. Jaishree Pai, Dr. A.V. Patel, Dr. G.S. Dhariwal, Dr. B.S. Prakash, Dr. S.A. Chaubal and Dr. S.S. Honnappagol received cash prize of Rs. 101/- each for their best presentations.

The following lead papers and guest lectures were presented during different sessions.

1. Dr. C.R. SaneOration lectureon Field Problems on infertility in dairy cattle and buffaloes. Dr. A.S. Kaikini, Emeritus Scientist (ICAR) and Editor IJAR, Nagpur.
2. Embryo Transfer Technology and its future prospectives. Dr. M.P.G. Kurup, N.D.D.B. Anand.
3. Infertility conditions in Bulls. Dr. A.R. Rao, Dean, Post Graduate Studies, A.P.A.U. Hyderabad.
4. Overview of female fertility during Post Partum. Dr. M.L. Madan, Professor, N.D.R.I. Karnal.
5. Reproductive Managemental Innovations for improving fertility. Dr. B.P. Sengupta, Dean, Animal Sciences, H.A.U. Hissar.
6. Studies on Veterinary Education in subject of Animal Reproduction in different Veterinary Colleges of India. Dr. R.C. Gupta, Dean, Veterinary College, H.A.U. Hissar.
7. Studies on Research Gaps in Research in field of Animal Reproduction. Dr. Y.L. Dugwekar. Gujarat Agril. University, S.K. Nagar.
8. Augmenting fertility in farm animals and package of practices. Dr. K. Janakiraman. Director of Research, Gujarat Agril. University, Ahmedabad.
9. Studies on Invitro Fertilization. Dr. S.N. Maurya, Prof. Gynaecology, G.B. Pant Agril. University, Pantnagar.

GLIMPSES OF ISSAR CONFERENCE ANAND

November 10-12, 1989

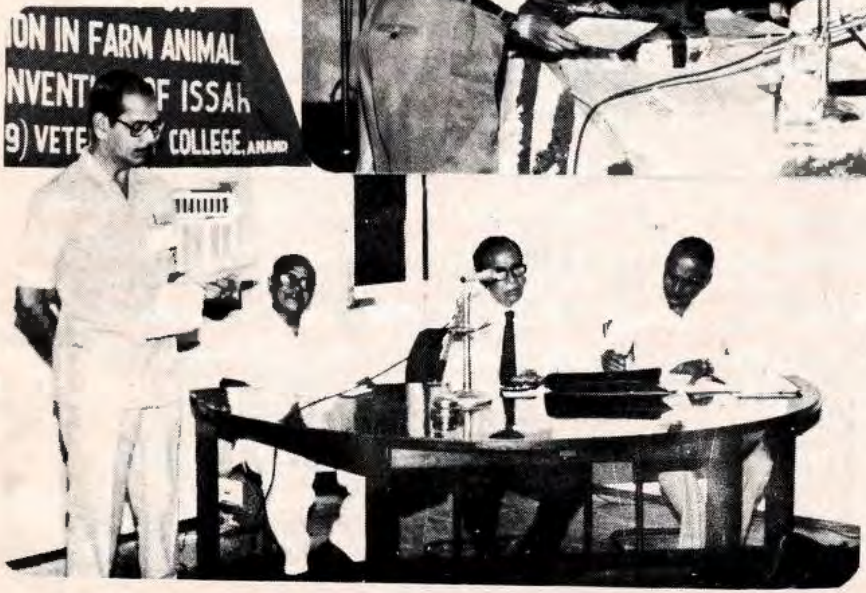


Inaugural Function VIPs on Dais

Inauguration of Symposium by Lighting Lamp.

Session In Progress.

Best Chapter Award to
Gujarat Chapter President
Dr. M.C. Vyas
Receieves Trophy.



National Executive Body Meeting,
Treasurer Presenting His Report.

During three days symposium the Video film show on efficacy of Receptal and Prostaglandin in cattle (courtsey M/s. Hoechst India Ltd.), a cultural programme on Folk Dances of Gujarat, and excursions to Embryo Transfer Laboratory, (S.A.G. Beedaj), Amul Dairy, Sperm Station and Reproductive Biology Research Unit (G.A.U.) were organised.

The recommendations emerging out of different sessions were as follows.

(1) The ISSAR should act as watch dog for implementation of syllabus on Animal Reproduction (Gynaecology, Obstetrics, Andrology, Artificial Insemination and reproduetive physiology) at different colleges in country. The infra structural facilities required for implementation of syllabus be uniform at different Veterinary Colleges.

(2) The ISSAR should provide awareness about gaps in research in animal reproduction to different research units & Universities working on those lines.

(3) Embryo transfer Research in buffaloes required to be made on more fundamental aspects before it is made for field use.

(4) The enzyme leakage studies be undertaken in field use of frozen semen. The fertility of post thaw semen is required to be ascertained in relation to time lag between thawing and insemination.

(5) The study of progesterone profile in post partum animals to decide the estrus and conception behaviour of cattle and buffaloes. This requires to be studied on large scale before correction of postpartum anestrus be thought of.

List of persons who acted as Chairman, Co-chairman and Repporteur for different scientific Sessions of National Symposium.

