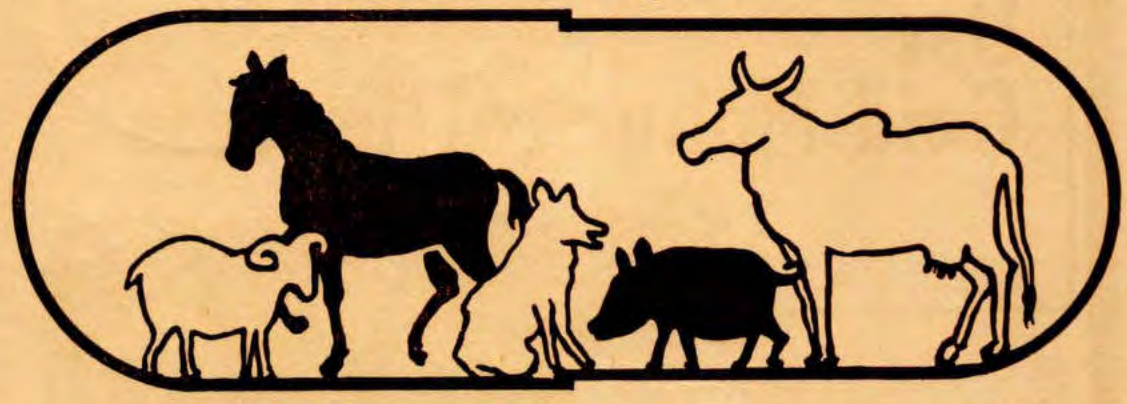
VOL. 4 No. 2 : FEBRUARY 1984

The Indian Journal of Animal Reproduction

JOURNAL OF THE
INDIAN SOCIETY FOR THE
STUDY OF
ANIMAL REPRODUCTION

(Regd. No. Bom. 253/78)

now! for the first time....
Large Animal Sized Gelatin Capsules



Available in:
Transparent and Opaque Shells Pre-printed per customer requirements

FOR ORAL, RECTAL AND INTRA-UTERINE USE

Ideal for dosing **cattle, horses** and **zoo animals** with Antibiotics, Anthelmintics, feed supplements and experimental medicines, in.....

Machines for high speed and accurate filling of veterinary capsules can be made available.

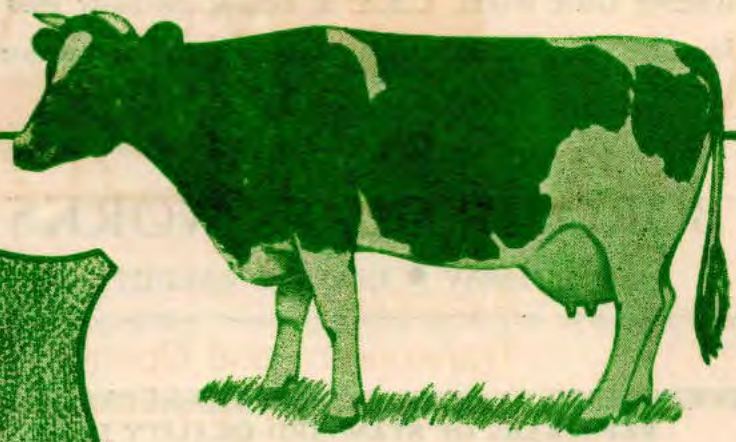
Advice on proven medicinal formulas also available.

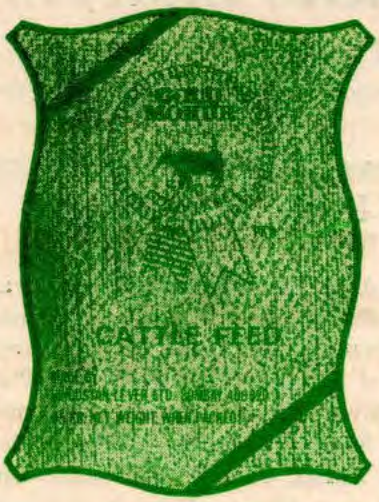
WRITE IN OR TELEPHONE US FOR FURTHER DETAILS:

The Associated Capsules Group

KANDIVLI WEST BOMBAY-400067 INDIA ● PHONE: 695321 (9 LINES)
TELEX: "115039 CAPS IN" ● GRAMS: "HARDCAP-BOMBAY 67"

For more milk and more profits
Use
Gold Mohur cattle feeds





HINDUSTAN LEVER LTD.

165-166, BACKBAY RECLAMATION, BOMBAY-400 020.

What's a banker doing in a poultry farm?

Ask State Bank!

To find a State Bank man in a poultry farm — or, for that matter, at a potter's wheel — should be no surprise.

For, in its effort to reach out and touch the lives of millions of farmers in rural India, State Bank embarked on an ambitious programme of direct financing of agriculture and its allied activities.

This direct financial assistance is extended for:-

1) Crop production — for purchase of various inputs like fertilisers, improved seeds, etc.
2) Irrigation facilities — for digging wells, lifting water from rivers, and so on.
3) Development of land — levelling, bunding, etc.
4) Mechanisation and modernisation of farms — purchase of tractors and other equipment.
5) Energisation of pumpsets.
6) Construction of silos, cold storages and godowns.
7) Agriculture-allied activities — animal husbandry, dairy, fish and poultry farming, horticulture, and a host of others.

Already, State Bank has financed over 33 lakh farmers, over 61% of whom are small and marginal farmers. And this number is growing steadily.

But that's not all. Three thousand specially trained personnel offer free technical assistance in a variety of fields, to help the farmer prosper.

And State Bank has set up more than 429 Agricultural Development Branches, specially geared to act as catalysts in the process of intensive rural development.

State Bank
Let's come closer

CHAITRA-581-620R

Therapeutically unsurpassed broad-spectrum activity

Achromycin*

Tetracycline HCl

INTRAMUSCULAR

FOR VETERINARY USE

The antibiotic that most closely approaches perfection through proved high effectiveness against bacterial, rickettsial, protozoal and large virus infections.

ACHROMYCIN Tetracycline is a potent antibiotic with a wide range of effectiveness. It is active against both Gram-negative and Gram-positive bacteria, Clostridia and Rickettsia. Because of the close chemical relationship of tetracycline and chlortetracycline, it is believed that Achromycin Tetracycline may prove to be of value in the treatment of infections due to virus-like organisms or other chlortetracycline-sensitive organisms.

PACKAGE : Vials of 100 & 500 mg.

CYANAMID

Cyanamid India Limited
Agricultural Division
P.O. B. 9109, Bombay 400 025.

Cyanamid the name every farmer trusts

* Registered Trademark of American Cyanamid Company, Wayne, New Jersey, U.S.A.

AG/VET/4/76

THE WOCKHARDT RANGE OF VETERINARY PRODUCTS

ANIMAL HEALTH PRODUCTS

- **BEEKOM-L (INJECTION)** — Potent liver stimulant
- **BLOATOSIL (SUSPENSION)** — Latest antibloat, antitympany therapy
- **CALDEE-12 (INJECTION)** — A tonic shot of Calcium, vitamin D vitamin B-12
- **CALCIUM BOROGLUCONATE (INJECTION)** — A drug of choice for milk fever
- **RINTOSE (INJECTION)** — A drug of choice for dehydration
- **THIACAL (INJECTION)** — Ideal in treatment of milk fever and ketosis complex
- **VETAMPIN (INJECTION)** — A true broad spectrum antibiotic
- **WOCKTRIN (TABLETS & POWDER)** — A new combination of antibacterial drugs-Sulphadiazine and Trimethoprim
- **WOLICYCLIN (INJECTION & TABLETS)** — A broad spectrum antibiotic - oxytetracyclin
- **WOLICYCLIN DS (INJECTION)** — Double strength oxytetracyclin

POULTRY PRODUCTS

- **NEFRAZONE - 50 & NEFRAZONE - 200 (POWDER)** — A potent nitrofurazone preparation
- **COCCILIUM (25%) PREMIX (POWDER)** — The latest broad spectrum Coccidiostat which also ensures additional weight gain

---

WOCKHARDT VETERINARY PRIVATE LIMITED
Poonam Chambers, Shivsagar Estate,
Dr. Annie Besant Road,
Worli,
Bombay - 400 018

Intervet

INTERVET INTERNATIONAL HOLLAND

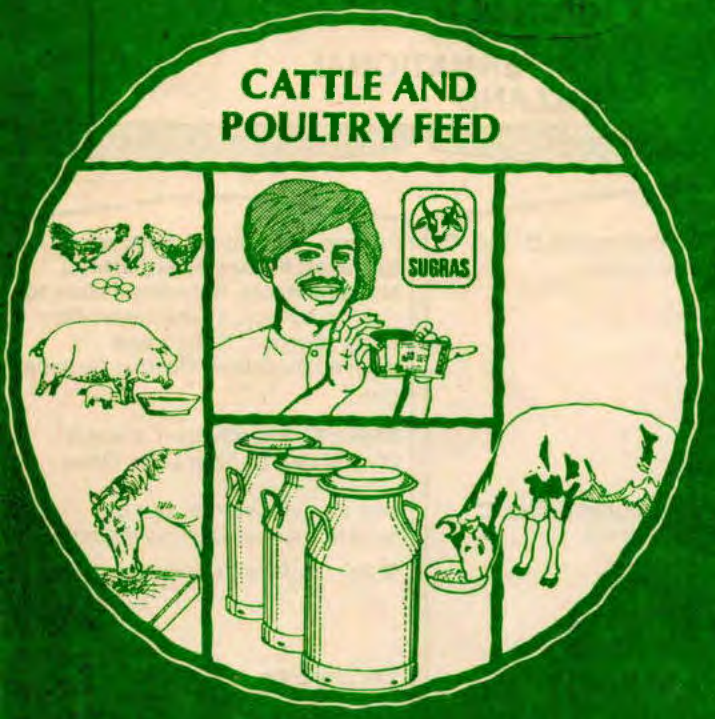
PRODUCTS	COMPOSITION	INDICATIONS
CHORULON	Chorionic Gonadotrophin B. Vet C Luteinising Hormone	Female . Anoestrus, Suboestrus, Lactation Failure (Post Partum), Nymphomania, Repeated failure to hold to service, Foetal resorption Early abortion. Failure and delayed ovulation Oestrus termination Male : Cryptorchidism, Genital Hypoplasia, Deficient Sex Drive.
FOLLIGON	Serum Gonadotrophin B. Vet. C Pregnant Mare Serum	Female : Anoestrus, Out of season mating, Oestrus induction Male Impaired spermatogenesis
NOBI-VAC DHL	Vaccine for Distemper, Hepatitis and Leptospirosis	
METRIJET	Each 20 ml. vial contains: 500mg Oxytetracycline HCL Ph Eur 500mg Furazolidone B. Vet.C. 500mg Iodochlorhydroxyquinoline U S.P 0 5mg Ethinyloestradiol Ph Eur	Endometritis
RIFIJET	Per Rifijet Injector contains 50mg. Rifamycine S V (as Sodium Salt) in a base to B gms	Mastitis
DEXADRESON	Dexamethasone Sodium Phosphate B P	Shock, Stress, Allergy, Ketosis Anti-inflammatory activity, Milk fever, Eczema, Burns, Arthritis, Bursitis
LAURABOLIN	Nandrolone Laurate Inj.	Debility, Quicker recovery and early healing of fractures, tendons etc
PROSOLVIN	Prosolvin is a clear solution of Luprostiol in Propylene glycol (7 5 mg/ml)	For controlled breeding, Suboestrus To induce abortion and Parturition.
FERTAGYL	Aquous solution containing Gonadotrophin Releasing Hormone (Gn RH) of 0.1 mg. per ml.	For cystic ovaries, Prevention of delayed ovulation, To impreve fertility

CHEFARO

For further details write :-

Chefaro Pharmaceuticals Ltd.,
Pragati Bhawan, Mezzanine Floor,
Jai Singh Road, New Delhi.

SUGRAS



With Sugras you win the higher milk yield battle

The Maharashtra Agro Industries Development Corporation Limited brings you Sugras, the complete balanced feed for cattle and poultry. Tested under strict laboratory control the nutritional value of Sugras makes for healthy farm animals.

Sugras comes in separately formulated blends for cows, buffaloes and calves, poultry, pigs, horses, bullocks and goats.

The specially enriched Sugras feed for milch cattle ensures a rich heavy milk yield, thus making for greater prosperity for the farmer.

Having made its mark in Maharashtra, Sugras is now in considerable demand with other states like Gujarat, Madhya Pradesh, Goa, Karnataka and also the Gulf countries.

MAIDC

MAHARASHTRA AGRO INDUSTRIES DEVELOPMENT CORPORATION LIMITED,
RAJAN HOUSE, 3RD FLOOR,
PRABHADEVI, BOMBAY 400 025.
TEL. NOS. 4228584, 4228211/12/13.

Contact/SUGRAS/83/1/E

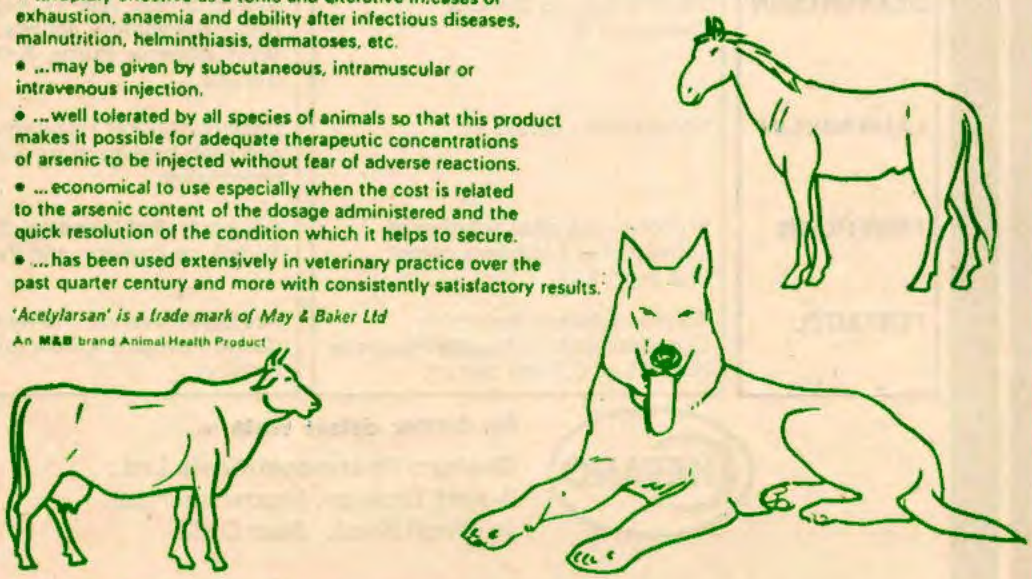
Why Acetylarsan is the animal tonic of choice

DIETHYLAMINE ACETARSOL

- ...rapidly effective as a tonic and alterative in cases of exhaustion, anaemia and debility after infectious diseases, malnutrition, helminthiasis, dermatoses, etc.
- ...may be given by subcutaneous, intramuscular or intravenous injection.
- ...well tolerated by all species of animals so that this product makes it possible for adequate therapeutic concentrations of arsenic to be injected without fear of adverse reactions.
- ...economical to use especially when the cost is related to the arsenic content of the dosage administered and the quick resolution of the condition which it helps to secure.
- ...has been used extensively in veterinary practice over the past quarter century and more with consistently satisfactory results.

'Acetylarsan' is a trade mark of May & Baker Ltd

An **M&B** brand Animal Health Product



M&B May & Baker

MAY & BAKER (INDIA) LIMITED

Bangalore • Bombay • Calcutta • Gauhati • Hyderabad • Indore • Jaipur • Lucknow • Madras
New Delhi • Patna

AH. 23

THE INDIAN JOURNAL OF ANIMAL REPRODUCTION

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

Vol. 4 No. 2 FEBRUARY 1984

For Particulars Contact

Editor, The Indian Journal of Animal Reproduction

C/o, Department of Gynaecology and Obstetrics,
Gujarat Veterinary College, Anand-388 001.

The Indian Society For The Study Of Animal Reproduction

(Regd. No. : Bom. 253/78)

OFFICE BEARERS

President: Dr. C. R. Sane
G.B.V.C., F.R.V.C.S.

Hon. Secretary: Dr. B. R. Deshpande
Ph.D., F.R.V.C.S.

Treasurer: Dr. D. P. Velhankar
Ph.D., F.R.V.C.S.

Publication Editor: Dr. S. B. Kodagali
Ph.D., F.R.V.C.S.

EXECUTIVE COMMITTEE MEMBERS

Dr. V. Narayan Rao
M.S. (Andhra)

Dr. R. V. Patil
M.Sc., F.R.V.C.S.
(Karnataka)

Dr. I. S. Rohli
B.V.Sc., F.R.V.C.S. (Rajasthan)

Dr. R. D. Sharma
Ph.D. (Punjab)

Dr. S. K. Diwan
M.V.Sc., (Madhya Pradesh)

Dr. C. P. N. Iyer
M.V.Sc., F.R.V.C.S. (Kerala)

Dr. S. Rangaraj
B.V.Sc. (Tamil Nadu)

Dr. C. K. Rajkonwar
Ph.D. (Assam)

Dr. B. K. Bhavsar
M.V.Sc. (Gujarat)

Dr. S. K. Varma
Ph.D. (Haryana)

THE INDIAN JOURNAL OF ANIMAL REPRODUCTION

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

Vol. 4 No. 2 FEBRUARY 1984

For Particulars Contact

Editor, The Indian Journal of Animal Reproduction

C/o, Department of Gynaecology and Obstetrics,
Gujarat Veterinary College, Anand-388 001.

The Indian Society For The Study Of Animal Reproduction

(Regd. No. : Bom. 253/78)

OFFICE BEARERS

President: Dr. C. R. Sane
G.B.V.C., F.R.V.C.S.

Hon. Secretary: Dr. B. R. Deshpande
Ph.D., F.R.V.C.S.

Treasurer: Dr. D. P. Velhankar
Ph.D., F.R.V.C.S.

Publication Editor: Dr. S. B. Kodagali
Ph.D., F.R.V.C.S.

EXECUTIVE COMMITTEE MEMBERS

Dr. V. Narayan Rao
M.S. (Andhra)

Dr. R. V. Patil
M.Sc., F.R.V.C.S.
(Karnataka)

Dr. I. S. Rohli
B.V.Sc., F.R.V.C.S. (Rajasthan)

Dr. R. D. Sharma
Ph.D. (Punjab)

Dr. S. K. Diwan
M.V.Sc., (Madhya Pradesh)

Dr. C. P. N. Iyer
M.V.Sc., F.R.V.C.S. (Kerala)

Dr. S. Rangaraj
B.V.Sc. (Tamil Nadu)

Dr. C. K. Rajkonwar
Ph.D. (Assam)

Dr. B. K. Bhavsar
M.V.Sc. (Gujarat)

Dr. S. K. Varma
Ph.D. (Haryana)

THE INDIAN JOURNAL OF ANIMAL REPRODUCTION

THE INDIAN SOCIETY FOR THE STUDY OF ANIMAL REPRODUCTION

Vol. 4 No. 2 FEBRUARY 1984

CONTENTS

Editorial

HUMAN & ANIMAL REPRODUCTION

Fourth World Congress on HUMAN REPRODUCTION was held at Bombay from 27th November to 2nd December 1983. At the inaugural ceremony Shri Shankaranandgi, Hon'ble and Family Welfare Minister stated that India happened to be the first country to take up "Family Planning" as part of National Health Programme. Importance of Human Reproduction in Medical Education was detailed in the first congress guest lecture by Prof BN Sinha, Chairman of the Indian Medical Council. Human fertility in developing countries has been a world wide concern. In the field of human fertility the problem is of family planning. There is a need to recognise the interplay of cultural, moral, socio-economic and geographical factors which influence the individuals. Un-explained resistant infertility, Role of oxytocin, Hormonal contraception, injectable contraceptives, intra-uterine contraception devices, genital infections, artificial insemination in human and animals, isolation of X and Y bearing sperms, Endoscopic tubal surgery, Invitro fertilisation, cryofreezing, ovulation, super-ovulation, ovum pick up, embryo transfer, Endometriosis, perinatal care and population, immunology, sperm antibodies, immuno-suppression in pregnancy, iso-immunisation in pregnancy, Tubal micro surgery, endoscopy, etc. topics were covered under the COMMEMORATIVE GUEST LECTURES by the eminent scientists from Abroad and India.

Some of the important topics covered in the presentation of papers on HUMAN and ANIMAL REPRODUCTION RESEARCH at the scientific sessions were as follows:

Cervical factor in infertility, Investigations in infertility, non-isotopic hormonal assays, Hormonal manipulations, treatment of anovulations, torsion of spermatic cord, dysfunction of seminal vesicles and vesiculography, oligospermia & immunoreactive LH-RH., Effect of pH & semen concentration on invitro culture, therapeutic use of hydrotubation, testicular metabolism & function, Circulatory androgens in buffalo male calves, Cryopreservation and thawing of human semen, immunological aspermatogenesis in bovines, effect of membrane stabilisers on freezeability of buffalo spermatozoa, Infertility due to corpus luteum inadequacy, effect of dietary zinc on Vit. A levels & effects on reproduction in females, effect of thawing temperature, time on post-thawing motility, live count and acrosomal maintainence in bovine sperms frozen in German mini tubes, cervical mucus culture studies in infertile females, Embryo transfer in Sheep, Luteal

phase insufficiency, serum prolactin in ovulatory disorders, treatment of infertility, towards lowering perinatal loss, histo-pathology of placenta & co-relations with foetal outcome, Nuclear anomalies of PMNL in infertile/subfertile Cattle and Buffaloes, Chromosomal abnormalities in female cattle and buffaloes with reproductive deficiencies, functional activity of gonads in sexually mature nongravid Berari buffaloes, Thyroid activity in buffalo calves from birth to sexual maturity, Revival rate of Frozen buffalo spermatozoa with addition of (PMSF) (epididymal extract), Aloes compound in Farm animal infertility, effect of cryopreservation on the leakage of buffalo spermatozoa enzymes, sperm agglutinating activity & Infertility.

Editorial Board

IJAR 4: 2: 1-5

Progesterone, Oestrogens, LH and Corticosteroids In Plasma During The Oestrous Cycle In Goat

FOK MGONGO, S[1] GOMBE and JS[1] OGAA

Department of Surgery, Obstetrics and Reproduction, University of Dar es Salaam, Box 3020, Morogoro, Tanzania and 1 University of Nairobi, Box 29053, Kabete, Kenya

ABSTRACT

Progesterone, oestrogen, LH and corticosteroids concentrations in plasma were measured in 10 goats by R.I.A. Mean progesterone levels was 0.6 to 0.8 ng/ml in oestrus and 2 to 6 ng/ml in dioestrus. Estrogen levels ranged from 10 to 24 pg/ml in dioestrus; around oestrus, a peak of 44.18 pg/ml was observed. LH values were 1.36 ± 0.27 to 2.63 ± 0.27 ng/ml with a preovulatory peak of 42.5 ± 11.6 ng/ml 6 h after the onset of oestrus. The mean corticosteroids values were low and were at 1.8 ± 0.2 to 2.3 ± 0.23 ng/ml.

* * *

With a view to establishing a sound basis for successful studies on hormonal control of the oestrous cycle in goats of tropical origin, it is incumbent to study the hormone levels in body fluids, peculiar to particular breeds. Other studies in several countries on hormones levels in female goat have reported variations in progesterone (Heap and Linzell, 1966; Thorburn and Schneider, 1972; Jones and Knifton, 1972; Wentzel, Botha and Viljoen, 1979; Kakusya, 1980; Thibier, Pothelet and Jeanguyot, 1981). Similarly oestrogens concentrations (Van Rensburg, 1971; Wentzel, Morgenthal and Van Nierkerd, 1975; Kakusya, 1980; Bone et al., 1983) and LH profiles (Kakusya 1980; Bone et al., 1983).

The present experiment was conducted to determine progesterone, oestrogen, LH and corticosteroids concentration variations during the different phases of the oestrous cycle in the East African short horned goat. These results will provide a landmark from which the application of modern methods of hormonal improvement of fertility, for this breed, can commence.

Materials and Methods

Ten goats of the East African short horned breed, traditionally kept for meat, aged $1\frac{1}{2}$ to 2 years, and weighing 20 to 25 kg were used. Four blood samples were collected by jugular vein puncture into heparinized receptacles every other day during the entire oestrous cycle except at presumed oestrus when blood was drawn at 3 hourly intervals. The blood was centrifuged at 2500 g for 15 min. at 4°C, and plasma thus obtained was stored at — 20°C until assay.

Occurrence of oestrus was checked daily at six hour intervals by identification of marked animals; two brisket raddle marked, penis deviated marker bucks were used as aids in oestrus detection.

LH, Progesterone, Oestrogens and Corticosteroids assays

Progesterone was quantitated by the modified version of the competitive protein binding assay as reported by Gombe and Kayanja (1974). Total unconjugated oestrogens were determined as according to Gombe (1977). Percent recovery for progesterone procedure was at 78±0·5% with the sensitivity of the assay at 0·2 ng/ml, the blank value was below this limit and the (inter and intra assay) coefficient of variations were below 9%. For oestrogens per cent recovery rate was at 82±0·6% with sensitivity of the assay at 3 pg/ml, the blank value was below this limit and the (inter — and intra assay) coefficient of variations were below 8·8%.

LH concentration was measured using a modification of the method of Gombe et al. (1973). ^{125}Iodine was used for labelling, the second antibody was supplied by Dr. R.B. Heap (Babraham, Cambridge) and was obtained by immunization of a donkey. The interference of other antipituitary hormones in the assay was always lower than 1% of LH activity (Mgongo, 1979). Sensitivity was 0·1 ng/ml and (inter and intra-assay) coefficient of variations were below 9%.

The competitive protein binding assay as described by Murphy (1967) and Bassett and Hinks (1969) and validated by Mgongo (1979) was adapted and used for the determination of corticosteroids concentration in the peripheral plasma. The antiserum, cortisol binding globulin, CBG, was obtained from the third trimester serum. In our tests one ml, CBG at 1:3000 dilution cross reacted with cortisol (35%), and corticosterone (42%) and all values are given as total plasma corticosteroids. The standard corticosterone, and tritiated corticosterone (1, 2, (n)3H) were obtained from Guy, E. Abrahams, California, and radiochemical centre, Amersham, respectively. Coefficient of variations (intra- and inter-) were both below 8%. The sensitivity of determination *i.e.* the lowest amount differing significantly from zero was below 0·05 ng per ml. plasma; found by determination of the significant water blank values and then the mean blank values plus twice the standard error of mean of the blank. Per cent recovery was at 80±0·6%.

Standardized chi square, t-test and analysis of variance were used as appropriate (Snedecor and Cochran, 1975).

Results and Discussions

Mean variations of plasma oestrogens, progesterone, LH and corticosteroids observed in ten goats during the 10 days preceding and following ovulatory LH peak are shown in figure I.

Mean plasma progesterone concentrations during mid-dioestrus reached maximal values with MEAN±sem of 5·9± 0·56 ng/ml and during dioestrus ranged between 2 and 6 ng/ml. Between the 72th and 56th hour before ovulatory peak, plasma progesterone levels abruptly declined, remained lower than 1 ng/ml (0.6 to 0.8 ng/ml) for about 5 days and subsequently the concentration gradually increased to typical dioestrus values. The plasma progesterone dropped to low oestrus values 36 h before behavioural oestrus occurred; the length of behavioural oestrus in other breeds of goat have been reported to vary between 30 and 36 h (Kakusya, 1980; Bono et al., 1983). Through analysis behavioural oestrus in the East African short horned goat lasted a mean of 28.4 h and may last from 72 to 84 hr. 81% of goat of this study had

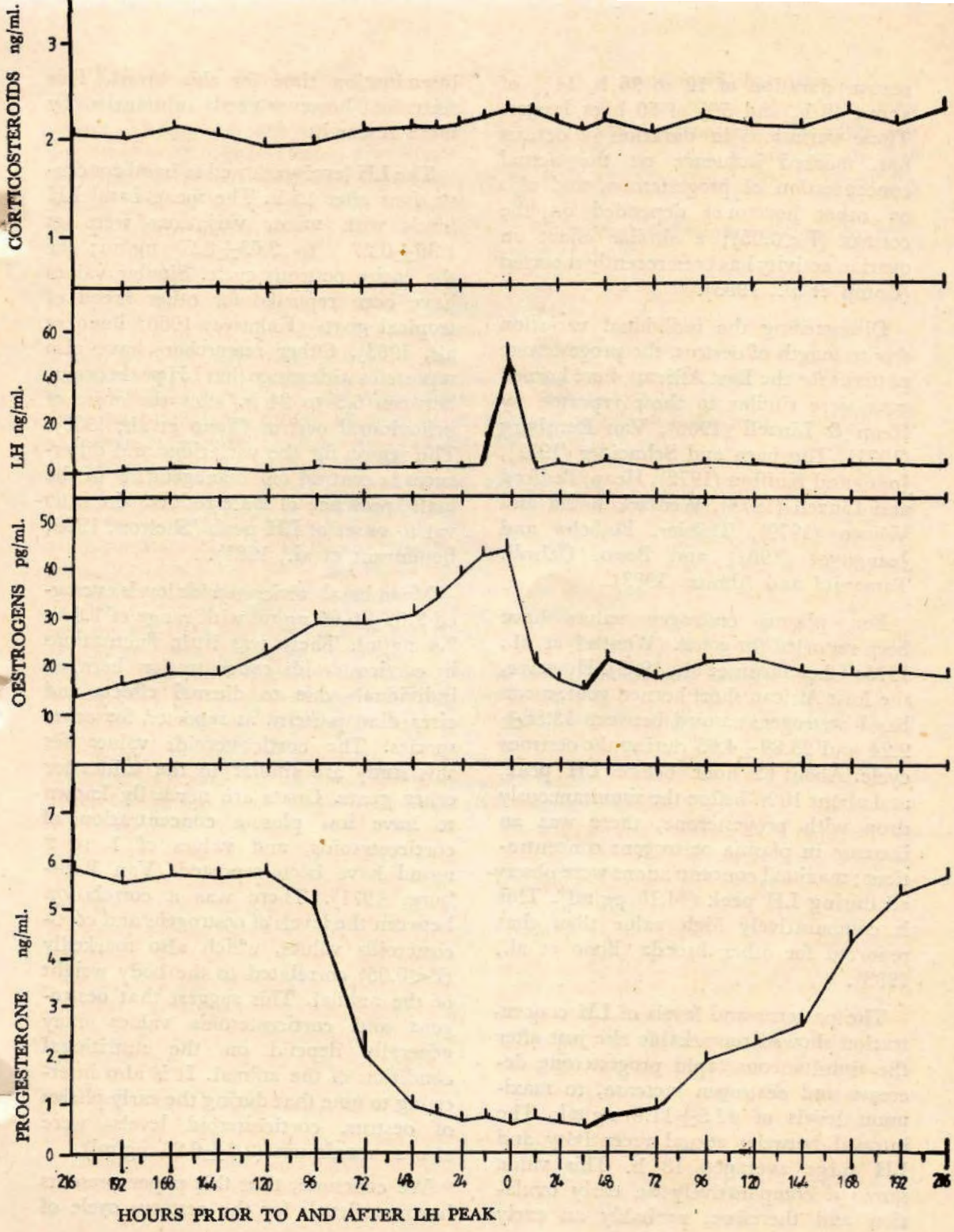


FIGURE 1: Mean Variations in Plasma Progesterone. Oestrrogens. LH And Corticosteroids During Period Preceeding and Following LH Peak in Goat.

oestrus duration of 12 to 36 h, 14% of about 48 h, and 5% of 60 h or longer. These variations in duration of oestrus had marked influence on the actual concentration of progesterone, and also on other hormones depended on the oestrus ($P<0.05$); a similar effect on ovarian activity has been recently reported (Camp et al., 1983).

Disregarding the individual variation due to length of oestrus, the progesterone patterns for the East African short horned goat were similar to those reported by Heap & Linzell (1966), Van Rensburg (1971), Thorburn and Schneider (1972), Jones and Knifton (1972), Heap, Bedford and Linzell (1975), Wentzel, Botha and Viljoen (1979), Thibier, Pothelet and Jeanguyot (1981) and Bono, Cairoli, Tamanini and Abrate (1983).

Few plasma oestrogen values have been reported for goats. (Wentzel et al., 1975; Chemineau et al., 1983). However, the East African short horned goat, mean basal oestrogens ranged between 13.56 ± 2.24 and 23.89 ± 4.65 during the oestrous cycle. About 62 hour before LH peak, and about 10 h. before the simultaneously drop with progesterone, there was an increase in plasma oestrogens concentrations; maximal concentrations were observed during LH peak (44.18 pg/ml). This is comparatively high value than that reported for other breeds (Bono et al., 1983).

The patterns and levels of LH concentration showed remarkable rise just after the simultaneous rapid progesterone decrease and oestrogen increase, to maximum levels of 42.5 ± 11.6 ng/ml. The interval between sexual receptivity and LH surge averaged 18 h. This value shows a comparatively an early ovulation and therefore, probably an early insemination time for this breed. This statement however needs substantion by more research.

The LH levels returned to basal concentrations after 15 h. The mean basal LH levels with minor variations were at 1.36 ± 0.27 to 2.63 ± 0.27 ng/ml; for the entire oestrous cycle. Similar values have been reported for other breed of tropical goats (Kakusya, 1980; Bono et al., 1983). Other researchers have also reported a wide range that LH peaks occur, between 6.5 to 24 h. after the onset of behavioural oestrus (Bono et al., 1983). The reason for the variations and differences is centred on management of the male, presence of male reduces the interval to onset of LH peak (Shelton, 1966; Bondurant et al., 1981).

Mean basal corticosteroids levels averaged 2.03 ± 0.06 ng/ml with range of 1.8 to 2.4 ng/ml. There was little fluctuations in corticosteroids concentration between individuals due to diurnal effects and circardian pattern, as reported for other species. The corticosteroids values for this study are similar to the values for other goats. Goats are normally known to have low plasma concentration of corticosteroids, and values of 1 to 2 ng/ml have been reported (Van Rensburg, 1971). There was a correlation between the levels of oestrogens and corticosteroids values, which also markedly ($P<0.05$) correlated to the body weight of the animal. This suggest that oestrogens and corticosteroids values may generally depend on the nutritional condition of the animal. It is also interesting to note that during the early phases of oestrus, corticosteroid levels were also at maximum (2.3 ± 0.23 ng/ml).

We conclude, that this paper presents hormone levels for the oestrous cycle of

the East African short horned goat, and elaborate the minor differences that exists. The values are similar to those for other goat breeds; steroid administration to this breed, therefore, may bring similar effects to that already reported in the literature.

Acknowledgements

We wish to thank the Norwegian Agency for International Development (NORAD) and the University of Dar es Salaam, Tanzania, for a grant for the study.

The secretarial work was done by Mrs. S. S. Mbwana.

REFERENCES

Bassett, JM & NT Hinks (1969). *J Endocr.* 44: 387.
Bondurant, RH; BJ Darien; CJ Munro; H Stabenfeldt and P Wang (1981). *J. Repr. Fert.* 63: 1.
Bono, G; F Cairoli; C Tamanini and L Arbrate (1983) *Reprod. Nutr. Develop.* 23: 217.
Camp, JC; DE Wildt; PK Howard; LD Stuart and PK Chakraborty (1983). *Biol. Repr.* 28: 673.
Chemineau, P; G Gauthier; JC Poirier and J Saumande (1983). *Theriog.* 17: 313.
Gombe, S and W Hansel (1973). *J. Anim. Sci.* 37: 728.
Gombe, S and FIB Kayanja (1794). *J. Repr. Fert.* 40: 45.
Gombe, S (1977). *East Afric. Med. J.* 54: 466.
Heap, RB and JL Linzell (1966). *J. Endocr.* 36: 389.
Heap, RB; CA Bedford and JC Linzell (1975). *J. Endocr.* 64: 485.
Jones, DE and A Knifton (1972). *Res. Vet. Sci.* 13: 193.
Kakusya, GRE (1980). *Anim. Breed Abstr.* 48: 6791 (Abstr.) and 806 (Abstr.).
Mgongo, FOK (1979). *M.Sc. Thesis.* University of Nairobi, Kenya.
Murphy, BEP (1967). *J. Clinic. Encodr. & Met.* 24: 187.
Shelton, M. (1966). *J. Anim. Sci.* 19: 368.
Snedecor, GW and WG Cochran (1975). 6th Edt. Oxford and IBH Publish. Co., Calcutta.
Thibier, M; D Pothelet & N Jeanguyot (1981). *J. Dairy Sci.* 64: 513.
Thorburn, GD and DH Nicol; JM Bassett; DA Shutt and RI Cox (1972). *J. Repr. Fert.* (Suppl 16): 16.
Thorburn, GD and W Schneider (1972). *J. Endocr.* 52: 23.
Van Rensburg, SJ (1971). *Ondersterpoort. J. Vet. Res.* 38: 1.
Wentzel, D, LJJ Botha and KS Viljoen (1979). *Agroanimalia* 11: 27.
Wentzel, D, JC Morgenthal and CH Van Nierkerk (1975). *Agroanimalia* 7: 35.

IJAR 4: 2: 6-9

Studies On Hormonal Levels Before And Following Treatment For Induction of Oestrus in True Anoestrus Cows.

DR PARGAONKAR,[1] AS KAIKINI,[2] AR SHETH[3] and Mrs. UM JOSHI.[4]

ABSTRACT

Various therapies to induce oestrus in True Anoestrum cases have been tried. Serum FSH, LH, Prolactin and Progesterone hormone levels before and following the treatment have been studied.

Out of the different Herbal, Homeopathic and Alopathic drugs tried, 'Fertivet' (Clomiphene) was found having most encouraging results. It was further observed that before the treatment, LH and Progesterone hormone levels were below the measurable limits. But the same rose to 3.6 and 1.1 ng/ml, respectively following the 'Fertivet' treatment.

It appears that these increasing levels of LH hormone might have helped in bringing out behavioural changes and ovulatory heats.

* * *

Majority of the cows in the country are of assorted genetic make-up 'non-descript' Cows. Anoestrus gonads is the main problem with this lot (Kaikini, 1975). Cows though apparently normal, appear weak, get some feed and fodder but fail to manifest oestrus cycles at regular intervals. These animals are being used for cross-breeding on mass scale to bring about an overall improvement in their progeny through introduction of exotic blood.

Anoestrus cows have small inactive ovaries with no Graafian follicle or functional corpus luteum palpable per rectum. In domestic animals the oestrus cycle is controlled by the oestrogens and progesterone liberated from the ovary under the influence of pituitary gonadotrophins. No data is available on the circulating hormonal levels in farmers' native cows in the country. Therefore it was decided to carry out systematic controlled trials with different therapies to induce oestrus in true anoestrus cases and also to estimate hormonal levels in these animals before and following the treatment.

Materials and Methods

(A) *Treatment of Anoestrum:*

The animals were subjected to a regular periodical Gynaeco-Clinical examination and true anoestrus and lactational dioestrus cases were diagnosed and grouped separately. The animals were divided in small groups of 6 to 10 each for conducting systematic trials with different therapies. Equal number of cases were kept as control group for each trial. All the

Present Address:

1. Professor of Gynaecology, College of Veterinary & Animal Sciences, Marathwada Agricultural University, Parbhani.
2. Dean, Faculty of Veterinary Science, Punjabrao Krishi Vidyapeeth, Akola.
3. Asstt. Director, Institute for Research in Reproduction, Bombay.
4. Asstt. Director I/c Steroid Division, Institute for Research in Reproduction, Parel, Bombay.

(I) **Indigenous Drugs:**

S.No.	Name	Dose	Duration
1.	Guggul Powder (Balsomendron Miukul)	6 gm. each	21 days
2.	Samudra Phal (Argureia Speciosa)	20 gm. each	Single Dose
3.	'Heaterone' (Alarsin Pharma)	20 gm. each	15 days
4.	'Prajana' (Indian Herbs Co.)	3 capsules each	3 days
5.	Jowar Striga (Sorghum Vulgar-Striga)	1 kg. each	10 days

(II) **Homeopathic Drugs:**

1.	'Graphitis' (German Tinctures)	5 drops each	14 days
2.	'Medorrhinum' — ,, —	5 drops each	14 days

(III) **Allopathic Drugs:**

1.	'Prostigmin' (Roche Co.)	5 mg i/m. injection	3 days
2.	'Fertivet' (Ar-Ex Laboratory)	300 mg each	5 days

animals were maintained under the identical managemental practices, except that the 'Control' group animals received no treatment. Changes in tubular genitalia and gonads were recorded systematically 'Teaser' bull was also paraded daily morning and afternoon hours for detection of animals in heat from experimental and control groups.

The different therapies tried were from the following three categories:

(i) Indigenous, (i) Homeopathic and (iii) Allopathic.

13

(B) *Hormonal Estimations:*

Blood samples were collected prior to, during and following treatment of all the cows which manifested oestrus and also of the animals from control groups. The serum samples separated were well labelled and preserved at–20°C until processed for hormone estimations.

Estimation of FSH, LH Prolactin and Progesterone Hormones:

The endocrinological studies hormone estimations were carried out by Radio-Immuno-Assay (RIA) technique. Facilities available at the Institute for Research in Reproduction (ICMR), Bombay were utilised. RIA was carried out as per Greenwood *et al.* (1963) and Midgley (1966), with slight modifications.

Progesterone estimations were done as per the technique of Thorncroft and Stone (1972), with slight modifications.

Results

(A) *Treatment of Anoestrum:*

(i) *Indigenous Drugs:*

Guggul powder, Samudraphal, Heaterone, Prajana and Jowar Striga were administered orally with dropper. None of the animals responded to the treatment.

(iii) *Allopathic Drugs:*

(a) 'Prostigmin' (Roche Co.) 5 gm. diluted in distilled water was injected I/m to each cow for 3 days. This drug was also found to be of no avail as none of the cow responded to the treatment.

(b) 'Fertivet' (Ar-Ex Laboratory) 300 mg tablets each were crushed and administered as drench with water to each of the ten experimental Cows. Treatment was discontinued to the animal which manifested oestrus during the course of 5 day treatment.

Six cows (60 per cent) responded to this treatment. Two cows manifested signs of heat on day 3 of the treatment and were inseminated next morning. Three more cows came in heat on day 4 of the treatment. Out of these 3 cases, two were having well developed Graafian Follicles, and services were offered to them. On the last day (Day 5) of the treatment, one more cow showed heat and in all two cows were offered services on that evening. 'Teaser' bull also pointed them out. On Gynaeco-Clinical examinations, these heats were confirmed to be ovulatory.

None of the animals from control group came in heat. All the animals were followed up till 21 days following the treatment.

(B) *Hormone Estimations:*

FSH, LH, Prolactin and Progesterone hormones were estimated by R.I.A. technique. It was interesting to note that in True Anoestrum condition also the FSH hormone levels were appreciably high (33.57 ng/ml while LH and Progesterone hormone levels were even below the measurable limits. It was further observed that Prolactin hormone levels were very high (average 464.33 ng/ml).

The hormonal levels in animals which responded to the treatment indicated that following the treatment LH and Progesterone hormone levels rose to 3.6 ng/ml and 1.1 ng/ml, respectively. Prolactin levels dropped down to 224.6 ng/ml on the Day 1 in the cases which responded to the treatment (Vide Table 1)

Discussion

Systematic trials were conducted in True Anoestrus Cows with (A) Indigenous, (B) Homeopathic and (C) Allopathic Preparatory Drugs. From Indigenous group of drugs, it was observed that only one cow responded to the therapy with Prajana. While all other drugs/therapies were found to be of no avail. Homoepathic Drugs (Graphitis and Medorrhinum) were also found to be of no avail in inducing oestrus.

These observations are not in agreement with Deshpande (1976) and the other workers who reported encouraging results with Indigenous drugs. The difference may be due to breed differences and plane of nutrition.

TABLE I. Details of Blood Serum Hormonal Levels Observed Prior to and Post-Treatment with 'Fertivet' in Experimental Non-Descript (Native) Cows.