Session No.	Chairman	Co-chairman	Repporteur
1.	Dr. B.R. Deshpande	Dr. S.K. Gupta	Dr. (Miss) L.V. Deshpande
2.	Dr. V.B. Hukeri	Dr. K.S. Kharche	Dr. A.J. Dhami
3.	Dr. A.S. Kaikini	Dr. S.K. Verma	Dr. R.L. Dhoble
4.	Dr. P.J.S. Rattan	Dr. M.R. Bhosrekar	Dr. P.K. Pareek
5.	Dr. B.P. Sengupta	Dr. M.C. Vyas	Dr. F.S. Kawani
6.	Dr. K. Janakiraman	Dr. B.K. Bhavsar	Dr. V.R. Jani
7.	Dr. M.L. Madan	Dr. S.R. Pattabiraman	Dr. M.M. Pathak
8.	Dr. D.R. Pargaonkar	Dr. S.R. Maurya	Dr. H.J. Derashri
9.	Dr. S.B. Kodagali	Dr. B.N. De	Dr. B.L. Bishnoi
10.	Dr. Y.L. Dugwekar	Dr. V.M. Mehta	Dr. G.R. Pangawkar

Anand
December 5, 1989.

Dr. V.M. Mehta
Organising Seeretary

Governor's inaugural address at the National Symposium on 'Applied Animal Reproduction and VIIIth Convention of the Indian Society for the Study of Animal Reproduction (ISSAR)' at the Gujarat Agricultural University Anand Campus, on November 10, 1989 at 11.30 a.m.

Distinguished guests, eminent scientists and researchers, ladies and gentlemen,

I am happy to be with you this morning to inaugurate the National Symposium on Animal Reproduction and VIIIth Convention of the Indian Society for the Study of Animal Reproduction. It is quite befitting that Anand, the Milk City of India, has been chosen as the venue for this national symposium.

Our country is rich in its livestock wealth. As per the livestock census, 1982, there are 192.5 million cattle, 69.7 million buffaloes, 48.8 million sheep and 95.25 million goats. Apart from other livestock, there are 207 million poultry. Animal husbandry plays a vital role in the agricultural economy of the country. The contribution of livestock in terms of milk, eggs, wool, meat and other products is significant. It has been estimated that animal husbandry contributes to the extent of Rs. 16,500/- crores to the national income. The draught animal power plays an important role in agricultural operations and rural transportation. Livestock offers gainful employment and subsidiary source of income to the small/marginal farmers, agricultural labourers and weaker sections of the society.

Even though the livestock population is quite large, the average productivity of our animals is low as compared to their counterparts in developed countries. However, adoption of scientific methods of breeding, feeding, management and health protection have yielded good results in the field of milk production. This is evident from the figures of milk production in 1971 which was only 21.0 million tonnes. This has risen to 46.4 million tonnes during 1988. However, due to the simultaneous increase in human population, the per capita availability of milk continues to be low, being 157 gm/day. As per Indian Council of Medical Research (ICMR) recommendations, a vegetarian should receive at least 200 gm of milk per day. Thus, it is necessary to take suitable measures to provide this nutritive diet in sufficient quantity to our teeming millions. This will be only possible by increasing the productivity of our milch cattle.

The productivity of livestock is governed by several factors like genetic inheritance of animals, nutrition and environment provided to them. Apart from this, protection against diseases and efficient reproduction of the animals are vital for increased milk production. Inheritance contributes to the extent of about 20 to 25 per cent. I am glad, therefore, that this national symposium has been organised to focus attention on applied aspects of reproduction in farm animals.

As I understand, the problems of reproduction are different in cattle, buffaloes and other animals. Climatic and seasonal effects are quite prominent in some animals like buffaloes. Scarcity of feeds and fodder and the failure to adopt modern scientific and technological methods of animal husbandry also affect productivity of livestock. Due to poor growth rate, the animals like cows and buffaloes mature late. The period between two calvings is very long. This leads to less number

of calvings, reduced milk production and less number of calves produced during the life time of the animals.

Artificial insemination and cross breeding of cattle and buffaloes have been taken up by the Government and other agencies to improve the genetic potential of our animals. However, this technique has to reach the rural areas in a big way. Modern scientific methods of animal husbandry and research innovations made in the field of animal reproduction should reach the livestock owners. Enough emphasis should be given to extension activities.

The Dairy Technology Mission of the Government of India is now spearheading the Animal Husbandry and Dairy Development Programme in the country and emphasis is being laid on taking up research in the field of biotechnology as applied to animal reproduction. Embryo-transfer technique, embryo sexing, cloning, genetic engineering, use of superior progeny tested bulls in frozen semen stations are some of the new areas where research work has been initiated.

Tremendous economic losses occur to dairy and animal husbandry sector due to infertility and reproductive disorders in cattle and buffaloes. Solutions to the existing problems of reproduction have to be found to raise the productivity of our animals. We cannot also lose sight of the problem of uneconomic cattle. Cross-breeding will to some extent improve the yield in some cases but we will have to consider ways and means to take care of the scrub cattle which is a serious contender for the scarce fodder and other resources. An innovative approach will be called for to provide economic benefit to the poorer farmers in the long run.