S.N.	Hormonal levels (in ng/ml) Pre-treatment				Hormonal levels (in ng/ml.) Post-treatment				Remarks
	FSH	LH	Prolactin	Progesterone	FSH	LH	Prolactin	Progesterone	
1.	31.1	<10 Pg	265	<10 Pg	55	32	204	0.36	Oestrus.
2.	53.5	<10 Pg	144	<10 Pg	116	1.2	57	0.32	Oestrus.
3.	35.5	<10 Pg	300	<10 Pg	45.5	2.8	205	0.35	Oestrus.
4.	34.0	<10 Pg	276	<10 Pg	59.8	3.1	154	0.45	Oestrus.
5.	22.5	<10 Pg	246	<10 Pg	35.5	1.8	240	0.42	Oestrus.
6.	55.6	<10 Pg	352	<10 Pg	70.0	2.2	320	0.48	Oestrus.
7.	45.5	<10 Pg	700	<10 Pg	42.7	0.3	675	<10 Pg	No response.
8.	24.5	<10 Pg	372	<10 Pg	22.5	<10 Pg	306	0.18	No response.
9.	22.5	<10 Pg	264	<10 Pg	31.5	0.6	206	0.10	No response.
10.	31.5	<10 Pg	1000	<10 Pg	38.5	<10 Pg	1000	<10 Ph	No response.

Observations about encouraging results with 'Fertivet' therapy are in full agreement with those of Deshpande *et al* (1976), who also reported 50 per cent response in cows treated with 'Fertivet'.

The blood serum FSH values from true anoestrus cases were found to be 33.57 $\pm$4.25 ng/ml. No data on circulating levels of FSH hormone in Indian Cows is available. The observations of the present studies regarding blood serum FSH levels on Day1, are in agreement with those of Akber *et al*. (1973), who reported 78$\pm$8 ng/ml FSH hormone in cows at oestrus.

It was not possible to measure the LH and Progesterone values in true anoestrus Cows. It indicates that, the animals under the studies were not deficient in FSH levels. That means deficiency of LH and Progesterone hormones may be responsible for high incidence of longer post-partum anoestrum and true anoestrus condition of these cows.

Poor body condition and low plane of nutrition may be responsible for low LH release and lowered steroidogenesis.

LH hormone values on Day of oestrus were in agreement with Kodagali (1978) who reported 4.12 ng/ml LH levels in Gir cows. Data on circulating levels of blood serum Prolactin hormone in Indian cows is not available. The blood serum Prolactin values observed on Day1 (oestrus) under the present studies are in agreement with those of Ariji *et al* (1974) who reported Prolactin values as 15-300 ng/ml

Low levels of LH and Progesterone observed under the present studies indicate weak endocrine constitution of these cows.

REFERENCES

Akber, AM, Nett, TM and Niswender, GD (1973). FSH levels in cows during various phases of reproduction. Endocrinolcgy **51**: 66-69.

Ariji, GR, Wiltbank, JN and Hcpwood, ML (1974). Hormone levels in pre-parturient beef cows. J. Anim. Sci. **39**: 338.

Deshpande, BR (1976). Functional forms of infertility with special reference to some indigenous herbal measures. Paper presented at the National Convention of I.C.I.V M. April 12 1976, New Delhi.

Deshpande, BR, Hukeri, VB, Velhankar, DP and Sane, CR (1976). Preliminary observations on 'Fertivet' in induction of heat in anoestrus cows & buffalces. Indian Vet. J. **53**: 561-563.

Greenwood, FC, Hunter, WM and Glover, CJS (1963). The preparation of I 125 labelled human growth hormone of high specific activity. Biochem. J. **89**: 114.

Kaikini, AS (1975). A preliminary report on A.I. with frozen semen at Akola. Paper presented at 63rd Session, All India Sci. Congress, Waltair.

Kaikini, AS, Pargaonkar, DR, Dindorkar, CV and Patil, PK (1978). Studies on the effects of various therapies for anoestum in non-descript cows. Paper presented at FAO/SIDA Followup Seminar, Nov. 1978 at Tirupati.

Kodagali, SB (1978). Environmental influence on ovarian activity in Gir Cows and trials with 'Fertivet' 'FVT-300' in post-partum anoestrus condition. MVSc. Thesis, Kokan Krishi Vidyapeeth Dapoli, 1978.

Midgley, AR (1966). Endocrinolcgy. **79**: 10.

Thorncroft, IB and Stone, SC (1972). Radioimmunoassay Serum Progesterone in women receiving oral contraceptive steroid. Contraception, **5**: 129-146.

IJAR 4: 2: 10-14

Studies on Blood Glucose, Cholesterol and Total Leucocyte Count in Anestrus Crossbred Cows

RS Prasad, KG Kharche and OP Shrivastava

Department of Veterinary Obstetrics and Gynaecology
College of Veterinary Science & Animal Husbandry, Jabalpur

ABSTRACT

The study was conducted on 80 crossbred cows to observe the incidence and causes of anestrus in cows due to biochemical and haematological values and response of some remedial measures to combat it. The blood glucose concentration ranged from 32.37 to 102mg per cent with an average of 65.43 mg per cent in anestrus cows. On the day of estrus, the values ranged from 45.87 to 89.31 mg per cent with an average of 66.39 mg per cent. The cholesterol concentration in anestrus cows ranged from 107.95 to 321.89 mg per cent with an average of 224.44 mg per cent. On the day of estrus the values ranged from 163.68 to 327.95 mg per cent with an average of 245.42 mg per cent. The mean total leucocyte count (10.33×10^3 cells/cu mm) in anestrus cows was high as compared to that on the day of heat (10.09×10^3 cells/mm).

* * *

Anestrus is one of the major hurdles in the reproductive cycle of female. Lack of minerals especially calcium, phosphorus and trace elements such as glucose, cholesterol, cobalt, manganese, zinc and copper upset the proper functioning of reproductive organs. The role of calcium in sensitizing the tubular genitalia for action of hormones has been envisaged (Moddie, 1965). Cows and heifers exposed to a negative energy balance may fail to show heat, suffer from delay in or failure of ovulation and embryonic death, low level of blood glucose in anestrus animals may be an indication of subnormal energy status (McClure 1965). A reduced haemoglobin concentration was observed in anestrus cows as compared to normal cycling cows (Hansel 1953). Hence the study was planned to investigate the biochemical constituents and haematological values in anestrus crossbred cows.

Materials and Methods

The study was done on crossbred cows belonging to Military Dairy Farm, Jabalpur. The experimental animals comprised of 80 anestrus crossbred cows. Animals were divided into following groups:

Group	Numbers of cows in the group	Type of group	Name of group
I	20	Control	Anestrus
IIa	10	Treatment	Fertivet
IIb	10	Treatment	Fertivet+copper sulphate
III	20	Treatment	Secrodyl
IV	20	Treatment	Lugol's iodine with utero-ovarian masage.

TABLE 1 Blood glocose concentration (mg%) in different groups of crossbred cows.

Group	Pre-treatment (mg%)		Post-treatment (mg%)	
	Mean±S.E.	Range	Mean±S.E.	Range
I	71.15±4.42	32.37—102.00	72.89±4.37	33.43—102.32
IIa	64.69±4.76	47.23—87.77	66.71±4.96	46.39—88.62
IIb	62.62±3.88	43.48—82.27	63.27±3.91	46.12—84.22
III	62.25±3.44	32.56—87.32	64.05±3.78	37.50—90.88
IV	66.66±4.17	42.23—92.27	68.28±3.83	42.43—89.32
0	63.85±2.50	42.39—92.27	66.39±2.51	45.87—89.31

Anestrus group (control): No treatment was given to the cows of this group. Blood samples were collected on the day of gynaeco-clinical examination. Each animal of this group was observed for signs of heat upto 21 days. Blood samples were collected from the cows that came in heat within the above period on the day of induction of heat and also from the cows that failed to come in heat within the above period on day 21 of gynaeco-clinical examination.

Treatment group: Blood samples from all the cows in these groups were collected just prior to treatment and after gynaeco-clinical examination. Each animal was observed for signs of heat upto 21 days. If they come in heat on any day post-treatment, their blood was collected on the day of induced heat within the above period. The blood samples of the animals which failed to come in heat upto 21 days were obtained on twenty first day of gynaeco-clincial examination.

Estrus group: Blood samples from the cows of this group were obtained on the day of induction of heat after gynaeco-clinical examination. The concentration of different blood chemical constituents was compared with the corresponding values recorded during anestrus.

Results and Discussion

Glucose:

In the present study the blood glucose level ranged from 32.37 to 102 mg per cent with an average of 65.43 mg per cent in anestrus cows. The mean blood glucose value increased from 63.85 to 66.39 mg per cent on the day of induced heat (Table 1). Statistically the difference was significant ($P>0.01$).

This clearly shows that blood level is increased at the time of heat. The normal plasma glucose level in cows ranged from 47 to 63 mg per cent (Campbell and Kronfeld 1961). McClure (1965) stated that at 25 mg per cent blood glucose level the conception rate was nil, whereas at 48 mg per cent level or above it was 77 per cent. Thus a low level of blood glucose in anestrus females may show an indication of sub-normal energy status and the blood glucose level may therefore be used to assess the reproductive function in dairy herd.

Similarly Roberts (1971) reported the importance of glucose in infertility. When the energy intake in adult animals was low, follicles failed to develop to maturity resulting in follicular atresia, anestrus and loss of sexual desire. Arthur (1975) recorded cessation of estrus in cows and heifers exposed to negative energy balance and pituitary function may be influenced by blood glucose level. The blood glucose level increased significantly after the administration of Fertivet tablets and Lugol's iodine application. The mean

TABLE 2 Serum cholesterol concentration in different groups of crossbred cows

Group	Pre-treatment (mg%)		Post-treatment (mg%)	
	Mean±S.E.	Range	Mean±S.E.	Range
I	212.35±12.08	107.95—321.89	215.99±12.32	111.81—330.17
IIa	234.28±12.11	189.17—299.37	245.59±11.31	201.44—300.18
IIb	221.82±17.04	146.59—293.37	226.77±15.06	163.68—297.95
III	230.99±9.78	157.39—310.08	232.08±11.83	113.98—310.44
IV	222.73±12.17	113.43—293.37	232.08±11.83	113.98—310.44
0	239.21±6.82	146.59—310.08	245.42±6.87	163.68—327.95

blood glucose level had increased by 2.03 per cent and 1.62 mg per cent respectively. Bhosrekar *et al* (1967) opined that season has influence on the blood glucose level. Result of present study is also in partial agreement with Oxenrieder and Wagner (1971) who stated that there is significant negative correlation between plasma glucose level and post partum interval to occurrence of 10 mm follicles and ovulation. The effect of blood glucose on reproductive cycle in cows is thus evident.

Cholesterol:

The cholesterol concentration averaged 245.42 mg per cent at estrus and 224.44 mg per cent during anestrus in the present study (Table 2). However, the difference in these values was statistically

TABLE 3. Haemoglobin percentage in different groups of crossbred cows

Group	Pre-treatment (0%)		Post-treatment (0%)	
	Mean±S.E.	Range	Mean±S.E.	Range
I	10.62±0.21	8.8—12.8	10.66±0.19	9.0—12.8
IIa	10.26±0.41	7.8—12.8	10.0±0.38	7.2—11.0
IIb	9.78±0.46	0.4—11.4	9.82±0.43	7.0—11.0
III	11.03±0.30	8.2—13.8	10.74±0.30	8.0—13.8
IV	11.01±0.38	6.0—13.6	10.66±0.33	7.0—12.8
0	10.95±0.25	6.4—13.8	10.61±0.24	7.0—13.8

TABLE 4. Total leucocyte count (10^3 cells/CU mm) in different groups of crossbred cows.

Group	Pre-treatment (10^3 cells/CU mm)		Post-treatment (10^3 cells/CU mm)	
	Mean±S.E.	Range	Mean±S.E.	Range
I	10.44±0.32	6.25—13.45	10.37±0.30	7.25—12.50
IIa	0.81±0.52	5.85—13.60	8.55±0.43	5.25—10.65
IIb	10.78±0.70	6.45—15.60	10.44±0.61	7.75—15.75
III	11.49±0.46	7.30—15.75	10.97±0.44	7.20—13.95
IV	10.11±0.36	7.10—13.35	10.10±0.38	7.65—14.05
0	10.32±0.40	5.85—15.75	10.09±0.34	6.10—14.05

non-significant. Similar values of cholesterol was recorded by Bhattacharya *et al* (1972). These workers recorded significantly higher blood cholesterol concentration at estrus as compared to the value recorded during peak luteal activity in cows. Deopurkar (1974) also reported significant difference between the cholesterol levels obtained during anestrus and estrus in cows. Higher cholesterol value (264.30 mg per cent) have been reported during estrus than during anestrus (188.61 mg per cent) by Purohit and Kohli (1977). Robinson (1957) stated that gonadal steroids have a correlation with cholesterol metabolism. Zala *et al* (1972) studied the relation of blood cholesterol level with the activity of pituitary gland and corpus luteum in buffalo heifers. The highest adrenal cholesterol values were observed at estrus when animals were under estrogen dominance. The cholesterol concentration showed a sharp decline when the animals were in the progestational phase. Contrary to this the blood levels were lowest on day of estrus while the levels were highest during corpus luteum activity in the luteal phase.

Haemoglobin Percentage:

In the present study the haemoglobin percentage ranged from 6.0 to 13.8g per cent with an average value of 10.54g per cent in anestrus cows, while it decreased to 10.61 g per cent with a range of 7.0 to 13.8 g per cent. The value of haemoglobin percentage is slightly lower (10.61 g per cent) at estrus as compared to anestrus state (10.95 g per cent) in group 'O' (Table 3). However the difference was statistically significant ($P < 0.01$). The values of haemoglobin per cent in the present study are in agreement with the reports of Mullick and Kehar (1959) and Bianaca (1970).

Mukherjee and Bhattacharya (1953) stated that haemoglobin content of blood was higher but variable between years and among seasons and among months within season. Spring season was found to be the best and autumn the worst. According to Agrawal *et al* (1965) haemoglobin per cent decreased after parturition.

Total Leucocyte count:

In the present investigation mean total leucocyte count on the day of induced heat was 10.09×10^3 cells/CU mm with a range of $6.10 - 14.05 \times 10^3$ cells/CU mm in comparison to 10.32×10^3 cells/CU with a range of 5.58 to 15.75×10^3 cells/CU mm in anestrus state (Table 4). However, the difference was statistically non-significant.

The observations are not in agreement with the findings of Agrawal *et al* (1965) and Gupta (1977) who observed a low value of total leucocyte count during follicular phase as compared to luteal phase. Present investigation is in the line with Soliman and Selin (1965) who reported a higher white cell count of $12.5 \pm 0.30 \times 10^3$ cells/CU mm at estrus in comparison to the count of $9.19 \pm 0.30 \times 10^3$ cells/CU mm at diestrus.

REFERENCES

Agrawal, SP, Luktuke, SN and Sharma, VD (1965). Studies on the influence of certain phases of reproduction on blood picture in bovine female. *Indian J. Dairy Sci.* 18: 156.

Arthur, GH (1975) Veterinary Reproduction and Obstetrics. 4th Ed. The McMillan Publishing Company Inc. New-York.

Bhattacharya, AR, Luktuke, SN and Pal, AK (1972). Studies on blood cholesterol in relation to oestrous cycle in bovines. F.A.O. Swedish follow up seminar on Animal Reproduction, Bangalore.

Bhosrekar, MR, Daniel, SJ and Mullick, DN (1967). A study of pulse and respiration rates, rectal temperature and blood serum composition of lactating dairy cows. *Indian J. Dairy Sci.* 20: 49-52.

Bianaca, G (1970). Effects of dehydration, rehydration and overhydration on the blood of oxen *Brit. Vet. J.* 126:121.

Campbell, LA and Kronfeld, DS (1961) cited by Kaneko, JJ and Cornelivis, CE (1971). Clinical Biochemistry of Domestic Animals. 2nd Ed. P. 2-52.

Deopurkar, VL (1974). M.V.Sc. Thesis, Konken Krishi Vidyapeeth Dapoli.

Gupta, SK (1977). Anoestrus in buffaloes First All India Symposium on Animal Reproduction. I.P.A.U. Ludhiana.

Hansel, WM (1953). Field observations on the relation of nutrition to sterility dairy cattle, J.A.V.M.A. 122: 126-127.

McClure, TJ (1965). A nutritional cause of low non-return rates in dairy herds. *Aust. Vet. J.* 41: 119.

Moddie, EW (1965). Hypocalcaemia and Hypomagnesaemia. *Brit. Vet. J.* 121: 338-349.

Mukherjee, DP and Bhattacharya, P (1953). Seasonal variation in semen quality and haemoglobin and cell volume contents of the blood in bulls. *Indian J. Vet. Sci.* 22: 73-91.

Mullick, DN and Kehar, ND (1959). Seasonal variation in the pulse rate, respiration rate, body temperature and haemoglobin level of dairy cows. *Indian J. Dairy Sci.* 12: 56-62.

Oxenreider, SL and Wagner (1971). *Effect of lactation and energy intake on post-partum ovarian activity in the* cow. *J. Anim. Sci.* 33: 1026-1031.

Purohit, ML and Kohli, IS (1977). Variations in the blood serum cholesterol level in Rathi cows during oestrus. *Indian Vet. J.* 54: 268-270.

Roberts, SJ (1971). Veterinary Obstetrics and Genital Diseases. (Theriogenology). 2nd Ed. Scientific Book Agency, Calcutta-1.

Robinson, TJ (1957). "Pregnancy" in the progress in physiology of farm animals. 3:793 Edited John Hammond, Butterworth Publication, London.

Soliman, MK and Selin, R (1965). Blood picture of buffaloes at the various reproductive phases. *Indian J. Dairy Sci.* 19:29-32.

Zala, PM, Jankiraman, K and Menon, GN (1972). Ascorbic acid and cholesterol of blood and adrenale during oestrous cycle in Surti buffaloe heifers. *Indian J. Exp. Biol.* 10:312-314.

IJAR 4: 2: 15-17

Blood Serum Cholesterol Levels In Sahiwal, Hariana And Cross-Bred Cows

CV Dindorkar, AS Kaikini and NB Agrawal

University Department of Post Graduate Studies in Animal Reproduction,
Punjabrao Krishi Vidyapeeth, AKOLA-444 104

ABSTRACT

Blood serum cholesterol levels were estimated in various stages of reproduction in Sahiwal, Hariana and Cross-bred cows maintained at Livestock Instructional Farm, Akola and Central Livestock Research Station, Borgaon. The blood serum Cholesterol level was estimated as per Zak's (1957) method during estrus, Met-estrus, Diestrus and Day 20 of estrous-cycle and in Early, Middle and Advanced stages of pregnancy. The average blood serum cholesterol levels recorded were higher in estrus 253.33 + 27.96 and 335 00±10.18 mg per cent in Sahiwal and Hariana cows respectively, which gradually decreased to 227.92± 23.15 and 307.50±12.39 mg per cent in Metestrus, 193.67±21·50 and 225.50± 12.23 mg per cent in Diestrus stage and 183.67±12.30 and 252·08 +23.51 mg per cent on day 20 of estrus cycle in Sahiwal and Hariana cows respectively.

During Early, Middle and advanced stages of pregnancy, the blood serum cholesterol gradually decreased in Sahiwal, Hariana and cross bred cows, thus: 277.5±5.62, 282.08±16.16 and 287.08± 11.76; 221.67±5.22, 264.58±14.36 and 163.75±9.11; 183.00±3.77, 221.67± 19.27 and 128.25±8.36 mg. per cent respectively.

Lowered blood serum cholesterol concentration was observed during peak luteal activity with increased progesterone synthesis.

* * *

In economic cattle breeding no other factor plays such an important role as fertility. In order to achieve optimum fertility in a cattle herd, it is necessary to know the various physiological phenomena which govern reproduction. Reproduction is largely controlled by hormones and steroidal hormones constitute an important group of reproductive hormones. Cholesterol is the precursor of steroidal hormones.

The cholesterol level in the body varies in concentration during various stages of reproduction such as lactation, estrous cycle, pregnancy and parturition. It also varies with breed, age, ambient temperature, diet, sire, heat stress, nutrition, and the level of immunity. Cholesterol level in the blood is an indication of the reproductive status of the animal. Hence, the present research work was undertaken to study the blood serum cholesterol levels in different stages of reproduction in the bovine.

Materials and Methods

(A) *Blood Serum Cholesterol levels in Estrus Cycles:*

The experimental animals in these studies consisted of six adult pluri-

parous Sahiwal and Hariana cows of 8-10 years of age.

The blood serum samples were collected from these animals on the day of estrus, Metestrus, Diestrus and Day-20 following estrus. The estrus was detected with the help of teaser bull. Gynaeco-clinical examination of each cow was carried out before the collection of serum samples at various stages of estrus cycle. The findings were noted and immediately thereafter the blood serum samples were collected for cholesterol estimation.

(B) *Blood Serum Cholesterol Levels in Early, Middle and Advanced pregnancy stages:*

The experimental animals for these studies comprised of 18 adult pluriparous cows each of Sahiwal, Haryana and cross-breds of identical age group ranging between 7 to 10 years.

The blood serum samples were collected from these animals in the early, middle, and advanced stages of pregnancy. The stage of pregnancy was confirmed by Gynaeco-clinieal examination carried out per rectum. The serum cholesterol level was estimated as per Zak (1957).

Results and Discussion

The blood serum cholesterol concentration in experimental cows was not constant and varied during the course of estrus-cycle. It was higher on the day of estrus, which gradually receded at Metestrus, Diestrus and Day 20-of the cycle. On the day of estrus, the total blood serum Cholesterol level was 253.33±27.96 and 335.00±10.18 mg per cent in Sahiwal and Haryana cows respectively, which gradually decreased to 227.92±23.15 and 307.5±12.39 mg. per cent in Metestrus; 193.67±21.15 and 225.5±13.23 mg per cent in Diestrus and on Day-20 of estrus cycle 183.67±12.30 and 252.08±23.51 mg per cent, in Sahiwal and Hariana cows respectively. The differences during various stages of estrus cycle were statistically significant.

The blood serum cholesterol concentration was much lower on Day-20 of estrus in pregnant cows. However, the differences of comparative levels in Non-pregnant cows were not significant.

Similarly blood serum Cholesterol levels in the cows under study were not constant and varied during early, middle and advanced stages of pregnancy. It was higher in the early pregnancy which gradually receded in middle and advanced pregnancy. In early pregnancy, the total blood serum Cholesterol levels were 277.5 ±5.62, 282.08±16.16 and 287.08± 11 76 mg per cent in Sahiwal, Hariana, and cross-bred cows. In the mid-pregnancy stage, the total blood serum Cholesterol levels were 221.67±5.22; 264.58± 14.36 and 163.75±9.11 mg per cent in Sahiwal, Hariana and cross-bred cows respectively. During the stage of advanced pregnancy, the total blood serum cholesterol levels in Sahiwal, Hariana and Cross-bred cows were 183.00±3.77; 221.67±19.27 and 128.25±8.36 mg per cent respectively. All these differences were statistically significant.

Studies in relation to histological characteristics of corpus luteum, progesterone synthesis and secretion, indicated that bovine Corpus luteum was most active during mid-cycle, and the activity gradually declined with its regression (Haf's and Armstrong, 1968). Lynn *et al* (1965), observed that FSH depressed progesterone biosynthesis by luteal tissue and L.H. stimulated it. Inskeep *et al* (1967) noticed increased synthesis of progesterone from Cholesterol between day 11 and 13 of cyclic corpus luteum.

In view of these findings, it is evident that the function of corpus-luteum and conversion of Cholesterol to progesterone was maximum at the mid cycle and was influenced by pituitary gonadotrophin. FSH inhibited it. Therefore, it was presumed that during this active phase of progesterone synthesis, there would have been increased turnover of Cholesterol from plasma pool. Available literature also indicates that steroidogenic glands derived plasma Cholesterol for hormone synthesis (Shima *et al*, 1968). Therefore, there is possibility that hypocholesteremia may develop during the greater production of progesterone by the corpus luteum such as during mid-cycle. In the present study in Sahiwal and Hariana cows, the total blood serum Cholesterol concentration in Diestrus stage (i.e. Day-12 of estrus) explains this concept. Development of hypercholesteraemia on the day of estrus may be attributed to decrease in progesterone synthesis as a result of preceeding corpus-luteum regression as well as increased FSH secretion by pituitary during this period.

The findings of the present studies are in agreement with those of Purohit and Kohli (1977).

The pregnancy gave rise to increasing level of serum cholesterol, since it was the precursor of progesterone. The exact relationship between the blood serum Cholesterol level and the output of progesterone was not known. In the present studies, the blood serum Cholesterol level in early, middle, and advanced pregnancy in Sahiwal, Hariana and Crossbred cows decreased gradually. A gradual increase of progesterone level during early, middle and advanced pregnancy in cows was observed by Kaikini *et al* (1978). Possibly therefore, during the progesterone synthesis in pregnancy stages, there would be an increased turnover of Cholesterol from plasma pool. Literature also indicated that steroidogenic glands derived plasma Cholesterol for hormone synthesis (Mitchell, 1967; Shima *et al*, 1968). There is a possibility that hypocholesteraemia might develop during greater production of progesterone. The higher values of Cholesterol in early pregnancy and lower values during advanced pregnancy observed in the present studies indicated that being the precursor, Cholesterol might be utilized for the synthesis of progesterone hormone during these various stages. However, these postulations need further investigations and confirmation.

REFERENCES

Bhattacharya, AR, Luktuke, SN and Pal, AK (1972). Studies on blood cholesterol in relation to estrus cycle in hovines. FAO/Swedish Follow-up Seminar on Animal Reproduction, Bangalore-1.

Haf's HD and Armstrong, DT (1968). Corpus luteum Growth and progesterone synthesis during the bovine oestrus-cycle. J. Ani. Sci. 27: 134.

Inskeep, EK, Johnson, CE, M Nary, JE and Hall, PE (1967). Variation in biosynthesis of progesterone and response to interstital Cell stimulating hormone in vitro in bovine corpora lutea. J. Anim. Sci. 26: 540.

Kaikini, AS, Pargaonkar, DR and Joshi UM (1978). Peripheral serum progesterone levels during various phases of reproduction in Non-descript cows. In Press.

Lynn, JE, Collins, WE, Ins Keep, EK, McShan, WH and Casida, LE (1965). Effect of Gonadotrophin: Oxytocin and Ghcose on the bovine corpus luteum at the fourteenth day of the estrus cycle. J. Anim. Sci. 24: 790.

Mitchell, FL (1967). Steroid metabolism in the foetoplacental Unit and in early childhood. Vitamins and Hormones, 25: 191.

Purohit, MK and Kohli, IS (1977). Variation in the blood serum Cholesterol level in Rathi cows during estrus. Ind. Vet. J. 54: 268-270.

Shimas, *et al.* (1968) C.f. Bhattacharya *et al.* (1972).

Zak, B. (1957). Simple rapid microtechnique of semen total Cholesterol. Amer. J. Clin. Patho. 27: 583.

IJAR 4: 2: 18-21

Studies on Efficacy of Certain drugs on Anoestrus Cattle

ID SINGH, SN SINHA, BALRAJ SINGH and MP SINGH

Ranchi Veterinary College, Ranchi-834007

ABSTRACT

The efficacy of Fertivet, Prajana Capsule and injection, Lugol's solution, vetosterol and progesterone injection were compared for the induction of oestrus and subsequent pregnancy in anoestrus cows and heifers. Among all the drugs tried, Fertivet was found to be the most effective as cent per cent oestrus was induced within 8.82 ± 2.99 days in cows and 72.7% in heifers within 11.38 ± 6.47 days. The pregnancy rate in cows and heifers were 100% and 87.5% respectively. It was observed that 71.4% animals came into oestrus in each of the treatment groups of Prajana injection and progesterone injection out of which 86.7% conceived. However, it was observed that the differences between the Fertivet, Prajana capsule, Prajana injection and progesterone injection groups were not significant but these treatments differed statistically from Lugol's solution paint, vetosterol injection and control groups. The difference between Lugol's solution paint and vetosterol injection and vetosterol injection and control was not significant where as Lugol's solution paint differed significantly from the control.

* * *

Failure of oestrus or anoestrus is the most common cause of infertility in cattle and its incidence has been reported to be quite high in different investigations (Khan & Luktuke, 1967; Rao & Keshavamurthy 1972; Rahman *et al.*, 1975.) Since the etiological factors of this condition are many, several drugs have been tried to induce heat in anoestrus cattle with varying results (Kohli & Acharya, 1960; Gupta, 1967; Galhotra *et al.*, 1971; Salam & Rahman, 1974; Deshpande *et al.*, 1978).

In view of its high incidence and since it poses serious threat to the economic rearing of cattle, the present study was designed to observe the efficacy of different drugs for induction of oestrus and pregnancy rate of cattle inseminated during induced heat.

Materials and Methods

The study was conducted on 147 non descript and crossbred cattle brought to the out door clinics of the department of Gynaecology and Obstetrics, Ranchi Veterinary College, Ranchi. Gynaeco -clinical examination of the animals was done to know the reproductive status of the animals. Cows which had the history of calving about 2-3 months back and heifers aged 2-3 years which did not evince symptoms of oestrus were included in the study. Condition of the genital organs was monitored in all such cases by rectal palpation. Animals in which the ovaries were found to be inactive with no palpable ovarian follicle or corpus luteum were selected for the purpose of trial of drugs. All the animals to be treated for anoestrum were randomly

TABLE 1. Effect of different treatments for induction of oestrus and conception rate in cows and heifers.

Experimental group	Treatment	No. of animals treated		No of animals showing oestrus			No of animals conceived		
		Cows	Heifers	Cows	Heifers	Pooled	Cows	Heifers	Pooled
T_1	Fertivet tab (orally)	10	11	10(100)	8(72.7)	18(85.7a)	10(100)	7(87.50)	17(94.40)
T_2	Prajana capsule (orally)	10	11	6(60)	8(72.7)	14(66.7a)	4(66.67)	7(87.50)	11(78.5)
T_3	Lugol's solution (cervicalpaint)	10	11	7(70)	3(27.3)	10((47.6b)	6(85.7)	1(33.33)	7(70.00)
T_4	Prajana injection	5	16	2(40)	13(81.3)	15(71.4a)	2(100)	11(84.62)	13(86.7)
T_5	Vetosterol injection	7	14	2(28.6)	5(35.7)	7(33.3bc)	2(100)	3(60.00)	5(71.4)
T_6	Progesterone injection	9	12	4(44.4)	11(91.7)	15(71.4a)	3(75.00)	10(90.90)	13(86.7)
Control	No treatment	11	10	2(18.2)	2(20.0)	4(19.00c)			

Figures in the parenthesis denote values in percentage. Values bearing same superscripts in a row for occurrence of oestrus (Pooled) did not differ significantly among themselves.

divided into seven groups (six treatment and one control). Each group consisted of 21 animals, and the following treatment schedule was followed:

Group T_1: Consisted of 10 cows and 11 heifers. These were treated with one tablet of "Fertivet" (FVT 300 mg of Ar-ex laboratories Pvt. Ltd. Botawala Building, Bombay 400 016) orally consecutively for 5 days.

Group T_2: Comprised of 10 cows and 11 heifers. These were treated with 3 capsules of Prajana (Indian Herbs) in treacle or gur. 2nd dose was repeated after 24 hrs. when the animals failed to show the symptoms of heat within 24 hrs. of the first treatment.

Group T_3: Consisted of 10 cows and 11 heifers. Lugol's Iodine solution (0.5%) was painted to the os portio twice weekly with a maximum of 5 paints to each animal.

Group T_4: Consisted of 5 cows and 16 heifers. Under this group animals were given 4 ml intramuscular injection of Prajana (Indian Herbs). The 2nd dose was repeated after 21 days in those cases only in which the first dose failed to induce heat.

Group T_5: Animals of this group (7 cows and 14 heifers) were administered single intramuscular injection of 2-3 ml (20-30 mg) vetosterol (May & Baker).

Group T_6: The 9 cows and 12 heifers of this group were treated with progesterone. One ml of Progestin (Organon India) containing 25 mg of progesterone, was injected intramuscularly daily for 12 days.

Control: No treatment was given in this group. Vagina was simply swabbed with normal saline as placebo.

Animals which evinced oestrus after treatment were inseminated with chilled semen from Holstein Friesian bulls after evaluating the quality. Pregnancy diagnosis was done per rectum after 45-60 days of artificial insemination. Statistical analysis was done according to Snedecor and Cochran (1968)

Results and Discussion

Effect of different treatments on the

TABLE 2. Average values of time interval between treatment and occurrence of oestrus and no. of inseminations per conception under different treatments.

Treatments	Interval between treatment and occurrence of oestrus (days)				Average no. of inseminations per conception (Mean±S.E.)
	Cows		Heifers		
	Mean±S.E.	C.V. %	Mean±S.E.	C.V. %	
T_1	8.82±2.99 (10)	112.33	11.38±6.47 (8)	160.93	1.41±0.15 (18)
T_2	31.17±6.80 (6)	50.17	21.38±5.81 (8)	98.09	1.92±0.02(13)
T_3	28.67±5.40 (6)	46.15	23.67±8.29 (3)	60.69	2.30±0.15 (9)
T_4	9.50±7.50 (2)	111.65	16.83±2.43 (13)	55.15	1.87±0.24 (15)
T_5	4.50±0.50 (2)	15.71	3.00±0.55 (5)	40.82	1.78±0.28 (7)
T_6	8.75±1.84 (4)	42.02	12.00+2.41 (11)	66.56	1.78±0.18 (14)
Control	40.00±20.00 (2)	70.71	13.00±3.00 (2)	32.64	

Figures in the parenthesis denote no. of observations

induction of oestrus and subsequent pregnancy rate in cows and heifers is presented in table 1, whereas table 2 shows the interval between treatment and occurrence of oestrus and average number of inseminations per conception. It is evident from table 1 that all the cows treated under group T_1 came into heat and conceived but in case of heifers only 72.7% came into oestrus with this treatment. Maximum conception (90·90%) in heifers was obtained with progesterone injection. However overall efficacy was found to be best in group T_1 (94.40%) followed by group T_6 (86.7%), T_2 (86.7%) and T_3 (78.5%). The number of pregnancies in control group was too meagre to be put to statistical analysis. Chi-square test was conducted to study the effect of different treatments on occurrence of oestrus in cows and heifers combined. It indicated that T_1, T_2, T_4 and T_6 did not show any significant difference among themselves but these treatments differed statistically from T_3, T_5 and control group. The difference between T_3 and T_5 and T_5 and control was not significant whereas T_3 differed significantly from control group. The present findings are in agreement with the reports of Deshpande *et al.*, (1976) and Kodagali *et al.*, (1978) who observed 80% and 100% induction of ovulatory oestrus respectively with Fertivet. But the observations of Kaikini *et al.*, (1977) do not seem to agree with the present results, they reported only 60% manifestation of oestrus with fertivet. Progesterone injection and Prajana capsules have been widely used for induction of oestrus (Salam and Rahman, 1974; Galhotra *et al.*, 1970; Sharma and Ishaque, 1972); with varying results. Among all the drugs included in the study Fertivet was found to be the most effective drug for induction of oestrus and subse-

quent pregnancy in cows whereas in heifers progestin proved to the best.

The variation in response in cows and heifers to Fertivet and Progesterone respectively is interesting. More work in regard to pharmaco-Kinetics of these drugs and interaction with the endocrine system of cows and heifers seems necessary to account for the causes of the variation.

Acknowledgement

Authors wish to express their thanks to Dr. H. R. Mishra, Dean and Principal, Ranchi Veterinary College, Ranchi-7 for providing necessary facilities during the period of study.

REFERENCES

Deshpande, BR, Hukeri, VB, Velhankar, DP and Sane, CR (1976). Preliminary observations on "Fertivet" in induction of heat in anoestrus cows and buffaloes. Indian Vet. J., **53**: 561.

Galhotra, AP, Bhaskar, VV and Gautuam, OP (1971). Clinical trials of Prajana indigenous drug in anoestrus animals. Hissar Agri. Univ. J. Res., **1**: 66.

Gupta, RC (1967). Studies on the effect of various treatments of anoestrus due to nonfunctional ovaries in Hariana Cattle. M.Sc. Thesis, Punjab Agric. Univ.

Kaikini, AS, Pargaonkar, DR, Patil, RK and Dindorkar, CV. Break throngh therapy for anoestrus in cattle. Indian Vet. J., **54**: 667.

Khan, BU and Luktuke, SN (1967). Studies on the incidence of anoestrum and repeat breeding in Hariana cows. Indian Vet. J., **48**: 678.

Kodagali, SB, Deshpande, BR and Sane, CR (1978). Trial with Fertivet (AR.Ex lab) for inducing ovulation in anoestrus cows with standing follicles. Indian Vet. J., **55**: 339.

Kohli, ML and Acharya, RM (1960). Efficacy of Lugol's solution in anoestrus cows, Indian J. Vet. Sci., **30**: 224.

Rahman, A, Rahman, A, Rahman, H and Ahmed, MU (1975). Anoestrus and repeat breeding problem in indegenous cattle in Bangla Desh. Tropical animal health and production, **7**: 114 (Vet. Bull. **45**: 5231, 1975).

Rao, AV Narsimha and Kesavamurthy, DA (1972). Studies on reprodnctive disorders in cows of Andhra [Pradesh. Indian Vet. J., **49**: 61.

Salem, MA and Rahman, A (1974). Therapeutic use of progesterone in anoestrus cows, Indian Vet. J., **51**: 29.

Sharma, C and Ishaque, SM (1972). Studies on the comparative efficacy of various treatments in case of anoestrus complex for Tharparkar and nondescript cows. MVSc.. Thesis, R.A.U., Bihar.

Snedecor, GW and Cochran, WG (1968). Statistical methods 6th Edition. Oxford and IBH Publishing Co., New Delhi.

IJAR 4: 2: 22-23

Utero-tubal insufflation Technique 1. Fabrication of tubal Insufflation Equipment

KV Athman, CP Neelakantha Iyer and K Prabhakaran Nair

Department of Animal Reproduction
College of Veterinary and Animal Sciences
Kerala Agricultural University, Vellanikkara

ABSTRACT

The design and fabrication of a utero-tubal insufflation apparatus for conducting tubal patency test in cows is described. The test was successfully carried out on infertile cows using this equipment.

* * *

Diseases of the bursa and salpinx constitute about 10 to 15 per cent of reproductive failures in cows (Roberts, 1971). Rectal palpation is of limited value in the diagnosis of most of the tubal lesion causing blockage. Rubin's uterotubal insufflation test was modified for application in bovines by many workers (Hanley, 1953; Kawata and Koike, 1959; Koike and Kawata, 1959; Nair and Raja, 1977). However, with these equipments total obturation of the cervical canal by the cannula was difficult to obtain. This paper describes the design and fabrication of a utero-tubal insufflation equipment with which total obturation of the cervical canal was obtained and the test was successfully carried out in infertile cows.

Design of the instrument

A new apparatus in partial modification of the one designed by Nair and Raja (1977) was fabricated using indigenously available parts (Fig. 1). The apparatus essentially consisted of the following units (Fig. 2).

(A) Two 50 cm. long stainless steel uterine cannulae of 5 mm. and 3 mm. diameter with a opening at the uterine end and two bulbs (one square and another round) at the opposite end. The smaller cannula could be used for primiparous animals.

(B) A 22 FR. Neo Foley's latex balloon catheter having universal aperture for inflating and deflating the rubber balloon near its tip.

(C) A dial manometer (Japan) caliberated to read between 0 and 300 mm. Hg. pressure.

(D) A rubber blower with one way air valve at the tip and a stopcock to release the air.

(E) A 'Y' shaped steel cannula, which is attached by plastic tubes to metal catheter with the sleeved in Neo Foley's latex balloon catheter at the straight end and the dial manometer and the rubber blower at its angular wings.

(F) A 5 ml. syringe for inflating and deflating the Neo Foley's balloon with water.

(G) Plastic tubes for connecting the 'Y' shaped steel cannula to the uterine cannula, dial manometer and air blower.

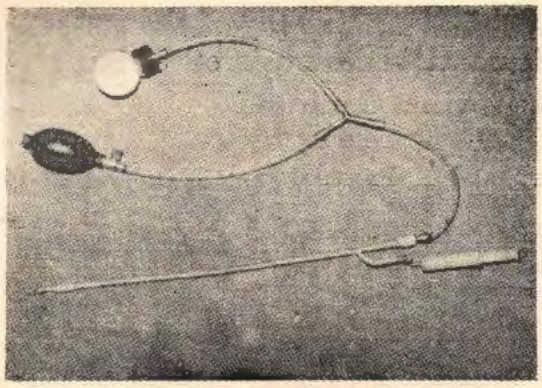


Fig. 1 Utero-tubal insufflation apparatus

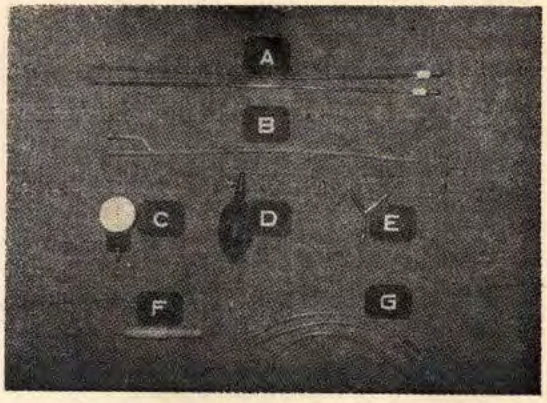


Fig. 2 Utero-tubal insufflation apparatus—disassembled units.

Procedure for tubal patency test

The Neo Foley's latex balloon catheter was sleeved over the metal catheter and the equipment was assembled as shown in Fig. 1. The uterine cannnla was guided into the cervical canal and balloon was located at the mid cervix. About 3-5 ml. of water was injected through the universal aperture to inflate the rubber balloon sufficiently to cause complete obturation of the cervical canal between cervical annular folds. Air was pumped into the uterus using the air blower at a rate of 10 mm. Hg. pressure per minute. The rate was reduced to 5 mm. Hg. pressure per minute on the uterine pressure reaching 50 mm. Hg. Gradual building up of pressure in the manometer was taken as an indication for complete cervical obturation. When sufficient pressure was built up in the uterine cavity, air started escaping through Ostium tubae abdominalis. The sensation of the escape of air through one or both Ostium tubae abdominalis by the operators hand with gradual reduction in the intrauterine pressure was considered indicative of tubal patency. On the other hand, intrauterine pressure remained steady in cases of bilateral impatency. The rate of fall in intrauterine pressure was much slower in unilateral impatency cases. Results of utero-tubal insufflation tests on both excised genitalia and live animals are reported separately.

Acknowledgement

This paper is published with the permission of the Dean, College of Veterinary and Animal Sciences, Mannuthy.

REFERENCES

Hanley, S (1953). A preliminary study of utero-tubal insufflation in the bovine animal. Ir. vet. J. 7: 142-161.

Kawata, K and Koike T (1959). Studies on tubal patency of the cow II. Tubo-insufflation test in clinical cases. Jap. J. vet Res. 7: 149-155.

Koike, T and Kawata, K (1959). Studies on tubal patency of the cow I. Experiments made with slaughter house material. Jap. J. Vet. Res. 7: 61-69.

Nair, KP and Raja, CKSV (1977). A preliminary study on utero-tubal insufflation on the bovine genitalia. Indian. vet. J. 54: 309-312.

Roberts, SJ (1971). VETERINARY OBSTETRICS AND GENITAL DISEASES: Published by author, Ithaca, New York. pp. 473-496.

IJAR 4: 2: 24-29

Utero-tubal Insufflation Technique II. Diagnosis of Tubal Impatency in Excised Bovine Genitalia

KV Athman, CP Neelakanta Iyer and K Prabhakaran Nair

Department of Animal Reproduction
College of Veterinary and Animal Sciences
Kerala Agricultural University, Vellanikkara

ABSTRACT

One hundred and thirty eight genitalia of cows and 23 genitalia from heifers were tested for tubal patency using a special utero-tubal insufflation equipment. Unilateral and bilateral impatency were recorded in 8.70 and 19.25 per cent of the excised genitalia. The mean pressure at which air escaped from both the tubes in the excised genitalia was 128.12±6.81 mm. Hg. in cows and 148.93±8.47 mm. Hg. in heifers. "Blown up" condition of the uterus took place in excised genitalia of cows and heifers between 100-280 mm. Hg. and 100-260 mm. Hg. respectively. The safety margin was found to be fairly high and hence the test can be adopted in live animals.