It is necessary that emphasis is laid on progeny testing of bulls, adoption of newer techniques of immuno-reproduction and embryo transfer in cattle and buffaloes. Cross breeding of cattle has helped in producing high yielding animals, but has also geoerated different sets of problems related to their reproduction and health. High calf mortality in field conditions, problems of poor growth rate, anoestrus and repeat breeding conditions should be thoroughly discussed and newer approaches should be identified. Early embryonal mortality and diseases of reproductive organs lead to impairment of the reproductive efficiency of animals. These aspects are important from the economic point of view. I hope this symposium will provide opportunity to discuss them.

The State Government I understand is seriously considering the setting up of an Animal Husbandry University during the Eighth Plan after considering all the relevant factors. I hope that the recommendations and suggestions which will emerge out of this symposium will be of immense help to the policy makers researchers and farmers. The main aim should be to solve the problems of animal reproduction and find new areas of thrust for augmenting fertility in our animals.

I have great pleasure in inaugurating this national symposium and the VIIIth Convention of Indian Society for the Study of Animal Reproduction.

Presidential Address, delivered by Dr. V.M. Jhala, Vice Chancellor, G.A.U. on 10.11.89 at 11.30 a.m.

His Excellancy and Chancellor of Gujarat Agricultural University Shri R.K. Trivedi, Dr. K.C. Patel, Vice Chancellor of Sardar Patel University, Board Members, Dr. C.H. Joshi Director of Animal Husbandry, Mrs. Trivedi, President ISSAR, Dist. Collector, Delegates of National Symposium, invited guests, Ladies and Gentlemen,

The President, Indian Society for Study of Animal Reproduction (ISSAR) had shown the desire that since Gujarat is one of the leading States in Dairy Development and Animal Reproduction Research and Gujarat Chapter of ISSAR is adjudged as most active chapter, the National Symposium and 8th Annual Convention of ISSAR be held at Gujarat Agricultural University, Anand Campus. In organising this symposium we got the helping hand of Gujarat Agricultural University and NDDB authorities due to which the symposium is being organised on large scale. I am happy to specially note the presence of Chancellor of Gujarat Agricultural University at this inauguration function of National Symposium. Sir, we are very much overwhelmed with your acceptance of invitation. As a Chancellor of Universities in Gujarat State, Sir, you are holding the torch for development of teaching and research excellence. I take this opportunity in specially thanking you on behalf of organising committee and Gujarat Agricultural University.

The productivity of livestock is directly linked with reproductive efficiency. We are well aware that Indian subcontinent possessing 1/5th of total world livestock population but due to poor genetic make up, poor nutritional and managemental status, poor awareness about economics of livestock production, poverty and reproductive abnormalities their production potential is considered to be very poor. These situations lay importance on activities of reproduction physiologist and gynaecologists since many of these aspects can be improved through the betterment in reproductive efficiency of farm animals.

Since the Indian Livestock remained neglected in past there is a dire need for doing fundamental and applied research in reproductive efficiency and related deciplines. At present, we have piece-meal data available on physiological, reproduction, endocrine and biochemical norms of farm animals. These informations are not only required to be collected on larger population but also the interactions between reproduction and nutrition, reproduction and environment, reproduction and breeding status have to be studied for knowing their field applications. The observations made in applied research in farm animals need to be adopted in field after scrupulous scrutiny and best reproducibility.

The basic studies carried out on Surti buffaloes at Reproductive Biology Research Unit of this University have revealed the fact that with optimal management and nutrition the reproductive efficiency can be improved. As a part of these studies on interactions between seasons and reproductive efficiency, it got understood that the hormone prolactin seems to influence the reproductive behaviour of domestic buffaloes especially during summer stress. The high levels of prolactin during summer seems to make ovaries refractory to gonadotrophins. These detrimental effects of prolactin can be minimised by providing shed, shelter, showering and green feeding especially in summer season. The beliefs that a buffalo calf cannot be weaned at birth, the early

weaning affects the let down of milk, buffaloes have natural late sexual maturity and longer intercalving interval, buffaloes have breeding seasonality have been found to be baseless. The incoming biotechnologies before these get field application, the basic research on factors influencing them have to be made.

The applied work on improvement of reproductive potential require intensified efforts for diagnosis of reproductive disorders, correction of reproductive disorders, application sperm and embryo biotechnologies. Large number of reproductive problems such as torsion of uterus, retention of placenta, endometritis, abortions, repeat breeding, anestrum-due to various causes are required to be solved for economic management of dairy animals. Newer innovations of radioisotopy, immuno-assay, microbiological studies, hormonal trials etc. shall provide better insight into these problems.