* * *

Various adaptations of Rubin's utero-tubal insufflation equipment have been tried in the diagnosis of tubal patency in excised bovine genitalia (Hanley, 1953; Kawata and Koike, 1959; Koike and Kawata, 1959; Gowda and Khan, 1975; Nair and Raja, 1977; Athman *et al.* 1983). Results of the study on the incidence of tubal impatency in excised bovine genitalia are reported in this paper.

Materials and Methods

One hundred and thirty eight genitalia of cows and 23 genitalia of heifers, collected from Municipal Slaughter House, Trichur formed the material for the study. Tubal patency was tested by standard procedure (Athman *et al.* 1983). After testing tubal patency, intrauterine pressure was increased until the uterus was "blown up" as indicated by a sudden drop in uterine pressure. The data were statistically analysed (Snedecor and Cochran, 1967).

Results and Discussion

Results of utero-tubal insufflation test on 161 excised genitalia are presented in tables 1 to 4.

The incidence of unilateral and bilateral impatency was recorded to be 8.70 per cent and 19.25 per cent respectively. The incidence of unilateral impatency and bilateral impatency in the genitalia of cows were respectively 7.97 and 18.84 per cent as against 13.04 and 21.74 per cent in the genitalia of heifers (Table 1). Analysis of the data revealed that there was significant difference in the incidence of tubal impatency between cows and heifers ($P<0.01$). This observation of a higher incidence in heifers is in contrast to earlier reports (Gowda and Khan, 1969; Nair and Raja, 1977).

The pressure range at which air escaped from both the salpinx in bilateral patency

TABLE 1. Incidence of tubal impatency in the excised genitalia

Particulars	No. observed			Percentage		
	Cows	Heifers	Total	Cows	Heifers	Total
Bilateral patency	101	15	116	73.19	65.22	72.05
Unilateral impatency	11	3	14	7.97	13.04	8.70
Bilateral impatency	26	5	31	18.84	21.74	19.25
Total	138	23	161	100.00	100.00	100.00

Normal deviation for significance difference of impatency is 1.96 ($P<0.05$) and 2.54 ($P<0.01$)

in cows was 60-185 mm. Hg. with a mean of 128.12±6.81 mm. Hg. On the other hand, in heifers the range of pressure was 80-190 mm. Hg. with a mean of 148.93 ±8.47 mm. Hg. (Table 2). Analysis of data revealed that significantly higher pressure was required to open both the salpinx in heifers than in cows ($P<0.01$). This could probably be explained by the fact that the genitalia of heifers is endowed with better tensile strength and the utero-tubal junction is more tightly closed.

It may be observed from table 3 that in 69.31 per cent of bilateral patency in cows the right salpinx was first to open with a mean pressure of 113.57±2.94 mm. Hg. The mean additional pressure required to open the left salpinx in these cases was 15.79±1.32 mm. Hg. The left salpinx opened first in 26.73 per cent genitalia with a mean pressure of 108.15±4.96 mm. Hg. An additional mean pressure of 19.63±2.34 mm. Hg. was required to open the right salpinx. In the remaining 3.96 per cent genitalia both the salpinx opened simultaneously at a mean pressure of 105.00±15.00 mm. Hg. Analysis of the data revealed that significantly higher pressure was required to open the left salpinx ($P<0.05$). In contrast, the right salpinx was first to open with a mean pressure of 120.42±7.52 mm. Hg. in heifers. The mean additional pressure required to open the left side was 29.17± 5.50 mm. Hg. The left salpinx opened first in 13.33 per cent cases with a mean pressure of 97.50±2.50 mm. Hg. An additional mean pressure of 47.50±42.50 mm. Hg. was required to open the right salpinx in these cases. In the remaining 6.67 per cent genitalia both the salpinx opened simultaneously at a mean pressure of 160.00 mm. Hg. Analysis of the data revealed that significantly higher pressure was required to open the left salpinx ($P<0.01$).

The pressure at which "blown up" condition of the uterus took place in excised genitalia of cows was between 100-280 mm. Hg. with a mean of 164.46 ±2.86 mm. Hg. (Table 2). Similarly in heifers, "blown up" condition occurred at a pressure range of 100-260 mm. Hg. with a mean of 210.00±11.13 mm. Hg. An additional pressure of 36.53±2.37 mm. Hg. over the pressure required to open both the salpinx caused "blown up" condition of uterus of cows. In contrast, in the genitalia of heifers, an additional pressure of 60.35±7.49 mm. Hg. was required to produce "blown up" condition. Statistical analysis showed that significantly higher pressure was needed to produce "blown up" condition of the uterus in heifers ($P<0.01$). The safety margin i.e. the difference between

TABLE 2. Tubal-insufflation test in the excised genitalia

Conditions	No. of genitalia examined			Pressure at which left tube opened (mm. Hg.)		Pressure at which right tube opened (mm. Hg.)		Pressure at which both tubes opened (mm. Hg.)		Pressure at which uterus "blown up." (mm. Hg.)		Additional pressure required to blow up uterus (mm. Hg.)		Safety margin pressure (mm. Hg.)	
	Cows	Heifers	Total	Cows	Heifers	Cows	Heifers	Cows	Heifers	Cows	Heifers	Cows	Heifers	Cows	Heifers
Bilateral patency	101	15	116	Range	60—185	Range	80—180	Range	60—180	Range	65—190	Range	60—185	Range	80—190	Range	100—280	Range	100—260	Range	5—145	Range	20—120	Range	0—140	Range	15—115
				Mean	123.02±2.68	Mean	143.33±8.15	Mean	117.23±2.45	Mean	126.33±8.10	Mean	128.12±6.81	Mean	148.93±8.47	Mean	164.46±2.86	Mean	210.00±11.13	Mean	36.53±2.37	Mean	60.33±7.49	Mean	31.53±2.37	Mean	55.33±7.49
Unilateral impatency	11	3	14	Range	80—120			Range	60—155	Range	140—160	Range	60—155	Range	140—160	Range	150—225	Range	160—240	Range	13—140	Range	20—80	Range	10—135	Range	15—75
				Mean	106.25±8.98			Mean	117.14±12.04	Mean	146.67±6.67	Mean	113.18±8.18	Mean	146.67±6.67	Mean	176.36±6.75	Mean	200.00±23.09	Mean	61.37±11.28	Mean	53.33±17.64	Mean	56.37±11.28	Mean	53.33±17.64
Bilateral impatency	26	5	31	Range	80—210											Range	120—225										
				Mean	157.12±6.58											Mean	171.00±13.68										

Both tubes opened in heifers than in cows $t = 3.1245^{**}$ with df 114 ($P<0.01$)
Pressure needed for producing blown up in heifers $t = 14.294^{**}$ with df 114 ($P<0.01$)

TABLE 3. Bilateral patency of salpinx in the excised genitalia

Particulars	No. observed			Percentage			Mean pressure at which 1st tube opened (mm. Hg.)		Mean pressure at which 2nd tube opened (mm. Hg.)		Mean Additional pressure required to open 2nd tube(mm. Hg.)	
	Cows	Heifers	Total	Cows	Heifers	Total	Cows	Heifers	Cows	Heifers	Cows	Heifesr
Left tube first opened	27	2	29	26.73	13.33	25.00	108.15 ±4.96	97.50 ±2.50	127.78 ±3.96	145.00 ±45.00	19.63 ±2.34	47.50 ±42.50
Right tube first opened	70	12	82	69.31	80.00	70.69	113.57 ±2.94	120.42 ±7.52	129.57 ±2.96	149.58 ±8.24	15.79 ±1.32	29.17 ±5.50
Both tube opened simultaneously	4	1	5	3.96	6.67	4.31	105.00 ±15.00	160.00	105.00 ±15.00	160.00	..	55.00 ±9.57

Pressure to open left salpinx in cows t = 2.1457* with df 95 (P<0.05)
Pressure to open left salpinx in heifers t = 3.2088** with df 12 (P<0.01)

TABLE 4. Unilateral impatency of salpinx in the excised genitalia

	No. observed			Percentage			Pressure at which tube opened (mm. Hg.)		Pressure at which uterus "blown up" (mm. Hg.)		Additional pressure required to "blow up" uterus (mm. Hg.)		Safety margin pressure (mm. Hg.)	
	Cows	Heifers	Total	Cows	Heifers	Total	Cows	Heifers	Cows	Heifers	Cows	Heifers	Cows	Heifers
							Range Mean	Range Mean	Range Mean	Range Mean	Range Mean	Range Mean	Range Mean	Range Mean
Right tube impatent	4		4	36.36		28.57	80—120 106.25±8.98		150—225 178.75±16.63		40—110 72.50±14.93		35—105 67.50±14.93	
Left tube impatent	7	3	10	63.64	100.00	71.43	60—160 117.14±12.40	140—160 146.67±6.67	160—200 175.00±6.27	160—240 200.00±23.09	15—140 57.86±15.65	20—90 53.33±17.64	10—135 52.86±15.75	15—75 48.33±17.64
Total	11	3	14	100.00	100.00	100.00								

Normal deviation for significant difference of impatency between left and right salpinx is 1.96 ($P<0.05$) and 2.54 ($P<0.01$)

the highest pressure at which air escaped through the normal patent salpinx and the maximum safe pressure (5 mm. Hg. less than pressure at which "blown up" condition of uterus occurred) was 31.53 ±2.37 mm. Hg. and 55.33±7.49 mm. Hg. in excised genitalia of cows and heifers (table 2) respectively.

The incidence of unilateral impatency in excised genitalia was recorded to be 8.70 per cent. There was significantly higher ($P<0.01$) incidence of impatency in left side (71.43%) than right side (Table 4). The pressure range at which air escaped through the patent left salpinx in impatency of the right side was between 80-120 mm. Hg. with a mean of 106.25±8.98 mm. Hg. In contrast, in the left sided impatency, air escaped through the right salpinx at a range of 60-160 mm. Hg. with a mean of 117.14 ±12.40 mm. Hg. Mean pressure at which "blown up" uterus occurred was 178.75±16.63 mm. Hg. and 175 00± 6.27 mm. Hg. in right and left impatency cases respectively. The additional pressure required to produce "blown up" condition of the uterus in right and left sided impatency were 72.50±14.93 mm. Hg. and 57.86±15.65 mm. Hg. respectively. Safety margins in unilateral impatency cases were noted to be 67.50± 14.93 mm. Hg. and 52.86+15.75 mm. Hg. respectively in right and left sided impatency in cows. Unilateral impatency of salpinx in heifers was found restricted to left salpinx. In all these cases, the right tube opened with a mean pressure of 146.67±6.67 mm. Hg. and an additional pressure of 53.33±17.64 mm. Hg. was required to produce "blown up" condition. The safety margin in heifers was found to be 48.33±17.65 mm. Hg.

The incidence of bilateral impatency in excised genitalia of cows and heifers was recorded as 18.84 and 21.74 per cent respectively. The pressure at which "blown up" uterus occurred ranged from 80-210 mm. Hg. with a mean of 157.12+6.58 mm. Hg. in cows as against 120-225 mm. Hg. with a mean of 171.00 ±13.68 in heifers.

Acknowledgement

This paper is published with the permission of the Dean, College of Veterinary and Animal Sciences, Mannuthy.

REFERENCES

Athman, KV, Iyer, CPN and Nair, KP (1983). Utero-tubal insufflation technique I Fabrication of tubal insufflation equipment (under publication).

Gowda, HC and Khan, CKA (1975). Tubal insufflation of excised genitalia. Mysore J. Agri. Sci. 9 (1): 145-161.

Hanley, S (1953). A preliminary study of utero-tubal insufflation in the bovine animal. Ir. vet. J. 7: 142-161.

Kawata, K and Koike, T (1959). Studies on tubal patency of the cow II. Tubo-insufflation test in clinical cases. Jap. J. vet. Res. 7: 149-155.

Koike, T and Kawata, K (1959). Studies on tubal patency of the cow I. Experiments made with slaughter house material. Jap. J. vet. Res. 7: 61-69.

Nair, KP and Raja, CKSV (1977). A preliminary study on utero-tubal insufflation of the bovine genitalia. Indian vet. J. 54: 309-312.

Snedcor, CN and Cochran, WG (1967). STATISTICAL METHODS. 6th edn. The Iowa State University Press, Ames, Iowa, U.S.A.

IJAR 4: 2: 30-33

Utero-tubal Insufflation Technique III Diagnosis and Treatment of Tubal Impatency in Repeat Breeder Cows

KV Athman; CP Neelakanta Iyer and K Prabhakaran Nair

Department of Animal Reproduction
College of Veterinary and Animal Sciences
Kerala Agricultural University, Vellanikkara

ABSTRACT

Thirty five repeat breeder cows and two repeat breeder heifers were subjected to utero-tubal insufflation test using an equipment designed by the authors. The incidence of unilateral and bilateral impatency of the salpinx in cows were 2.86 per cent and 14.28 per cent respectively. However, both the heifers were found to have bilaterally patent salpinx. The test showed that the safety margin is fairly high and hence uterotubal insufflation test is of great diagnostic value in bovines. Since 69.56 per cent cows with bilaterally patent salpinx on testing conceived with an average of 1.13 inseminations, the test is considered to be of therapeutic value in clearing temporary tubal blockage.

* * *

Pathological conditions of the salpinx and bursa ranged from 10 to 15 per cent and caused failure of fertilization and repeat breeding (Roberts, 1971 and Arthur, 1975). Since many of the salpingeal affections with the possible exception of pyosalpinx and hydrosalpinx do not cause gross alteration in size and consistency of the organ, the conditions are difficult to diagnose by palpation on clinico-gynaecological examination. This paper presents observation on the diagnosis and treatment of tubal impatency in cyclic non-breeder cows and heifers with a special uterotubal insufflation equipment (Athman *et al.* 1983).

Materials and Methods

Thirty five repeat breeder cows and two repeat breeder heifers formed the material for study. The tubal patency was tested in these repeat breeders by standard procedure (Athman *et al.* 1983). After carrying out the test, in a few cases, the air pressure was increased until "blown up" condition of the uterus was produced as indicated by sudden drop in air pressure. All these animals were clinically examined for the next 2-5 days. Two of them were slaughtered at 48 hours to estimate the extent of uterine damage. All the animals subjected to the test were administered intra-uterine 1 g of streptomycin and 4 lakh units of penicillin in 30 ml. of distilled water to prevent possible uterine infection. All the cows with bilateral patency which returned to heat after the test were inseminated in the first heat to study conception rate. The data was subjected to statistical analysis as per Snedecor and Cochran, (1967).

Results and Discussion

The incidence of bilateral patency,

TABLE 1. Incidence of tubal impatency in infertile cows and heifers

Particulars	No. observed			Percentage		
	Cows	Heifers	Total	Cows	Heifers	Total
Bilateral patency	29	2	31	82.86	100.00	83.78
Unilateral impatency	1	..	1	2.86	..	2.70
Bilateral impatency	5	..	5	14.28	..	13.52
Total	35	2	37	100.00	100.00	100.00

TABLE 2. Tubal-insufflation test in infertile cows and heifers

Conditions	No. of cattle snbjected to the test			Pressnre at which left tube opened (mm. Hg.)		Pressure at which right tube opened (mm. Hg.)		Pressure at which both tnbes opened (mm. Hg.)	
	Cows	Heifers	Total	Cows	Heifers	Cows	Heifers	Cows	Heifers
				Range Mean	Range Mean	Range Mean	Range Mean	Range Mean	Range Mean
Bilateral Patency	29	2	31	80—155 110.52±4.28	120—130 125.00±5.00	65—145 104.48±4.12	110—145 127.50±17.50	65—150 116.38±3.88	110—145 127.50±17.50
Unilateral impatency	1		1			120.00			

Both tubes opened in heifers than in cows t = 5.91** with df. 29 (P<0.01)

unilateral impatency and bilateral impatency in repeat breeder cattle were recorded to be 83.78, 2.70 and 13.52 per cent respectively. Out of the 35 cows subjected to the test, 82.86 per cent had bilateral patency, 2.86 per cent unilateral impatency and 14.28 per cent bilateral impatency. In contrast, both the heifers were found to have bilaterally patent salpinx (Table 1).

The pressure range at which air escaped from both the tubes in bilateral patency cases was 65-150 mm. Hg. with a mean of 116.38±3.88 mm. Hg. in cows and 110-115 mm. Hg. with a mean of 127.50±17.50 mm. Hg. in heifers (Table 2). Analysis of the data revealed that significantly higher pressure was required to open both the tubes in heifers than in cows (P<0.01).

The test revealed that in 20 out of the 29 cows with bilateral patency, the right salpinx opened first with a mean pressure of 97.50±6.90 mm. Hg. An additional mean pressure of 17.25±2.65 mm. Hg. was required to open the left salpinx. In seven cows the left tube opened first with a mean pressure of 98.57±5 93 mm. Hg. and an additional pressure of 17.86 ±3.91 mm. Hg. was required to open the right salpinx. Both the tubes opened simultaneously in two cows with a mean pressure of 80.00 mm. Hg. The right and left tubes were first to open in one case each in heifers (Table 3). There was no significant difference between the right and left side in the pressure required to open the salpinx.

Blown up condition of the uterus was produced in seven bilateral patency,

TABLE 3. Bilateral patency of salpinx in infertile cows and heifers

Particulars	No. observed			Percentage			Pressure at which 1st tube opened (mm. Hg.)		Pressure at which 2nd tube opened (mm. Hg).		Additional pressure required to open 2nd tube (mm. Hg.)	
	Cows	Heifers	Total	Cows	Heifers	Total	Cows	Heifers	Cows	Heifers	Cows	Heifers
Left tube first opened	7	1	8	24.14	50.00	25.81	98.57 ±5.93	120.00	114.43 ±5.53	145.00	17.86 ±3.91	25.00
Right tube first opened	20	1	21	68.97	50.00	67.74	97.50 ±6.90	110.00	117.00 ±16.64	130.00	17.25 ±2.65	20.00
Both tubes opened simultaneously	2		2	6.89		6.45	80.00		80.00			
Total	29	2	31	100.00	100.00	100.00						

one unilateral impatency and four bilateral impatency cases in repeat breeders (Table 4). In five cows with bilaterally patent tubes, the pressure at which "blown up" condition occurred was between 120-220 mm. Hg. The mean additional pressure required to produce "blown up" condition was 65.00±14.10 mm. Hg. and therefore the safety margin was estimated to be 60.00 mm. Hg. In contrast, in two heifers with bilaterally patent tube, the pressure at which "blown up" uterus occurred was between 195-200 mm. Hg. The mean additional pressure required to produce "blown up" condition and the safety margin were found to be 60.00±14.10 mm. Hg. and 55.00 mm. Hg. respectively. Analysis of the data revealed that there was significant difference between cows and heifers in the additional presure required to produce the "blown up" uterus ($P<0.05$). The mean additional pressure used to produce "blown up" uterus in one cow with unilateral impatency was 90.00 mm. Hg. Thus a safety margin of 85.00 mm. Hg. was obtained in cows with unilateral impatency of salpinx. The pressure at which uterus was "blown up" in cows and heifers with bilateral impatency were 195.00 mm. Hg. and 210.00 mm. Hg. respectively.

Clinical examination of cows and heifers subjected to "blown up" condition revealed total absorption of the escaped air in all cases. The uterine tear was not traceable and there was only small quantity of blood in the uterine cavity on post mortem examination. Conception rate of cows with bilaterally patent tubes after untero-tubal insufflation test is given in table 5. Sixteen out of 23 cows inseminated (69.56%) conceived with an average of 1.13 insemination per conception.

Acknowledgement

This paper is published with the permission of Dean, College of Veterinary and Animal Sciences, Mannuthy.

TABLE 4. Blown up condition subjected tubal-insufflation test

Conditions	No. of cattle subjected to "blown up" of uterus			Pressure at which both tubes opened (mm. Hg.)		Pressure at which uterus "blown up" (mm. Hg.)		Additional pressure required to "blow up" uterus (mm. Hg.)		Safety Margin pressure (mm. Hg.)	
	Cows	Heifers	Total	Cows	Heifers	Cows	Heifers	Cows	Heifers	Cows	Heifers
				Range Mean	Range Mean	Range Mean	Range Mean	Range Mean	Range Mean	Range Mean	Range Mean
Bilateral patency	5	2	7	65—150 100.00±8.55	110—145 127.50±17.50	120—220 171.00±16.16	195—200 197.50+2.50	35—100 65.00±14.10	55—65 60.00±5.00	30—95 60.00±14.10	50—60 55.00±5.00
Unilateral impatency	1		1	120.00	135.00	210.00	200.00	90.00		85.00	
Bilateral impatency						180—220 195.00±12.58	210.00				

TABLE 5. Conception rate of cows with bilateral patency of tubes after utero-tubal insufflation test.

No. of cows subjected to the test	No. of cows which came to heat	No. conceived	Percentage of conception	Average number of insemination per conception
24	23	16	69.56	1.13

REFERENCES

Arthnr, GH (1975). VETERINARY REPRODUCTION AND OBSTETRICS: The English Language Book Society and bailliere. Tindal. 4th edn. pp. 366.

Athman, KV, Iyer, CPN and Nair, KP (1983). Utero-tubal insufflation technique I. Fabrication of tubal insufflation equipment (under publication).

Roberts, SJ (1971). VETERINARY OBSTETRICS AND GENITAL DISEASES. Published by author, Ithaca, New York. pp. 473-496.

Snedcor, CN and Cochran, MG (1967). STATISTICAL METHODS. 6th edn. The Iowa State University Press, Ames, Iowa, U.S.A.

IJAR 4: 2: 34-41

Lymphocytic Infiltration in the Bovine Endometrium in Relation to Fertility.

AK SINHA, JM NIGAM, and DN SHARMA

Department of Gynaecology & Obstetrics
College of Veterinary Sciences
Haryana Agricultural University
Hissar 125 004 Haryana

ABSTRACT

Extent of lymphocytic infiltration in the endometrium of bovines during standing estrus has been found to be associated with the fertility of the animal. A technique for the scoring of lymphocytic infiltration in the endometrium has been developed. It was observed that fertility of the animal reduced when the lymphocytic infiltration score (I.S. value) was above 0.5 and increased significantly ($P<0.01$) when the I.S. value decreased below 0.5. In cases of endometritis majority of endometrial samples (58.55%) showed an I.S. value above 0.5. The nse of this technique for the diagnosis of subfertility and endometritis has been discussed.

* * *

Normally, the endometrium is infiltrated with various types of inflammatory cells and Studer and Morrow (1978) have suggested that presence of a certain category of cells may be indicative of a particular stage of estrus cycle in cattle. Lymphocytic infiltration in the endometrium has been reported in the repeat breeder cows (Hartigan *et al*, 1972) and Zafracas (1975) opined that extensive round cell infiltration indicated functional disorder of the uterus associated with failure of fertilization or implantation of the fertilized ovum. The present investigation was hence initiated to compare the extent of lymphocytic infiltration in the endometrium of repeat breeders and normal cows and buffaloes during standing estrus and also from buffaloes suffering from endometritis. An effort has also been made to devise a scale for the quantitation of lymphocytic infiltration in these animals on the lines adopted by Gordon & Sartin (1978) in mare nterus with minor modifications.

Materials and Methods

The experiment was conducted on 85 cattle belonging to College of Animal Science Farm, Haryana Agricultural University, Hissar and government Livestock Farm, Sector I, Hissar and 29 buffaloes from Progeny Testing Bull Farm, Hissar. The animals in these farms were maintained under optimum managerial condition with adequate nutrition. They were regularly checked for the seroprevalence of diseases like brucellosis, tuberculosis and Johne's disease. Heat detection was performed regularly with the help of vigorous vasetomised bull and trained attendants, both in the morning as well as in the afternoon.

The animals were divided into two groups to facilitate the collection of

samples of endometrial biopsy.

Group I: Comprised of animals which were given upto two inseminations before the cycle under study — normal.

Group II: Comprised of animals which had been given more than three inseminations before collection of biopsy — repeaters.

All the samples were collected during standing estrus. The animals were inseminated (Post collection) as per the farm schedule. All these animals had apparently normal genitalia and did not reveal any gross genital abnormality as confirmed through rectal examination. Buffaloes suffering from second degree endometritis constituted the third group.

The biopsy samples were collected with the help of Nielsen's Uterine biopsy catheter. The catheter was introduced into one of the horns of the uterus as in the artificial insemination by rectal manipulation. The piece of endometrium which lodged into the groove of the biopsy instrument was released into a tube containing 10% neutral buffered formalin. The tubes containing the samples were put on the ice and brought to the laboratory and kept in a refrigerator between 4-8°C till further processing.

The fixed tissues were processed through standard acetone-benzene schedule infiltrated and embedded in paraffin and sectioned at 4-6 microns thickness. The section were stained with standard haematoxylin and eosin stain. *Follow up of the animals and their grading for the interpretation of the results.* The animals were checked for pregnancy after an expiry of a period of 40-45 day post-biopsy and post A.I. Those animals which repeated and showed heat symptoms were reinseminated during their successive estrus.

On the basis of pregnancy results the animals were divided into three grades of fertility, Grade I — Those animals which settled by insemination given on the day of biopsy collection i.e. first A-I. post biopsy.

Group II: Comprised of the animals settling by the insemination on the second estrus post-biopsy.

Grade III: Were such animals which conceived on 3rd and/or subsequent insemination post-biopsy.

Quantitation of lymphocytic infiltration

The endometrial tissues were screened for the types of cells and extent of infiltration in their different components viz., the luminal epithelium, the glandular epithelium, the superficial stroma and the deep stroma. Following criteria were used for the quantiatation of cells in these components.

A. Luminal and glandular epithelium; upto one cell per high power field (h.p.f.) was considered mild infiltration and was denoted as degree I. Two to ten cells per h.p.f. was considered as moderate infil-

TABLE 1. Comparison of three grades of cows in relation to infiltration score.

Score	Grade I		Grade II		Grade III		Total	Chisquare
	obs.	expt.	obs.	expt.	obs.	expt.		value
Less than 0.5	27	15-64	13	16.68	9	16.68	49	26.32
More than 0.5	3	14.36	19	15.32	2	15.32	45	df.=2

** Significant at 1 per cent level.

TABLE 2. Comparison of grades I and II animals in relation to infiltration score.

Score	Grade I obs.	Grade I exp.	Grade II obs.	Grade II exp.	Total	Chisquare value
Less than 0.5	27	19.35	13	20.64	40	16.486**
More than 0.5	3	10.35	19	11.36	22	df.=1

** Significant at 1 per cent level.

TABLE 3. Comparison of grades I and III animals in relation to infiltration score.

Score	Grade I obs.	Grade I exp.	Grade III obs.	Grade III exp.	Total	Chisquare value
Less than 0.5	27	17.42	9	12.58	36	24.342**
More than 0.5	3	18-58	23	13.42	26	df.=1

** Significant at 1 per cent level.

TABLE 4. Comparison of grades II and III in animals in relation to infiltration score.

Score	Grade II obs.	Grade II exp.	Grade III obs.	Grade III exp.	Total	Chisquare value
Less than 0.5	13	11.0	9	11.0	22	1.108N.S.
More than 0.5	19	21.0	23	21.0	42	df.=1

N.S. = Not Significant

tration and was given degree 2. More than 10 cells per h.p.f. was considered as severe infiltration and was graded as degree 3.

B. For superficial and deep stroma; zero to five cells per h.p.f. were considered as mild (degree I), six to 15 cells per h.p.f. were considered moderate (degree 2) and more than 15 cells per h.p.f. was considered severe (degree 3).

Infiltration score (I.S.) was calculated in the following manner: $I.S. = \frac{\text{Total score of individual endometrial tissues}}{F}$

F being a factor obtained by multiplying three (degree of infiltration) with number of endometrial components.

Results

The tunics propria of the uterus which were normally quite cellular during estrus were generally infiltrated with eosinophils and neutrophils (Fig. 1) Lymphocytes were observed to be present in almost all the components of endometrium viz. lunimal epithelum (Fig. 2) glandular epithelium (Fig. 3) and propria (Fig. 4). However, no true lymph nodules were observed in any of the samples, although focal lymphocytic aggregates (Fig. 2) were noted in few samples.

On the basis of lymphocytic infiltration score the animals were classed into two categories, one having an infiltration score below 0.5 and other having a score value above 0.5. The distribution

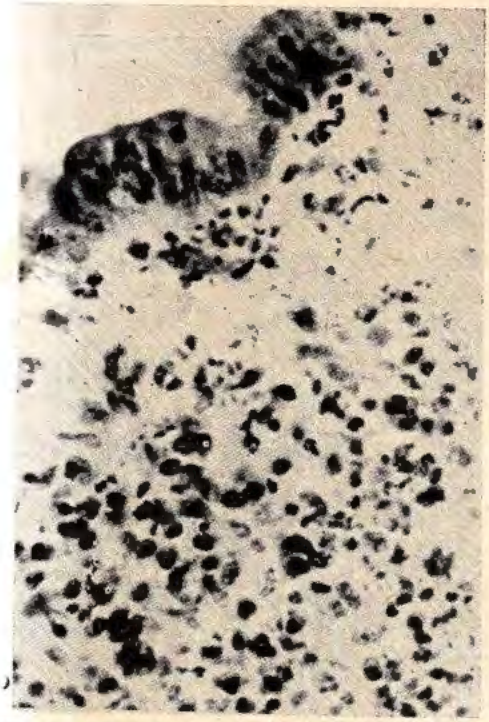


Fig. 1. Microphotograph showing eosinophilic and neutrophilic infiltration in the subepithelial propria & luminal epithelium. H & E×400.

Fig. 2. Microphotograph showing lymphocytic infiltration in the luminal epithelium and aggregate of lymphocytes in the subepithelial propria. H & E×400.

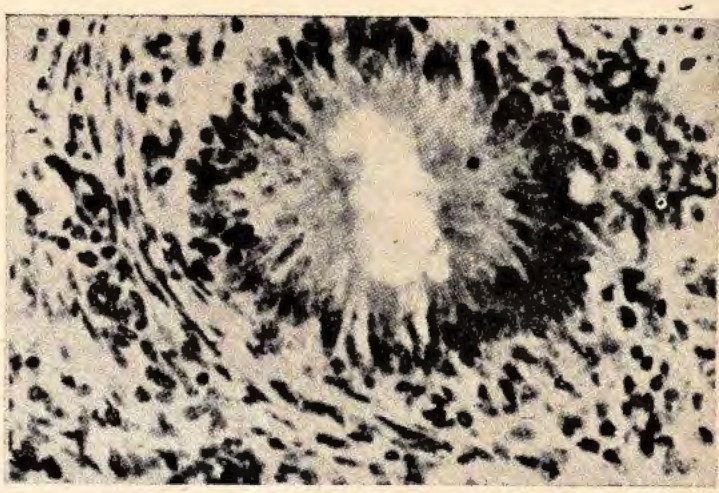


Fig. 3. Microphotograph showing lymphocytes around the gland and in the glandular epithelium H & E×400.

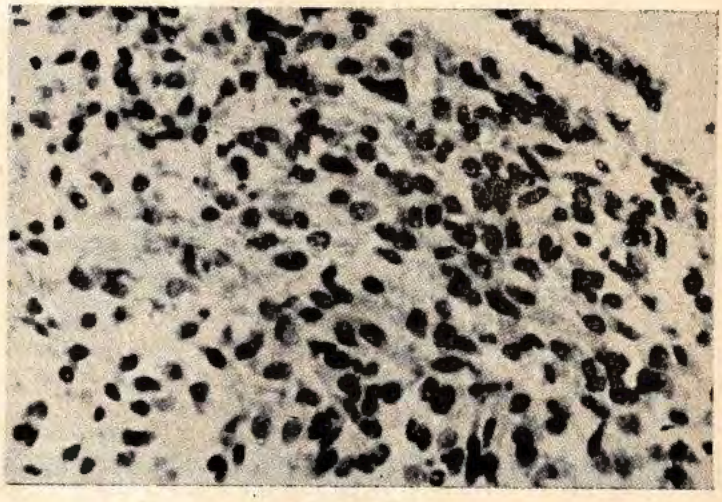


Fig. 4. Microphotograph showing infiltration of lymphocytes along with neutrophilic and eosinophilic in the superficial propira. H & E×400.

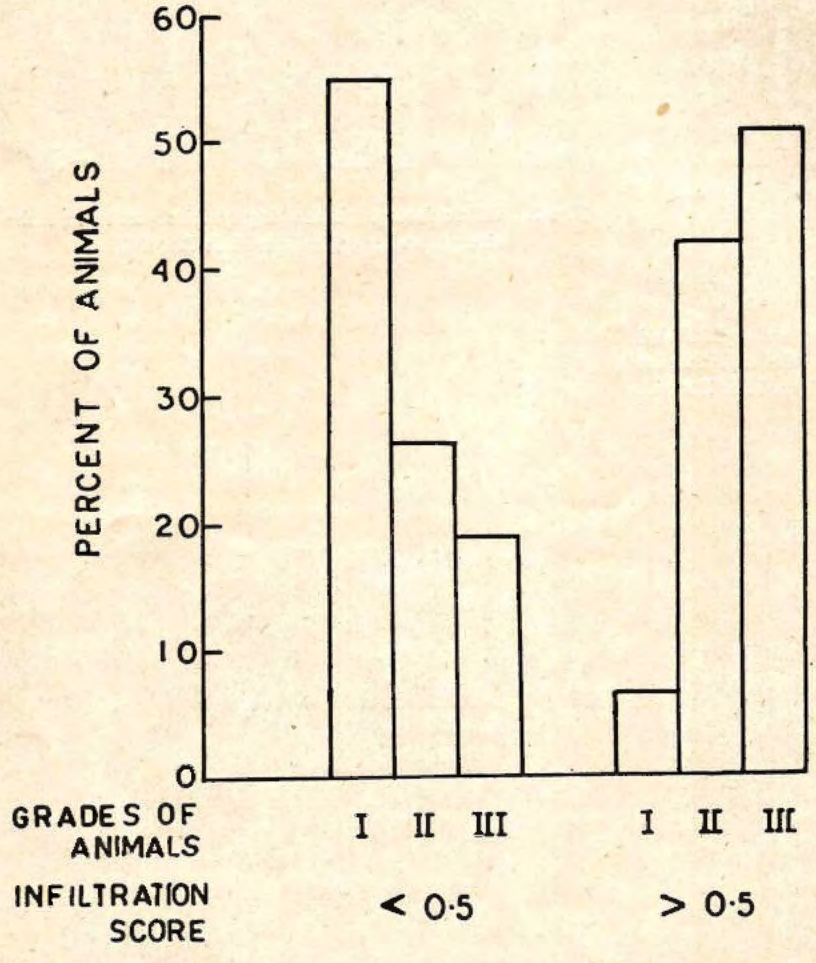


FIG.5 INFILTRATION SCORE IN COWS OF DIFFERENT GRADES OF FERTILITY

Fig. 5. Histogram showing infiltration score in cows in different grades of fertility.

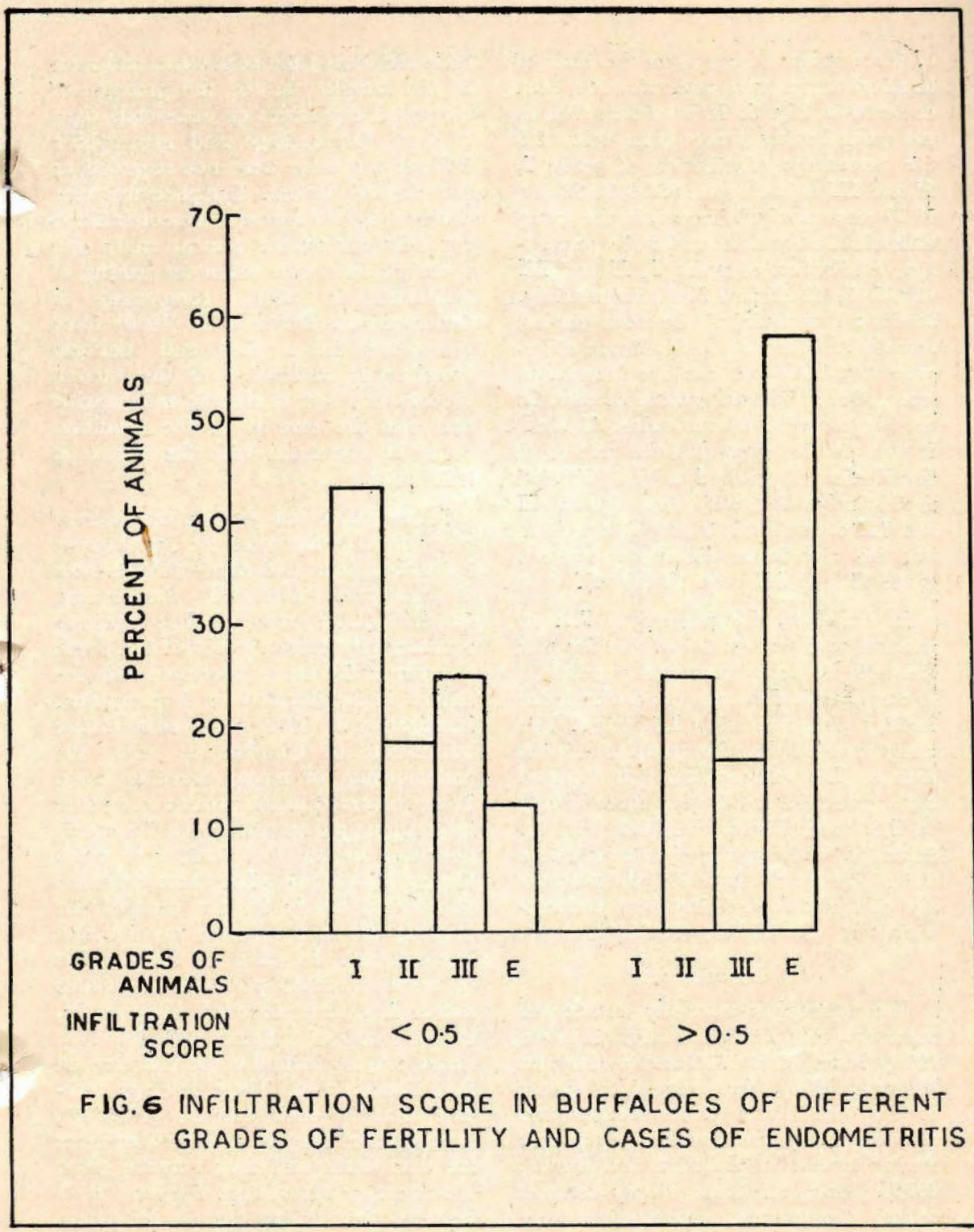


Fig. 6. Histogram showing infiltration score in buffaloes of different grades of fertility and cases of endometritis.

of three grades of cows (on the basis of fertility) under two categories has been depicted in Fig. 5. It is evident that in the group having a score value below 0.5 the percentage distribution of grade I, II and III animals were 55.10, 26.33 and 18.37 respectively. Whereas, in the group which had a score above 0.5 the percentage distribution of grade I, II and III was 6.47, 42.22 and 51.11 respectively. Statistical analysis of the data further revealed that there was significant difference ($P<0.01$) between the infiltration score of the different grades of cows in the two categories of score values (Table I). It was also observed that the pattern of distribution of grade I animals differed significantly ($P<0.01$) from grade II and III cows (Table 2 and 3) but there was no significant difference between grade II and III cows (Table 4).

In buffaloes, the pattern of I.S. in relation to three grades of fertility was although not consistent and parallel as in cows, yet it showed a trend of reduced fertility with increasing I.S. value. The study revealed that the group of animals with an I.S. value of less than 0.5 had more grade I animals than those having an I.S. value higher than 0.5 (Fig. 6). Secondly, in the group of animals where the IS value was above 0.5, the percentage of buffaloes suffering from endometritis was the highest (58.55%).

Discussion

The neutrophils normally invade the uterine mucosa at the time estrus (Skjerven, 1956, Dozsa, *et al* 1980 and Studer and Morrow, 1978), the eosinophils appear in the late estrus phase (Studer and Morrow 1978) and lymphocytes appear during metestrus (Dellman and Brown, 1976). Since all these biopsy samples during the present investigation were collected during the peak estrus and most of the samples showed the presence of congested capillaries or occasional signs of focal haemorrhage and neutrophilic infiltration; these were not regarded as pathological lesions. Lymphocytes were observed to be the most comomon infiltrating cells during the present study and therefore they were taken for scoring of infiltration in various components of endometrium. Dozsa *et al* (1960) have considered the marked and uniform lymphocytic infiltration of the uterine mucosa as a sign of chronic endometritis and also the severity of the condition could be correlated with the degree of infiltration.

It was observed during the present study that as the score for lymphocytic infiltration increased above 0.5, chances of conception decreased significantly. Zafracas (1975) reported that extensive round cell infiltration indicated functional disorder of the uterus associated with the failure of fertilization or implantation. Hartigan *et al* (1972) observed a diffuse infiltration of lymphocytes into the endometrium of repeat breeding cows. It was observed in the present study that infiltration upto certain degree ($I.S.<0.5$) does not impair the fertility of cows. Generally, when the I.S. value increased above 0.5, nearly 93 per cent of the animals did not conceive on the first insemination. In cases of endometritis in buffaloes, 58.55 per cent of animals had an I.S. value above 0.5. Additionally, in the group of buffaloes with IS value above 0.5, no animal could conceive on first insemination. These findings indicate that in such animals ($IS>0.5$), insemination may be withheld at least for that estrus and they may be given treatment or sexual rest. Hurley (1972) reported that during chronic inflamma-

tion mononuclear cells form an increasing proportion of extravascular cells in the inflammed areas and the non-specific histological appearances of chronic inflammation are often overlooked. Therefore, the scoring pattern developed during the present study may be used for the cytomorphological diagnosis of degree of uterine inflammation and subfertility.

REFERENCES

Dellman, Horst-Dieter and Brown, EM (1976). Textbook of Veterinary Histology. Lea and Febiger, Philadelphia.

Dozsa, L, Olson, NO and Compbell, A (1960). A uterine biopsy technique for following the histologic changes caused by Vibrio fetus in the uterine muccosa. Aur. J. Vet. Res. **21**: 878-883.

Gordon, LR and Sartin, EM (1978). Endometrial biopsy as an aid to diagnosis and prognosis in equine infertility. J. Equine Med. Surg. **1**: 328-336.

Hartigan, PJ, Murthy, JA, Nunn, WR and Griffin, JFJ (1972). An investigation into causes of reproduction failure in dairy cows. 1. gross and microscopic observation on the genitallia of slaughtered non pregnant cows. Irish Vet. J. **26**: 225:228 (Vet. Bull. 43:1279).

Hurley, JV (1972). Acute inflammation. Churchill Livingstone, Edinburgh.

Skjerven, O (1956). Endometrial biopsy studies in reproductively normal cattle-chemical, histochemical and histological observations during the estrous cycle. Acta Endocrinol. 22 (Suppl 26): 1-101.

Studer, E and Morrow DA (1978). Postpartum evaluation of bovine reproductive potential; comparison of findings from genital tract, examination perrectum, uterine culture and endometrial biopsy. J. Am. Vet. Med. Assoc. **172**: 489-494.

Zafracas, AM (1925). Diagnosis of endometritis in cattle by uterine biopsy. Proceedings 20th world Vet. Congr. **3**: 1966-1972.

IJAR 4: 2: 42-44

Physio-Biochemical Studies of Cervical Mucus in Cyclic and Repeat Breeding Crossbred Cattle

UMA SHANKER, MC SHARMA, RP VERMA and OP GUPTA

Livestock Production Research (Cattle & Buffalo)
Indian Veterinary Research Institute
Izatnagar (U.P.) 243 122.