Indian Society for Study of Animal Reproduction (ISSAR) as a custodian for animal reproduction shall have to watch critically to emerging technologies and reproductive disorders. National level discussions on applied reproduction will be essential before newer biotechnologies are applied on larger scale. All the facts of these technologies have to be studied before applying them at field level. The society should also create the general awareness amongst the field workers about the misuse of drugs and hormone preparations for increasing milk production, let down of milk and induction of estrus. The proper quality control on indigenous drugs shall have to be exercised and the over ambitious claims about efficacies to various preparations shall have to be verified. The society should work as a watch dog for proper implementation of syllabus and development of infrastructural facilities for teaching reproductive physiology and gynaecology at Veterinary Colleges in the country. I congratulate the winners of awards and fellowships. As Chairman of Organising Committee I welcome all the guests and delegates and wish the symposium a grand success. It is expected that the recommendations brought out of this Symposium and Annual Conventions shall prove useful to scientific society and to farmers at large. Thank you, Jai Hind!!!

Attention - ISSAR Life Members

(1) Life members who have opted to pay the life membership in instalments are requested to make complete and final payment on or before 31-3-1990.

(2) Life membership certificates have been despatched to all life members who have made full payment. Kindly send the acknowledgment with complete address for inclusion in the Directory.

(3) Send Bank Draft in the name of 'Treasurer ISSAR' payable at Madras.

Dr. S. R. Pattabiraman
Treasurer, ISSAR.
Professor and Head, Department of Clinics,
Madras Veterinary College, Madras-600 007

PRESIDENT'S LETTER

The Eighth Annual Convention of our Society was convened at the College of Veterinary Science, Gujarat Agricultural University, Anand on 10-12 November, 1989. I was eagerly looking forward to attend the annual convention and meet all our members, delegates and other invitees. Due to the cancellation of flights from Hyderabad, I could not attend the convention. The Secretary of our Society has informed me subsequently that the General Body of our Society has unanimously decided to request me and the other Office bearers to continue for one more term in their present capacities to serve the Society. We are overwhelmed by this decision. I wish to gratefully acknowledge with thanks the confidence reposed in us, to all the members of our Society. I am sure we will be able to discharge our duties towards our Society with renewed vigour in the coming years.

I take this opportunity to convey on behalf of the Office bearers of our Society a very happy and prosperous NEW YEAR to our patrons members and others whn have supported us in the cause of furthering the professional interests of our Society.

Hyderabad
November 21, 1989

A. RAMAMOHANA RAO
President, ISSAR

The C. R. Sane Oration Fund

Members of ISSAR may recall that an appeal was made more than once in this Journal requesting them to contribute generously for the C. R. SANE ORATION FUND. It is disheartening to note that the response from the esteemed members of our Society has been not very encouraging. The ISSAR is committed to institute this Oration in honour of a very distinguished Scientist who has contributed towards the growth of the subject of Animal Reproduction and has also been the first President of ISSAR.

I wish to appeal once again to all our members, former students and colleagues of Dr. Sane and others associated with our Society to come forward with their generous contributions towards this fund. I hope our members and others will respond positively to this appeal which only will help us to continue with the Oration.

Your contributions may kindly be sent to Dr. S. R. Pattabiraman, Treasurer, ISSAR, Professor of Clinics, Madras Veterinary College, Vepery, Madras–600 007.

A. Ramamohana Rao
President ISSAR

FROM SECRETARY'S DESK

Dear Members,

Through my appeals/circular letters I have approached you to convey important policy decisions of our Society and your response in the matter was worth appreciation. I am happy to communicate you regarding significant achievements as under:

(1) I have succeeded in procuring financial assistance from ICAR, New Delhi for publication of our Society's Journal (IJAR) and also for holding symposium. The assistance procured is Rs. 6000 and 10,000 respectively. Thus, in all Rs. 30,000 have been procured so far. Fresh proposals for financial assistance for the current year have been submitted to the ICAR, New Delhi and response is awaited.

(2) Procedural details were planned for different awards. I formulated a format to invite applications for the ISSAR Fellowship Award. The Society has instituted for the first time the 'Best Chapter Award'. The details of the various awards including the Award Committees are as under:

No. 1 Prof. Lagerlof Memorial Award (1988) and Dr. G.B. Singh Memorial Award (1988).

Dr. A.S. Kaikini	Chairman
Dr. K.G. Kharche	Member
Dr. K.P. Nair	Member
Dr. V.B. Hukeri	Member
Dr. Y.G. Dugwekar	Member

The committees critically went through the entries received for the said awards and their final verdict is as under.

(1) Prof. Lagerlof Memorial Award, 1988: Dr. A.V.N. Rao, Dr. W.M. Palmer and Dr. M.A. Shiekildin for their article entitled "Factors affecting Gonadotrophin Releasing Hormones induced LH and FSH release in Anoestrus cows." Published in IJAR 1988, 9 (2): 80-84.

(2) Dr. G.B. Singh Memorial Award, 1988 (Young Scientist Award): Dr. M.K. Awasthi for his article entitled "Antisperm Antibody titre associated with conception failure in Repeat Breeder Cows." Published in Cheiron 1988, 17 (4): 15-18.

No. 2 ISSAR Fellowship Award 1988 and Best Chapter Award 1988.

Dr. A. Ramamohana Rao	Chairman
Dr. S.N. Luktuke	Member
Dr. H.C. Pant	Member
Dr. A.S. Kaikini	Member
Dr. D.R. Pargaonkar	Member Secretary

The committees critically went through the entries received for the said awards and their final verdict is as under:

ISSAR Fellowship Award, 1988 is bestowed on Dr. S.R. Pattabiraman, Dr. K. Janakiraman and Dr. K.G. Kharche for their meritorious contribution for the development of Animal Reproduction and ISSAR.

'Best Chapter Award,' 1988 instituted for the first time has gone to Gujarat State Chapter for its significant Contribution for the development of Animal Reproduction and ISSAR. The committee is further pleased to bestow Special Award to Rajasthan State Chapter for it's significant contribution for the development of ISSAR.

I would like to thank profusely Chairman and members of various Award committees for their excellent evaluation work and co-operation.

As per the routine practice of the Society a cash prize of Rs. 101/- and a Certificate was presented to each of nine young scientists (below 35 yrs of age) for best presentation of their papers in different scientific sessions of the Conference.

On the eve of VIIIth National Symposium on Animal Reproduction held at Anand, the Executive Committee Meeting was held on 10th November 1989. Important resolutions adopted are as under:

(1) The registration fees should not be charged to the retired scientist members attending the conference.

(2) For student delegate registration fees should be nominal (Rs. 100/- only).

(3) General body may consider quarterly publication of IJAR. December 1989 issue of IJAR be a Bumper issue accomodating more articles and all proceedings and reports of Anand Conference.

The VIIIth National Conference was a grand success. Some two hundred delegates actively po rticipated in the Scientific sessions of the conference. There were in all five lead papers and 165 scientific/research papers presented during ten scientific sessions of the Conference.

General Body Meeting was convened on 11th November 1989 during the business session of the Society. Dr. A. Ramamohana Rao, our worthy President, could not attend the conference due to cyclone and circumstances beyond his reach. In his absence Dr. B.R. Deshpande (Ex-President) chaired the session. The General Body accepted the reports presented by the Secretary, Editor and Treasurer and also all the decisions taken by Executive Council in its Meeting held on 10.11.89 at Anand. I brought to the notice of the members that though the office bearers are located at different headquarters, it has not prevented us from carrying out the activities of the society efficiently and effectively. Audited statement of receipts and expenditure of Secretary's office will be published in the next issue of IJAR. The important resolution/suggestions are as under:

(1) StateChapters of Uttar Pradesh, Kerala, Meghalaya etc. need either revival or formation of New Chapters in their respective States. The concerned members were requested to approach with a proposal to the National Body for getting Secretaries names approved.

(2) Dr. A.S. Kaikini, Editor, IJAR is working very hard single handedly. It was decided that a secretarial assistance to the tune of Rs. 500/- per month be provided to him.

(3) The general body expressed that the present Executive Committee Members (except Dr. Rajkonwar) should continue for another term of three years (1990 to 1992). The body unanimously elected Dr. Kodagali as Vice-President in place of Dr. Rajkonwar.

(4) The body expressed its desire to have the next year's Conference at NDRI, Karnal. Dr. Madan was requested to host the next conference. Dr. Madan expressed that he will be

approaching ICAR, New Delhi for getting necessary approval in the matter. It was furthur heartening to note that there is standing invitation from Dr. R.C. Gupta, Dean Veterinary College, HAU, to host next year's Conference at Hissar. That means our next conference will be either at Karnal or Hissar.

With seasons greetings and wishing you a happy and prosperous New Year.

Parbhani,
December 15, 1989.

D.R. PARGAONKAR
Secretary, ISSAR

INDIAN JOURNAL OF ANIMAL REPRODUCTION (ISSN-0970-2997)
PROGRESS REPORT (1-12-1986 To 31-12-1989)

Presented by the Editor, IJAR to the Executive Committee Meeting and General Body Meeting of ISSAR held at Anand on 10th and 11th November, 1989.

1. Issues Published:

S.No.	Vol.	Issue	Month & Year	Articles	Copies Printed
1.	8	1	June 1987	34	600
2.	8	2	December 1987	28	600
3.	9	1	June 1988	28	800
4.	9	2	December 1988	28	800
5.	10	1	June 1989	31	1200
			Total Five Issues	149	4,000

2. Distribution: Position as on 31st October 1989.

S.No.	Category	Number	Remarks
1.	ISSAR Life Members	312	Ref: Treasure, ISSAR letter
2.	ISSAR Annual Members	250	recd. on 20-5-89
3.	ISSAR Chapters		
	(a) Madras	100	
	(b) Parbhani	100	
	(c) Anand	100	
4.	Institutional Subscribers	240	Excluding those enrolled Separately by Gujarat ISSAR Chapter (45)
5.	Complimentary & Advertisers	60	
6.	Balance	68	Prospective Members/Subscribers/ Back Vol. issues.
	Total	1,200	

3. Expenditure: Certified Receipts & Payment Account of IJAR, Nagpur for the period 1-12-86 to 31-3-89 is already published in IJAR 10 (1): June, 1989 which may please be per used.

Salient Features: It totals Rs. 86,483.35 including cash balance of Rs. 24,830.35 with State Bank of India A/C No. 61294 as on 31-3-1989.