ABSTRACT

Different biochemical parameters of cervical mucous in normal cyclic and repeat breeding crossbred cows have been studied. In normal cyclic animals, higher contents of total protein and total lipids were found whereas in repeat breeding group, fern pattern was scattered small in size with thin branching, higher alkaline pH and higher contents of calcium, chloride and magnesium were observed. The higher content of total protein in normal cyclic animals might be responsible to improve environment for sperm transport.

* * *

Reproduction plays an important role in livestock production. On the occurrence of varions reproductive disorders lead to economic losses. Repeat breeding cows normally follow regular oestrus cycle but fail to conceive. A deficiency of progesterone may be responsible for early embryonic mortality (Herrick, 1953; Dawson, 1954). The success of crossbreeding programme which have been taken up on large scale is chiefly dependent on normal reproductive process. Therefore, it was decided to study the various chemical changes taking place in cervical mucous during normal cyclic oestrus and repeat breeding crossbred cattle.

Materials and Methods

Cervical mucous samples of twenty crossbred oestrus cows were collected from the Institute farm. The cows were divided into two equal groups namely normal cyclic oestrus and repeat breeding cows. The normal cyclic oestrus group comprised those animals having physiological oestrus phenomena and was associated with the development of the Graafian follicles in the ovary under the influence of gonadotrophic hormones, characterised by sexual desire and acceptance of male by the cows. The repeat breeding group was comprised of such cows which were artificially bred more than five times with the semen of fertile bulls in subsequent oestrus cycle but failed to conceive. The cervical mucous was collected during oestrus by rectal massage and processed for further study. These animals were kept under conventional feeding and managerial conditions. The following parameters were studied namely elasticity and viscosity of mucous; fern pattern; hydrogen ion concentration (by BDH indicator paper), calcium (Webster, 1962,) chloride (Whitehorn, 1921), magnesium (Andreasen, 1957); total protein (Lowry *et al.*, 1951) and total lipid (Folch *et al.*, 1957).

The mean values of each parameters in the group of normal cyclic and repeat

TABLE 1. Showing physio-biochemical values of cervical mucous (mean±SE) in normal and repeat breeding crossbred cows

Biochemical entitis	Normal cyclic Cow	Repeat breeding Cow
Elasticity and viscocity	Beginning-thin albumin Middle-thick and elastic pale yellow	Beginning-thin albumin Middle-thick elastic and and slightly milky
Fern pattern	Tertiary branching (less lymphocyte)	Scattered, small in size and thin branching (none lymphocyte)
Hydrogen-ion concentration	6.90±0.49	8.2±0.26*
Calcium (mg/100 ml)	11.04±2.62	23.22±3.24*
Chloride (mg/100 ml)	900.00±72.32	1212.00±70.23*
Magnesium (mg/100 ml)	2.84±0.92	5.82±0.72*
Total protein (mg/100 ml)	485.67±48.32	450.00±59.62
Total lipid (mg/100 ml)	8.23±3.12	7.92±2.31

* P> 0.05

breeding cows were compared in respect of a particular observation only. Data are shown in terms of mean ± standard error (SE). For this comparison, the two sample 't' test was utilized (Snedecor and Cochran, 1967).

Results and Discussion

The biochemical changes of cervical mucous in both groups (normal oestrus and repeat breeding) have been shown in Table I.

1. *Elasticity and viscosity of mucous:* Oestrus is characterised by flow of the cervical mucous. In both the groups, in the beginning mucous was like thin albumin while it was thicker and elastic from mid to late heat. It was possible to draw out the strings from the mucous. The only differentiation was in the change of colour. It was towards pale in normal cyclic group while it was slightly milky in repeat breeding group. Similar findings were also reported by Tomar (1970).

2. *Fern pattern:* Fern pattern exhibits different forms in mucous drawn from normal cyclic and repeat breeding cows. In normal cyclic cows, typical tertiary branching was observed while in repeat breeding group, the fern pattern was scattered, small in size and branching was also thin and fine. Luktuke and Roy (1967) have also observed typical fern pattern in normal cyclic animals. The infiltration of lymphocytes was less in cyclic animals in comparison to repeat breeding animals.

3. *Hydrogen ion concentration:* The values of pH of cervical mucous in normal cyclic and repeat breeding cows were 6.9±0.49 and 8.2±0.26 respectively and difference in between two values was significant. Similar values have been observed by Ahuja *et al.* (1961) for normal cyclic

animals and El-Naggar and Horvath (1972) for repeat breeding cattle. Our results are disagreeable with Wani *et al.* (1981), the reason for the same may be breed variation.

4. *Calcium:* The calcium concentration of cervical mucous in normal cyclic oestrus cows were 11.04±2.62 mg % while in repeat breeding oestrus cows were 23.32±3.24 mg % and the results were statistically significant. Similar observations have also been reported by Roland (1952).

5. *Chloride:* The chloride concentration was less in normal cyclic (902± 72.32) mg % animals than repeat breeding (1212.00±70.23) mg % and the results were significant. Macdonald (1968) has also observed same findings.

6. *Magnesium:* The mean value of magnesium concentration in cervical mucous was 2.84±0.92 mg % in normal cyclic animals while 5.82±0.72 mg % in repeat breeding animals. The higher value for repeat breeding animals was statistically significant and were agreeable with Vickery and Bennett (1968).

7. *Total protein:* Total protein content of cervical mucous in normal cyclic animals was more (485.67±48.32) mg % than repeat breeding animals (450.00± 59.62) mg % and the results were not statistically significant. Our findings are in agreeable with Lamothe (1970), Iacobelli (1971), Hamana *et al.* (1971) and Wani *et al.* (1980). The higher concentration of total protein in normal cyclic animal may be due to higher percentage of oestrogenic activity for the secretion of cervical mucous so that increase in protein may help to increase the chance of conception.

8. *Total lipids:* The total lipid content of cervical mucous in normal cyclic cows was higher (8.23±3.12) mg % than repeat breeding cows (7.92±2.31) mg %. However, the results were statistically non-significant. Our findings are disagreeable with Wani *et al.* (1981), this may be due to breed variation.

Acknowledgement

The authors are thankful to Dr CM Singh, Director and Dr R R Mishra, I/C LPR (C & B), IVRI, Izatnagar, for providing necessary facilities. We are also thankful to Dr S N S Gaur, Associate Professor, G B Pant University of Agriculture & Technology, Pantnagar for providiug cooperation and necessary help.

REFERENCES

Ahuja, LD, Luktuke, SN and Bhattacharya, P (1961). Ind. J. Vet. Sci., **33** (Suppl.): 13.
Andreasen, E (1957). Scand. J. Clin. Lab. Invest., **9**: 138.
Dawson, FLM (1954). Vet. Rec., **66**: 326.
El-Naggar, MA and Baksai-Horvath, E (1972). Acta Vet. Hung., **22**: 31.
Folch, J, Lees, M and Solanestanley, CH (1967). J. Biol. Chem., **226**: 497.
Hamana, K, El-Banna, AA and Hafez, ESE (1971). Cornell Vet., **61**: 105.
Herrick, JB (1953). Vet. Med., **48**: 489.
Iacobelli, S, Carcea, N and Angeloni, C (1971). Fertil. Steril., **22**: 727.
Lamothe, P, Guay, P, Ibrahim, M and Temblay, A (1970). Canad. J. Comp. Med. **36**: 94.
Lowry, OH, Rosenbrough, NJ, Farr, AL and Randall, RJ (1951). J. Biol. Chem, **193**: 265.
Luktuke, SN and Roy, DJ (1967). Ind. J. Vet. Sci., **37**: 26.
Macdonald, RR (1968). J. Obst. Gynae. Brit. Comm, **70**: 58.
Roland, M (1952). Amer. J. Obst. Gynae., **63**: 81.
Snedecor, GW and Cochran, WG (1967). Statistical Methods. Oxford and IBH Publishing Co., New Delhi (1967).
Tomar, NS (1970). Artificial insemination and reproduction of cattle and buffaloes, Saroj Prakashan, Katra, Allahabad, pp. 144.
Vickery, BH and Bennett, JP (1968). Physiol. Rev., **48**: 135.
Wani, GM, Tripathi, SS and Saxena, VB (1981). Ind. J. Ani. Repro., **1**(1):76.
Wani, GM, Tripathi, SS and Saxena, VB (1980). Ind. Vet. Med. J., **4**: 62.
Webster, WW (Jr.) (1962). Amer. J. Clin. Path., **37**: 330.
Whitehorn, CE (1921). J. Biol. Chem., **45**: 449.

IJAR 4: 2: 45-48

Inorganic Phosphate Concentration in Cervico-Vaginal Mucus of Fertile and Infertile Cows

A KRISHNASWAMI and IM UTHAPPA

Department of Gynaecology & Obstetrics
Veterinary College, Hebbal, Bangalore-560 024

ABSTRACT

There was no significant difference between the concentration of inorganic phosphate in the cervico-vaginal mucus of cows in fertile heat and repeat breeders. However, its concentration in the cases of endometritis was significantly higher than in fertile heat and repeat breeders.

* * *

It has now been well established that cervical or cervico-vaginal mucus has some specific beneficial effect on the viability and longevity of the spermatozoa in the female genital tract. The comparatively maximum survival of the spermatozoa in the cervical mucus has been postulated to be due to the presence of cervical factors (Weed and Carrera, 1970). The chemical composition of these fluids, particularly, the cervical and cervico-vaginal secretions are gaining rapid recognition due to the fact that once the sperms have left the seminal plasma, they will have to depend upon an alternative source of energy available in these fluids. Although considerable work is done on the chemical evaluation of the cervico-vaginal mucus, the role and concentration of inorganic phosphorus in it with reference to the fertility status of cow in oestrum seems to be scanty. In the present investigation, its concentration has been estimated in cervico-vaginal mucus during different reproductive conditions.

Materials and Methods

Cervico-vaginal mucus was aspirated from the vaginal floor of 49 cows during oestrum and the samples were grouped in the following categories:

(a) *Cows in fertile heat:* This group consisted of 18 cows presented for artificial insemination during their first or second post-partum heat and conceiving to the insemination done during that heat period. Cervico-vaginal mucus had been collected before artificial insemination.

(b) *Repeat breeding cows:* This group consisted of 16 cows cycling regularly with apparently normal genitalia and normal mucus flow, but had failed to conceive with artificial inseminations during their last three consecutive heat periods with good quality semen.

(c) *Cows with mild endometritis:* This group consisted of 15 cows in oestrum showing cloudy or flaky oestrous discharge.

Mucus was aspirated from the vaginal floor of all the cows using a 10 ml pipette attached to a 20 ml sponge through a rubber adopted. The method of Fiske and Subbarow (1925) was initially employed for the estimation of inorganic phosphate in blood serum. But the method

TABLE I: Inorganic phosphorus concentration (mg/100 ml) in cervico-vaginal mucus of fertile and infertile cows

Cow No.	Fertile heat	Cow No.	Repeat breeder	Cow No.	Endo-metritis
X19	2.66	R762	2.93	E1	2.06
X24	1.40	R1505	2.66	E2	5.13
X40	2.00	R1634	1.40	E3	8.00
X54	0.93	R1669	1.46	E4	1.26
P63	1.13	R1769	0.47	E5	4.23
P86	1.26	R1704	1.33	E6	1.40
P99	1.80	R5847	1.33	E7	5.00
P101	1.63	R5785	0.53	E8	4.23
P98	1.73	R5770	0.80	E9	4.33
P46	2.00	R1801	1.20	E10	3.94
X28	1.53	R5772	0.73	E11	3.33
P37	1.06	R1	1.06	E12	3.60
P72	1.80	R2	2.06	E13	4.90
P66	3.00	R3	1.60	E14	4.13
P46	1.33	R4	1.86	E15	8.06
P104	2.60	R5	0.60		
P29	2.89				
X60	1.46				
Mean	1.78 ± 0.21		1.38 ± 0.19		4.24 ± 1.07
Range	0.93-3.00		0.47-2.93		1.40-8.06

often failed to detect the presence of inorganic phosphate in the mucus samples. Therefore, the mucus samples were treated with 10% trichloro-acetic acid in 1:10 ratio and 5.0 ml of the filtrate was subjected to analysis by chlorostannous reduced sulphuric acid system as described by Jackson (1967) for soil analysis.

Results and Discussion

The concentration of inorganic phosphate obtained in the cervico-vaginal mucus of cows in fertile heat, repeat breeders and endometritis are presented in Table I.

In the present investigation, no significant difference could be found between the concentration of inorganic phosphate in cervico-vaginal mucus of cows in fertile heat and repeat breeders. The observations are in agreement with those of Gupta (1962) and El-Naggar (1972) in bovine cervical mucus. Reddy (1973) on the other hand, employing the method of Jackson (1967) recorded a significantly higher concentration in cervical mucus of cows in fertile heat as compared to those in infertile heat.

It may be interest to note that the technique of estimation could also play an important role in determining its concentration. In the present investigation, the method of Fiske and Subbaro (1925) often failed to detect the presence of inorganic phosphate in a few of the mucus samples whereas the method of Jackson (1967) was effective and has been claimed to be the most sensitive of all the methods for the estimation of inorganic phosphate.

Besides the technique of its estimation, other factors such as the water content of the oestrous flow and inflammatory conditions of the uterine tissue could considerably influence its concentration in cervico-vaginal mucus. Baksai (1965) recorded the highest values of 5.5 to 10.34 mg% during dioestrum as compared to 0.5 to 0.9 mg% during oestrum and in the case of one of the cows examined, there was complete absence of inorganic phosphate. It has also been observed that inorganic phosphate concentration in cervical mucus varies significantly between the different stages of oestrum (More *et al.* 1970). The significantly higher concentration of inorganic phosphate in mucus of fertile cows recorded by Reddy (1973), as compared to those in the present study could perhaps be due to variations in the consistency of the mucus samples collected as well as the stage of oestrum during which its concentration was estimated.

In the present study, a progressive increase in concentration of inorganic phosphate was observed with corresponding increase of inflammatory reaction in uterus as observed by the degree of turbidity of the mucus discharge. This observation is in agreement with that of Olds and Van Demark (1957). The increased concentration was attributed to an increase of vascular permeability association with endometritis resulting in a greater outflow of inorganic phosphatic salts.

The role of inorganic phosphate in cellular metabolism is well established. Lardy and Phillips (1943) and White (1953) have reported that presence of atleast a minimum concentration of inorganic phosphate is essential for energy transformation at cellular level. It has also been associated with maintenance of sperm glycolysis and respiration (Lardy and Phillips, 1943). A decrease in the number of services per conception has been correlated with increase in the concentration of blood inorganic phosphate after its administration in feed (Morrow, 1969). Nevertheless, the presence of high concentration of inorganic phosphate in cervical mucus of animals with endometritis seems to indicate that levels higher than an optimum are not probably beneficial for the maintenance of normal intrauterine activity during reproduction. Bishop (1954) and Salisbury and Nakabayashi (1955) have observed disturbed respiration and oxygen uptake by bovine spermatozoa when the concentration of inorganic phosphate was increased in the semen extenders.

REFERENCES

Baksai, EH, 1965. Changes in inorganic phororus content of cervical and vaginal mucus in cows at various stages of oestrous cycle. Vet. Bull., **36**: No. 3724.

Bishop, MWH, 1954. Proc. Soc. Study of Fertility. Cited by T Mann, 1964. In: *The Biochemistry of Semen and of the Male Reproductive Tract.* John Wiley & Sons, New York.

El-Naggar, HA, 1972. Biochemical changes in the cervico-vaginal mucus of infertile cows. Biol. Abstr., **55**: No. 57991.

Fiske, and Subbarow, 1925. Quoted by PB Hawk, BL Oser and WH Summerson, 1954. *Practical Physiological Chemistry*, 13th Edn., McGraw-Hill Book Co. Inc., New York.

Gupta, HC, 1962. Biochemical and physiological properties of the cervical and uterine fluids of the cows during oestrum. Ph.D. thesis, Louisiana State Univ.

Jackson, ML, 1967. *Soil Chemical Analysis.* Prentice-Hall of India Pvt. Ltd., New Delhi.

Lardy, HA and Phillips, PM, 1943. Effects of pH and certain electrolytes on the metabolism of ejaculated spermatozoa. Am. J. Physiol., **138**: 741.

More, TK, Rawat, JS and Roy, A, 1970. Studies on certain aspects of physico-chemical and chemical properties of the cervical mucus of farm animals. Agra Univ. J. Res., **19**: 5-14, 45-60.

Morrow, AD, 1969. Phosphorus deficiency and infertility in dairy heifers. J. Am. Vet. Med. Ass., **154**: 761-765.

Olds, D and Van Demark, NL, 1957. Luminal fluids of bovine female genitalia. J. Am. Vet. Med. Ass., **131**: 555-556.

Reddy, VNV, 1973. Studies on certain physical and biochemical properties of cervico-vaginal mucus of fertile and iufertile dairy cows during oestrum. M.V.Sc., thesis, Univ. Agri. Sci., Bangalore.

Salisbury, GW and Nakayabashi, HT, 1955. The effect of phosphate containing and saline diluents on aerobic metabolism of bull semen. J. Dairy Sci., **38**: 603.

Weed, JC and Carrera, AE, 1970. Glucose content of cervical mucus. Fertil. Steril., **21**: 866-872.

White, IG, 1953. Studies on alkali metal requirements of ram and bull spermatozoa. Aust. J. Biol. Sci., **6**: 716.

IJAR 4: 2: 49-50

Levels of Serum Phosphatases and Reproductive Status in Surti Buffaloes.

HJ Derashri, GA Prabhu, FS Kavani and SB Kodagali

Gujarat Veterinary College, Gujarat Agricultural University,
Anand Campus, Anand 388 001.

ABSTRACT

The serum phosphatases — Alkaline phosphatase (AKP) and Acid phosphatase (ACP) — were estimated in different reproductive conditions viz: animals in oestrus (Group-I); animals with visible genital infections (Group-II); anoestrus animals (Group-III) and pregnant animals (Group-IV) in Surti buffaloes. The AKP levels in Group-III were significantly higher than the levels in Group-IV. The differences in ACP levels between the various groups studied were non-significant.

* * *

The serum phosphatase levels are influenced by physiological and pathological conditions. Alkaline phosphatase is a widely distributed enzyme which releases inorganic phosphate from many organic phosphomono-esters. Acid phosphatase hydrolysis the organic phosphomonoesters. Elevated levels of phosphatases are entirely confined either to bone diseases with increased osteoblastic activity or to the diseases of the hepatobiliary system. Acid phosphatase levels are also useful as index in assessing the estrogen level in animals. (King, 1971).

In the present report the serum phosphatase levels were studied under different reproductive conditions in Surti buffaloes.

Materials and Methods

The serum phosphatases (AKP and ACP) were studied in a total of 62 Surti buffaloes. The buffaloes were grouped into: animals in oestrus (Group-I) 17; animals with visible genital infections (Group-II) 15; anoestrus animals (Group-III) 16 and pregnant animals (Group-IV) 14.

The blood samples were collected from the animals from the jugular vein after examining the animal for its reproductive status. The blood samples were kept in slanting position and serum separated out. The serum samples were kept at — 15°C while awaiting estimations. The estimations were carried out according to Wooten (1964). The statistical analysis was carried out to see the effect of different reproductive conditions on the phosphatase levels. The Duncan's New Multiple Range Test (Pillai and Sinha, 1968) was applied to know the variations.

Results and Discussion

The Alkaline phosphatase (AKP) levels (KA Units/100 ml of serum) found were 7.71 ± 1.49 KAU% in animals in oestrus; 5.75 ± 1.27 KAU% in animals with visible genital infections; 12.03 ± 3.29 KAU% in anoestrus animals and 4.99 ± 0.76 KAU% in pregnant animals. The AKP levels during anoestrus condition were

TABLE 1. Reproductive conditions and Alkaline phosphatase levels

Source	D.F.	S.S.	M.S.	Cal. F.	Table F value
Between phases	3	362.5434	120.8478	2.1097NS	2.76 at 5% level of significance
Within phases	58	3322.3887	57.2826		
Total	61				

TABLE 2. Reproductive conditions and Acid phosphatase levels

Source	D.F.	S.S.	M.S.	Cal. F.	Table F value
Between phases	3	9.0763	3.0254	1.4956NS	2.78 at 5% level of significance
Within phases	56	113.3562	2.0242		
Total	59				

significantly higher than the levels in pregnant animals and animals with visible genital infections. The AKP levels in anoestrus condition were higher as compared to the animals in oestrus but the difference was not significant (Table-1).

Roussel and Stallcup (1967) reported no significant changes in AKP levels during various stages of oestrous cycle.

The Acid phosphatase (ACP) levels (KA Units/100 ml of serum) in different reproductive conditions were: 1.22 ± 0.13 KAU% in animals in oestrus; 1.49 ± 0.54 KAU% in animals with visible genital infections; 1.74 ± 0.46 KAU% in anoestrus animals and 0.64 ± 0.15 KAU% in pregnant animals. There was no significant difference in ACP levels in different reproductive conditions (Table-2).

Roussel and Stallcup (1967), Kaker *et al* (1969) add Vadodaria (1976) reported on ACP levels in cows and buffaloes. Vadodaria (1976) reported low levels of ACP during peak breeding period in Surti buffaloes which were associated wtth higher FSH, FSH/LH ratio, Copper and estrogenic activities.

Under the present study it was marked that the AKP levels in anoestrus animals were significantly higher than the levels in pregnant animals and in animals with visible genital infections. The ACP levels were lower in animals in Oestrus supporting the statement of King (1971) and Vadodaria (1976).

Acknowledgement

Thanks are due to the authorities of Gujarat Agricultural University, Anand Campus, Anand for providing the necessary facilities for the study.

REFERENCES

Kaker, M.L.; Chakravorthy, S.C. and Mishra, B. (1969) J. Res. 6:394-399.

King, JOL (1971). Vet. Rec. 89: 320-324.

Pillai, SK and Sinha, HC (1968). Statistical methods for biological workers. Ramprasad and Sons, Agra.

Roussel, JD and Stallcup, OT (1967). J. Dairy Sci. 50: 1341-1342.

Vadodaria VP (1976). Thyroid activity in relation to reproductive performance of Surti buffaloes. M.V.Sc. Thesis, Guj. Coll. of Vety. Sci. and A.H., Anand.

Wooten, IDP (1964). Micro analysis in Medical Biochemistry. 4th Ed. J. & A. Churcill Ltd. London, W.1.