4. Source of Income: (1) ISSAR Funds (2) Advertisement & (3) ICAR Grants.

5. Position of Articles: as on 31st October 1989.

Receipts:	378
Break-up Backlog Anand:	150
Receieved at Nagpur:	228
Published:	149
Awaiting Publication:	200
Rejected:	29

6. Under Publication: Sixth Issue IJAR 10 (2): December, 1989 which will be published in January, 1990 to accomodate Anand Conference Proceedings and Results of ISSAR Elections & Office Bearers 1990-92.

Place: NAGPUR
Date: 7 Nov. 1989

DR. A.S. KAIKINI
EDITOR
INDIAN JOURNAL OF
ANIMAL REPRODUCTION

REPORT OF TREASURER - ISSAR

Report on membership and finance for three years period from January 87 to October 89. Audited report for the year 1988 is furnished separately.

Membership of ISSAR: As on 31-10-89 the total number of members registered is 1068 which comprises of 756 annual and 312 life members. The number of annual members who have paid membership fee for 1987, 1988 and/or 1989 alone come to only 239. The remaining 517 annual members have not paid the membership fee after 1986. Such defaulters for more than three years cease to be members of society. During the three years period under report there is steady increase in the enrollment of life members. At the beginning there were only 116 life members, but now it has increased to 312. With the introduction of instalment payment of life membership amount more and more preferred to become life members. Of the total, 261 life members have paid the amount in full while about 51 life members who have opted to pay in instalments are yet to complete the payment. Reminders are sent to them individually with the request to pay the balance before 31-12-89.

Statewise analysis of the life memberships revealed that 20 States including union territories have life members. Rajasthan and Maharashtra chapters have more than 50 life members each. Tamil Nadu, Gujarat, Assam chapters have above 30 life members. Andhra Pradesh, Madhya Pradesh and Uttar Pradesh chapters have about 20 life members. Haryana, Himachal Pradesh,

Jammu and Kashmir, Karnataka, Manipur, Nagaland, Orissa, Punjab and West Bengal chapters have less than 10 life members.

Life membership certificate: With the object to provide an authenticated record of life membership, a certificate was prepared for the first time and despatched by post directly to the life members. For those who have not completed the full payment the certificate will be sent to them also as soon as they pay the balance amount due from them. For 261 certificates despatched, about 160 acknowledgement with complete address have been received so far. Only 8 certificates were returned back sinee the member is not in the address given.

Directory of life members: For the first time a booklet of 23 pages with the name, address and life membership number of 221 life members was prepared as a Directoryfor the year 1988. A revised and updated Directory with correct address of members and other relevant particulars about ISSAR will be printed as Directory for the year 1989. The same will be ready by January, 1990.

General Fund: Annual and life membership amount and interest that accrue from deposits are kept as General fund. Rs. 50,000/- kept in Savings Bank account was received in June 1987 and Rs. 7,500/- was received as final settlement in August, 1987 from the previous Secretary. Now as on 31-10-89, Rs. 1,00,167 is in General Fund. Of this Rs. 93,400/- is in fixed deposits and only Rs. 6,767/- is in Savings Bank account.

Nils Lagerlof Memorial Fund: The fixed deposit of Rs. 10,000/- in State Bank on maturity with the interest amount yielded Rs. 13,450/-. This amount is again deposited as a separate account in Unit Trust of India.

G.B. Singh Memorial Fund: Till this date, Rs. 11,006/- has been collected towards this fund. This sum is also kept separately in fixed deposit.

C.R. Sane Oration Fund: So far Rs. 1,440/- has been collected under this fund and the amount is kept as a separate account.

ICAR contribution: For printing of our Society Journal (IJAR) ICAR's contribution of Rs. 7000/- for the year 1986-87, Rs. 7000/- for the year 1987-88 and Rs. 6,000/- for the year 1988-89 were received in October and December, 1988 and April, 1989 respectively and were kept in separate account so as to make it available for printing of IJAR.

For the conduct of Seminar, ICAR contribution of Rs. 10,000/- was received in May 1989. This amount is for 3 years period and the same is kept as a separate account.

I wish to thank Secretaries, Treasurers and all members of different chapters in India and Dr. A.S. Kaikini, Editor, IJAR for all the help and interest shows in ISSAR to make the financial position of the Society reasonably sound. I am extremely grateful to all the help and guidance given to me by our beloved President, Secretary and Editor in the financial matters.

Before I conclude I wish to suggest that each State Chapter should have minimum 30 life members and 100 institutional membership. Finance generated by this and by other sources will enable ISSAR to work for the betterment of Animal Reproduction in particular and Veterinary profession in general by punctual publication of IJAR and holding Conferences, Symposia periodically without any break or discontinuity.

Madras
December 15, 1989

DR. S.R. PATTABIRAMAN
Treasurer, ISSAR.

The Indian Society For The Study Of Animal Reproduction, Madras

Balance Sheet As At 31st December 1988

Liabilities			Assets		
General Fund:			**Cash and Bank Balances:**		
As per last balance sheet	71468.13		Cash on hand		13.05
Add: Excess of income for the year	22225.71	93693.84	Cash with SBI Madras in SB a/c		26798.74
			Cash with Maharashtra Chapter		1036.80
G.B. Singh Memorial Fund:			**Investments:**		
As per last balance sheet	4050.00		With SBI Bombay in FD a/c towards		
Add: Contributions received	6956.00	11006.00	Nils Lagerlof Memorial Fund	10000.00	
			G.B. Singh Memorial Fund	10000.00	
Nils Lagerlof Memorial Fund:			Deposit with TTDFC	60000.00	80000.00
As per last balance sheet	10000.00	10000.00			
Prof. C.R. Sane Oration Fund:			**Amounts Receivable :**		
Contribution received		200.00	For VIth National Congress from ICAR		5000.00
			Interest accrued on FD with SBI Bombay		2501.25
Audit fee payable		500.00			
		115399.84			115399.84

Income And Expenditure Account For The Year Ended 31st December 1988

Expenditure		Income	
To IJAR Journal Expenses	19000.00	By Annual Membership Fee	6893.50
IJAR Journal Office Expenses	2000.00	Life Membership fee	30489.30
Bank Charges	122.50	Interest Earned	6008.29
Conveyance	253.00	ICAR Grant	7000.00
Postage	360.70	Advertisement	1000.00
Printing & Stationery	2628.40	Institutional Membership fee	1200.00
Meeting Expenses	50.50		
Prize Articles	2500.00		
Secretary Office Expenses	1500.00		
President Office Expenses	500.00		
Miscellaneous Expenses	241.18		
Maharashtra Chapter Expenses	709.10		
Audit Fees	500.00		
Excess of Income over expenditure transferred to general fund	22225.71		
	52591.09		52591.09

Madras 2. Dated 11-7-89
Vide Our Report Of Even Date.

A.R. RAO	D.R. PARGAONKAR	S.R. PATTABIRAMAN	RAMANAN & CO.
PRESIDENT	SECRETARY	TREASURER	CHARTERED ACCOUNTANT

The Indian Society For The Study Of Animal Reproduction, Madras

Receipts And Payments Account For The Year Ended 31st December 1988.

Receipts		Payments	
To Opening Balance:		By Investments with TTDFC	60000.00
Cash on hand	312.65	IJAR Journal	19000.00
Cash with S.B.I., Bombay	59148.05	Maharashtra Chapter	709.10
Closing balance held with Bombay Office	3969.59	Bank Charges	122.50
Difference in cash balance	241.18	Conveyance	253.00
Annual Membership Fees	6893.50	Postage	360.70
Interest earned	3853.70	Printing & Stationary	2628.40
Institutional Membership	1200.00	IJAR Office Expenses	2000.00
G.B. Singh Memorial Fund	6956.00	Meeting Expenses	50.50
Prof. C.R. Sane Oration Fund	200.00	Prize Articles	2500.00
ICAR Grant	14000.00	Secretary Office Expenses	1500.00
Life Membership Fee	30489.30	President Office	500.00
		Cash difference of 1987 written off as expenses	241.18
		Audit Fees	500.00
		G.B. Singh Memorial Fund Dep.	10000.00
		Closing Balance:	
		Cash on hand	13.05
		Cash with SBI, Madras	26798.74
		Cash with ISSAR, Maharashtra Chapter	1086.80
	128263.97		128263.97

Madras 2. Dated 11-7-89
Vide Our Report Of Even Date.

A.R. RAO	D.R. PARGAONKAR	S.R. PATTABIRAMAN	RAMANAN & CO.
PRESIDENT	SECRETARY	TREASURER	CHARTERED ACCOUNTANS

ERRATA

The following errors in IJAR Vol. 10, No. 1, June 1989 may please be corrected. Inconvenience caused is regretted.

No.	Item	Error	Correction
1.	Page 58 Fig. 1 legend	"Control"	"1 cms. column"
		"1 cms."	"Control"
2.	Page 58 Fig. 2 legend	"Control"	"22 mm dia 250 mg."
		"22 mm. dia 500 mg."	"Control"
		"11 mm dia 250 mg."	"22 mm dia 500 mg."
		"22 mm dia 250 mg."	"11 mm dia 250 mg."

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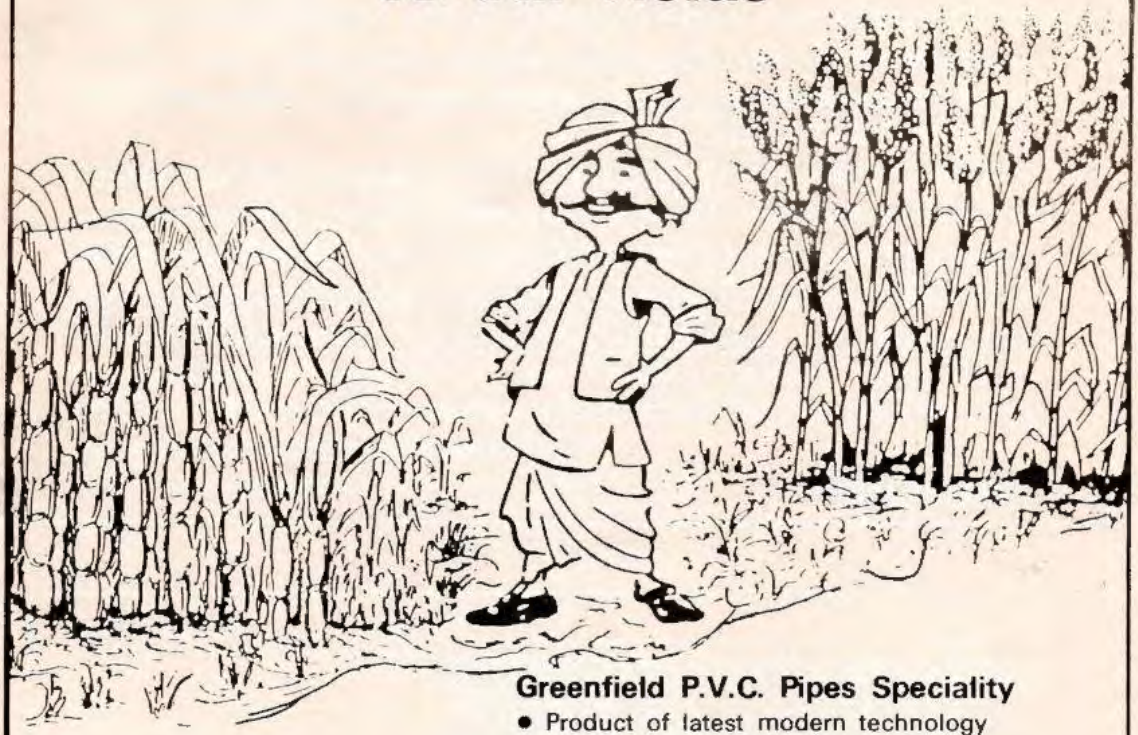

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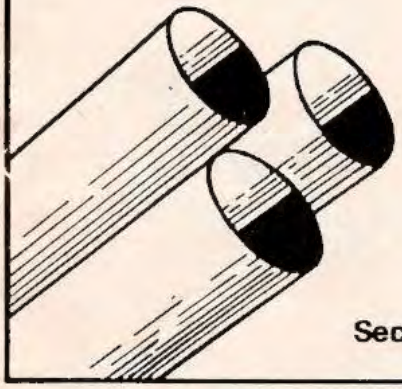

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B. Vet. C. Concentrated, Monovalent
(O, A, C, Asia-1 Types &
A 22 Subtype respectively)

RP
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(Live; B.P. Vet.)

HS
Haemorrhagic Septicaemia Vaccine
(BAIF - Aluminox ® Adjuvanted)

BQ
Black-Quarter Vaccine
(BAIF - Aluminox ® Adjuvanted)

HS-BQ
Haemorrhagic Septicaemia
& Black Quarter Combined Vaccine
BAIF Aluminox® Adjuvanted)

C19
Brucella Abortus C-19 Vaccine (Live)

POULTRY VACCINES

MAREK
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B.P. Vet (Living) HVT-FC-126 Strain

MUKT-R, B
Newcastle Disease
(Ranikhet Disease) Vaccine
(Living) MUKTESWAR R,B STRAIN

NDV-F Newcastle Disease
(Ranikhet Disease) Vaccine
(Living) F Strain

NDV-LaSota
Newcastle Disease
(Ranikhet Disease) Vaccine
(living) LaSota Strain

FPV
Fowl Pox Vaccine (Living)

IB
Avian Infectious Bronchitis
Vaccine

RANIPOX New Castle
Disease (Ranikhet Disease)
Mukteswar Strain and Fowl Pox
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Salmonella Pullorum Antigen

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with BAIF Gel-Aluminox ®

ETV-CD
Enterotoxaemia Vaccine
Clostridium Welchii Type C and D Toxoid Adjuvanted
with BAIF Gel-Aluminox ®

DIAGNOSTICS

BPA
Brucella Plain Antigen.

ABR
Abortus Bang Ring Antigen.

BCA
Brucella Coloured Antigen.

RBA
Brucella Rose Bengal Antigen.

TBN
Tuberculin (Mammalian)
Concentrated.

SPA
Salmonella Pullorum Coloured Antigen.

MDR
Mastitis Diagnostic Reagent.

PHARMACUTICALS

CBC
Calcium Borogluconate
Compound Injection - B. Vet. C.

CB
Calcium Borogluconate
Injection - B.P. (Vet.)

ST
Sulphadiazine and Trimethoprim
Injection - B.P. (Vet.)

SDM
Sulphadimidine Sodium Injection
33⅓ % B.P. (Vet.)

AS
Atropine Sulphate
Injection - B.P. (Vet.)

SBD
Stilboestrol Injection B.P. (Vet.)

AT
Adrenalin Injection B.P.(Vet.)

DEX 20%
Dextrose Injection
20% B.P. (Vet.)

DEX 10%
Dextrose Injection
10% B.P. (Vet.)

DEX 5%
Dextrose Injection
5% I.P. (Vet.)

DS
Dextrose Saline Injection U.S.P.
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0.9% Sodium Chloride)

NS
Normal Saline Injection
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- For Technical advice contact the Director of Animal Husbandry and Veterinary Service Project Officer;
- Special livestock programmes and the Taluka level veterinary officers for details of various programmes to improve the lot of weaker sections, scheduled castes etc.

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