IJAR 4: 2: 51-53

Biochomical Studies in Cyclic, Anoestrus and Repeat Breeding Crossbred Cows

MC Sharma, Uma Shanker, OP Gupta RP Verma and RR Mishra

Livestock Production Research (Cattle & Buffalo)
Indian Veterinary Research Institute
Izatnagar (U.P.) 243 122, India

ABSTRACT

An attempt was made to study the different parameters of blood biochemical constituents in normal cyclic, anoestrus and repeat breeding crossbred cows. It was observed that glucose, cholesterol, total proteins and serum electrolytes were deficit in anoestrus animals. Only glucose, total protein, calcium and phosphorus were statistically significant otherwise there was slight change in biochemical profile in between normal cyclic and repeat breeding cows.

* * *

Anoestrus in pubertal and post-partum animals, and repeat breeding conditions are the measure problems of bovine infertility. Laing (1970), Roberts (1971), Deshpande and Sane (1977) have extensively reviewed anoestrus conditions. Hewett (1968), Roberts (1971) and Deshpande (1977) have also reviewed repeat breeding syndrome. Very few data is available on biochemical constituents of blood. Earlier an attempt was made by various workers to study the biochemical parameters but no detailed study is available on this aspect in normal cyclic, anoestrus and repeat breeding cow. Keeping this in view, the present studies have been intended to report as a comparative measures.

Materials and Methods

Thirty crossbred cows maintained at Institute farm under conventional feeding and managerial condition, have been taken as an experimental animals for this study. These cows were divided into three groups of 10 each on the basis of their reproductive status viz. normal cyclic cows: having the normal cyclic oestrus; anoestrus cows: having the functionless ovaries and genitalia and have not shown any sign of oestrus for the last six months and repeat breeding cows: having the normal genitalia and have not conceived after five inseminations on subsequent cycle.

Blood samples were collected aseptically from jugular vein using a sterilized glass syringe having a 18 gauze needle. During the day of oestrus in normal cyclic and repeat breeding cows while in anoestrus cows, blood was collected after examination of genital organs. The blood samples were collected in two test-tubes, one of which contained an anti-coagulant (dipotassium EDTA). Uncoagulated blood was used for blood glucose estimation as per the method described by Folin and Wu (1920). Serum separated from coagulated blood was assayed for total protein and albumin (Greenberg, 1929); serum globulin was determined by

TABLE 1. Blood values (Mean±SE) in cyclic, anoestrus and repeat breeding cows

Blood entities	Cyclic	Anoestrus	Repeat breeding
Blood glucose (mg %)	61.28±5.85	45,20±6.30*	57.15±5.90
Total protein (gm %)	8.25±1.22	6.35±1.01*	8.10±1.38
Albumin (gm %)	5.10±0.95	3.55±0.71	4.90±1.05
Globulin (gm %)	3.15±0.73	2.80±0.52	3.20±0.81
Cholesterol (mg %)	99.62±8.23	91.15±6.28	102.61±8.95
Sodium (meq/lit.)	149.20±11.50	140.70±9.50	148.50±12.50
Potassium (meq/lit.)	4.75±0.43	3.25±0.23	4.45±0.38
Calcium (mg %)	10.69±2.05	7.95±1.08*	9.85±2.15
Phosphorus (mg %)	4.83±0.33	2.97±0.23*	4.76±0.29
Chloride (meq/lit.)	97.85±10.25	94.74±9.40	96.80±9.33

* Statistically significant at 90% confidence level (chi-square test).

substracting the values of albumin from the total protein; Cholesterol (MacIntyre and Ralston, 1954) sodium and potassium (Hawk *et al.*, 1965); calcium (Weli and Wiedeking, 1970); & phosphorus (Fiske and Subbarow, 1925).

The mean values of each parameter in the group of normal cyclic, anoestrus and repeat breeding were compared in respect of a particular observation. Data are shown in terms of mean±standard error (SE). For this comparison, the chi-square test was utilized (Snedecor and Cochran, 1967).

Results and Discussion

The mean biochemical values with standard error recorded in normal cyclic, anoestrus and repeat breeding bave been presented in Table I.

The average values for blood glucose was maximum in normal cyclic and minimum in anoestrus cows and this difference was statistically significant. Chauhan (1981) also observed lowered values for anoestrus.

The average total protein was maximum in cyclic cows and minimum in anoestrus cows and the results were statistically significant. There was slight variation between mean values of cyclic and repeat breeding animals and the results were non-significant. Dhoble and Gupta (1981) have observed higher values in true anoestrus and disagreeable with our findings. The difference may be the breed variation.

The higher mean values for albumin and globulin was observed in normal cyclic cows and minimum in anoestrus cows. There was slight variation in between cyclic and repeat breeding mean values but results were statistically non-significant among three groups.

Serum cholesterol concentration was maximum in repeat breeding group and minimum in anoestrus group. Results were statistically non-significant. Varma *et al.* (1981) have also observed the similar findings.

The mean values for serum electrolytes were higher in normal cyclic group for sodium, potassium, calcium, phosphorus and chloride and minimum mean values were observed in anoestrus cows. Results were statistically significant for calcium and phosphorus in anoestrus group. Our findings are agreeable with Bansal *et al.* (1978).

It indicates that blood glucose, cholesterol, total protein and serum electrolyte values are lower in anoestrus crossbred animals compared to normal cyclic and repeat breeding animals.

Acknowledgement

The authors are grateful to Dr. C. M. Singh, Director, IVRI, Iaztnagar for providing facilities.

We are also thankful to Dr. S.N.S. Gaur, Associate Professor, College of Veterinary Sciences, G. B. Pant University of Agricultural and Technology, Pantnagar, for his valuable cooperation.

REFERENCES

Bansal, RS, Gupta, SK, Singh, BG and Chauhan, FS (1978). J. Remo. Vet. Corps, **17**: 95.

Chauhan, FS, Thakkar, OP, Singh, Mehar and Tiwana, MS (1981). Seasonal variation, Biochemical Profile and treatment of anestrus in buffaloes. Ind. J. Ani. Reprod., **1**(1): 31-35.

Deshpande, BR (1977). Problem of repeat breeding in cows. Proc. Ist All India Sympo. Anim. Reprod., 17-19 Jan., 1977, PAU, Ludhiana.

Deshpande, BR and Sane, CR (1977). Prolonged post-partum anoestrus condition in cows. Ind. Vet. J., **54**: 63-68.

Dhoble, RL and Gupta, SK (1981). Ind. Vet. J., **58**: 544.

Fiske, CH and Subbarow, Y (1925). The calorimetric determination of phosphorus. J. Biol. Chem., **66**: 375-400.

Folin, O and Wu, H (1920). A system of blood analysis. Supplement I. A simplified and improved method for determination of sugar. J. Biol. Chem., **41**: 367-374.

Greenberg, DM (1929). The calorimetric determination of serum proteins. J. Biol. Chem., **82**: 545-550.

Hawk, PB, Oser, BL and Summerson, WH (1965). Practical Physiological Chemistry. McGraw Hill Book Co. Inc., New York, Toronto, London, pp. 1-1438.

Hewett, CD (1968). A survey of the incidence of repeat breeder cow in Sweden with reference to herd size, season, age and milk yield. Brit. Vet. J., **124**(8): 342-352.

Laing, JA (1970). Anoestrum and suhoestrum in cattle. Vet. Rec. **87**: 34-38.

Roberts, SJ (1971). Veterinary Obstetrics and Genital Diseases. Ithaca, New York.

Snedecor, GW and Cochran, WG (1967). Statistical methods. Oxford and IBH Publishing Co., New Delhi, pp. 1-593.

Varma, B, Kharche, KG and Datta, IG (1981). Association of blood chemical constituents with anoestrus in buffalo and evaluation of the efficacy of the different treatment. Ind. J. Ani. Reprod., **1**(1): 22.

Weli, B and Weideking, E (1970). Determination of trace elements in serum and urine using flameless atomization. Fresenius Zeitschrift Fuer Analytische Chemie, **252**: 111-117.

MacIntyre, I and Ralston, M (1954). Micro-analysis in medical biochemistry (King, EJ and Wootan, IDP, eds). J and A Ghurchill Ltd. London.

IJAR 4: 2: 54-56

Induction of Oestrus and Conception in Mature Anoestrous Gilts by Administration of Diethylstilboestrol

LN PURBEY and SN LUKTUKE

Division of Animal Reproduction
Indian Veterinary Research Institute, Izatnagar-243122.

ABSTRACT

Induction of oestrus and conception in mature anoestrous gilts by administration of diethylstilboestrol has been reported.

* * *

Anoestrum in adult gilts is mostly due to delayed maturity. It is one of the chief components of female infertility in pig. As this species is very prolific because of its litter bearing characteristic, the porcine keepers sustain economic loss on account of infertility problem. Efforts have been made earlier to induce fertility in anoestrous gilts by treatments with estrogenic hormones, Pregnant Mare Serum Gonadotropins and Human chorionic gonadotropins (Rasbech, 1964; Dzuick and Dhindsa, 1969; Arthur, 1975) with variable results. In this paper a study on the treatment of anoestrum in mature gilts by administering estrogenic hormone is presented.

Materials and Methods

The studies were conducted in the gilts of Livestock Research Project (Pig) at I.V.R.I., Izatnagar. Ten mature gilts aged 272 to 373 days (average 305.4 days) which had not shown any estrous sign were undertaken for this studies. All these gilts were healthy and had obtained mature body weight. They were reared under uniform management and feeding schedule. These gilts were treated with 8 mg of Diethylstilboestrol intramuscularly for the induction of oestrus and were kept under close observation morning and evening daily for the manifestational signs of oestrus by visual recording of hyperaemic condition of vulval lips and by sexual inclination to the boars. Service was given to the gilts on second and third day of oestrus. Observations on occurrence of subsequent natural cycle and on pregnancy occurring in induced heat as well as in subsequent cycles were recorded. Those gilts which conceived were followed up until farrowing to record the observations on gestational length, nature of parturition and litter size. The data were analysed and the results are presented in Table I.

Results and Discussion

The observations recorded on the occurrence of oestrus after the treatment revealed that the induced heat occurred in all the gilts treated (100%). In 8 gilts (80%) the oestrus was evinced at an interval of 4 to 5 days after the treatment while in 2 cases (20%) it occurred at an interval of 28 to 30 days. Only one gilt was found to conceive in the induced heat while the remaining were observed to repeat at an average interval of 50.2 days (range, 21 to 78 days). The pregnancy rate was found to be 55.5%

TABLE I Induction of oestrus and conception in anoestrous gilts

No. of gilts	Age (days)	Oestrus induction Interval	Pregnant(P)/ Non-pregnant (NP) in induced heat	Interval between induced heat and subsequent heat (days)	Pregnant(P)/ Non-pregnant (NP)	Litter size	Gestation period (days)
1	373	4	NP	40	NP	—	—
2*	349	5	P	—	—	—	—
3	321	5	NP	75	P	8	118
4	315	5	NP	46	P	11	116
5	302	30	NP	53	NP	—	—
6	289	5	NP	78	P	7	115
7	289	5	NP	51	NP	—	—
8	272	28	NP	21	NP	—	—
9	272	5	NP	70	P	7	113
10	272	4	NP	68	P	8	114
Average	305.4			50.2		8.2	115.2

* Died during gestation.

in the subsequent naturally occurring estrus. Thus, 6 out of 10 gilts treated (60%) conceived following the estrogenic therapy. The experimental gilts on follow up studies further showed to have an average litter size of 8.2 (range 7 to 11) on farrowing after an average gestation period of 115.2 days (range, 113 to 118 days).

Rasbech (1964) reporting on his investigation on the use of anaphrodisiacs in gilts and sows to induce oestrus and conception observed poorest results with stilboestrol alone especially when given in higher doses. However, he recorded best results with Pregnant Mare Serum and Human chorionic gonadotropins (PMS+HCG) and poorer with Estradiol and HCG. Dzuik and Dhindsa (1969) treated 126 anoestrous gilts with 500 I.U. of PMS and out of them 75 to 95% came into oestrus at 4 to 5 days after injection while 67% conceived. According to Arthur (1975) refractory cases of anoestrous pig may be treated with gonadotrophic or gonadic hormones but very variable results have followed such treatments and no firm recommendations can be given. However, he stated that the best results should follow the simultaneous adminitsration of follicle stimulating hormone followed three days later by luteinizing hormone (1000 units PMS + 500 units HCG); the induced heat should be accompanied by ovulation and mating should thereafter be allowed. Treatment with exogenous estrogenic hormone has been found to be effective in inducing oestruses also in majority of anoestrous cattle (Padhi and Purbey, 1983; Choudhary and Purbey, 1982) and buffaloes (Agrawal and Purbey, 1981) without being followed by ovulation and conception but has been found to be helpful in establishing oestrous cycles in them. Poor result of conception in the induced heat in this study may be also attributed to be due to anovulatory nature of oestrus. Arthur (1975) therefore suggested that doses of stilboestrol of the order of 5-10 mg may be useful in initiating heats, at the second of which the sows should be served.

The causative factors of the impair-

ment of oestrus and ovulation in pig may be hereditary (Roberts, 1971) or environmental. The problem of anoestrum in pig therefore, should be thoroughly investigated for the possibility of nutritional deficiencies or diseases to undertake appropriate treatment. Therefore, where management and nutrition are satisfactory poor manifestation of oestrus phenomena in pig may be attributed to be due to hereditary factors and hormone therapy in such cases is not advisable (Arthur, 1975).

Acknowledgement

The authors are grateful to Dr. C. M. Singh, Director, IVRI, for providing facilities for conducting this work. They are thankful to the Project Coordinator, LPR (Pig), IVRI for extending co-operation during the course of this study.

REFERENCES

Arthur, GH (1975). Veterinary Reproduction and Obstetrics. Fourth Edition, Bailliere Tindall, London, pp. 493.

Agarwal, SK and Purbey, LN (1981). Some therapeutic measures for restoring fertility in anoestrous buffaloes under field conditions. Livestock Adviser, VI, 12, pp. 41-44.

Choudhary, SK and Purbey, LN (1982). Clinical trial with stilboestrol Dipropionate and Prajana capsules for restoring fertility in anoestrous cattle under field conditions. Livestock Adviser (under print).

Dzuik, PJ and Dhindsa, DS (1969). Induction of heat, ovulation and fertility in gilts with delayed puberty. J. Anim. Sci., 29, 1, 39.

Padhi, SN and Purbey, LN (1983). Clinical trial with Gonadotrophin and Diethylstilboestrol to induce fertility in Hariana heifers with delayed puberty. (In Press).

Rasbech, NO (1964). Investigations on the use of anaphrodisiacs in gilts and sows; estrus promoting effect and the size of litter in 1,655 animals. Nord. Vet. Med., 5, 131.

Roberts, SJ (1971). Veterinary Obstetrics and genital diseases (Theriogenology) Second Edition (Indian Edition), Scientific Book Agency, 22, Raja Woodmunt Street, Calcutta-1, pp. 561.

IJAR 4: 2: 57-59

Revival Rate of Frozen Buffalo Bull Spermatozoa With Addition of Epididymal Extract (PMSF).

SO DHINGRA, VB HUKERI and BR DESHPANDE

Department of Animal Reproduction
Bombay Veterinary College, Bombay-400 012

AND

GV SHAH and AR SHETH

Department of Biochemistry
Institute of Research in Reproduction (ICMR) Bombay-400 012.

ABSTRACT

The buffalo epididymal extract PMSF (Progressive motility sustaining factor) a glycoprotein, was found to give encouraging results when added to the extended buffalo bull semen. It was added in various doses of 50,100,200 and 1000 μg./25×10^6 spermatozoa/straw of 0.25 ml. in Tris extender. The extended semen was deep forzen by Landshut method.

Tris+PMSF (100 μg) extender had significantly higher revival rate in terms of progressive motile percentage (62.47%) and fertility (61.29%) as compared to Tris extender which corresponds to 54.30% and 33.33% respectively. Addition of PMSF @ 100μ g/straw was significantly superior to other doses.

* * *

In contrast to the cow-bull spermatozoa, the buffalo bull spermatozoa have low survival and fertilizing capacity when the semen is either refrigerated or deep frozen. Attention of research has now been focussed on 'Tris' as a suitable diluent for preservation of buffalo semen (Sengupta and Chaube, 1972; Becker, *et al.* 1977; Chinnaiya, *et al*, 1979 and Shetti, *et al.* 1981). Several biochemical constituents have been studied but recently the importance of epididymal extracts in the initiation of sperm motility and keeping quality has been demonstrated (Hoskins, *et al.* 1978; Brandt, *et al.* 1978; Acott, *et al.* 1979; Sheth, *et al.* 1981 and Patil, *et al.* 1981). In view of this the present study was undertaken to deep freeze the buffalo spermatozoa in Tris-egg yolk glycerol extender with the addition of various doses of 'Progressive motility sustaining factor (PMSF)' derived from buffalo epididymis to know its effect on revival rate of spermatozoa.

Materials and Method

In all 20 ejaculates were studied from two adult Murrah buffalo bulls for semen evaluation, dilution, freezing and preservation in liquid nitrogen by employing standard techniques.

The 'Progressive motility sustaining factor (PMSF)' was extracted from epididymus of buffalo bull. The epididymis (about 1 kg.) collected from different buffalo bulls, were homogenised in 20% phosphate buffer saline, the proteins were precipitated by ammonium sulphate,

TABLE 1. Comparison of Progressive motility of buffalo bull spermatozoa before and after freezing in various dilutors.

Sr. No.	Dilutor	Progressive motile percentage Before freezing (at +20°C)	After freezing (at —196°C)
1.	Tris	70.965	54.305
2.	Tris + PMSF 50 μ g.	73.625	57.620
3.	Tris + PMSF 100 μ g.	76.575	62.475
4.	Tris + PMSF 200 μ g.	75.345	58.740
5.	Tris + PMSF 1000μ g.	74.820	56.055
	Mean	74.266	57.839
	S.E.	0.9516	1.3788
	S.D.	2.128	3.083
	C.V.%	2.865	5.330

the fraction of the protein precipitated between 40-60% was dialysed, lypholised and used as PMSF.

The Tris concentrate was prepared with Tris 12.1 gm. Citric acid 6.8 gm., Fructose-5.9 gm. with 6% Glycerol in 100 ml. of distilled water. The Tris semen extender was prepared in the proportion of tris, egg-yolk and distilled water as 1:1:3 parts respectively. The semen dilution rate was kept constant at 100 million spermatozoa/ml. The PMSF was added@ 50,100,200 and 1000 μg/25×10^6 spermatozoa/straw of 0.25 ml. filling, sealing and freezing of ministraw was done by 'Landshut' German method.

The revival rate of spermatozoa in respect of progressive motile percentage was estimated before (+20°C) and after (—196°C) freezing and thawing the printed straw separately at +37°C for 30 seconds.

For fertility trials, in all 24 and 31 buffaloes were inseminated with Tris and Tris+PMSF—100 μg straw respectively. Statistical analysis of data was also carried out.

Results and Discussion

The average revival rate of buffalo bull spermatozoa before and after freezing in various semen extenders inclusive of PMSF doses was estimated. (Table 1)

In the present study the revival rate in respect of progressive motile percentage of buffalo bull spermatozoa in all the five dilutors under study was $74.26 \pm 0.95\%$ before freezing, which was reduced to $57.83 \pm 1.37\%$ after freezing. The differences in percentage of progressive motile spermatoeoa between dilutors ($P<0.05$) as well as before and after freezing ($P<0.01$) were significant. On critical difference test the Tris+PMSF 100 μg dilutor had significantly ($P<0.01$) higher progressive motile percentage as compared to other dilutors having no PMSF and lower or higher doses of the PMSF.

Notable increase in the post thaw revival rate of buffalo spermatozoa has been observed by the addition of 'Progressive motility sustaining factor' (PMSF) to the tris extender by Patil *et al.* (1981). This epididymal extract is a glycoprotein and has a physiological role in the acquisition of sperm motility, which is essential for high fertility rate.

Accott and Hoskins (1978) reported

that this forward motility protein (FMP) is involved in the development of capacity for motility. The immature and immotile spermatozoa from the bovine caput epididymis develop an uncordinated thrashing motion in response to an elevation in cAMP level and convert to strong progressive motility upon the subsequent addition of the bovine FMP which binds to caput spermatozoa as they pass through the epididymis (Acott and Hoskins, 1981).

In the present study considerably higher post thaw motile percentage (62.47%) was observed in Tris+PMSF 100 µg dilutor as compared to Tris dilutor without addition of PMSF, as well as other combinations of PMSF viz. 50,200 and 1000 µg. There is no other work for comparison of these results except the work of Patil, *et al.* (1981), who added the PMSF from human epididymis to the buffalo semen and reported 53.10% post thaw progressive motility in Tris+ PMSF 100 µg dilutor.

Sheth *et al.* (1981) studied the effect of addition of PMSF to human semen and reported that the effect was more pronounced in the samples having motility less than 60%. They further noted that the effect was maximum at 80 µg dose of PMSF.

In the present study the fertility rate in Tris+PMSF (100 µg) extender was significantly more (61.29%) as compared to Tris extender (33.33%) without PMSF addition. This finding is on higher side as compared to the work of Chinnaiya, *et al* (1979) and Vasanth (1979) who observed the fertility rate as 46.22% and 45% respectively. The fertility rate in the present Tris+PMSF (100 µg) extender is superior to Egg Yolk Citrate dilutor (50%) as observed by Roy Chaudhary (1979). Fertility rate in Tris dilutor noted in the present study was higher than those reported by Nagarcenkar (1979), Shafi and Stefan (1979) and Raizda *et al.* (1980).

The bovine epididymal extract is added for the first time in the semen dilutor which has given encouraging results. PMSF addition @ 100µg/straw in the Tris extender has significantly increased the post thaw revival in respect of progressive motile percentage of spermatozoa and fertility and seems to be comparatively superior than the other conventional extenders for preserving the buffalo bull semen.

REFERENCES

Acott, TS and Hoskins, DD (1978). J. Biol. Chem. **253**: 6744-6750.

Acott, TS, Johnson, DJ, Brandt, H and Hoskins, DD (1979). Biol. Reprod. **20**: 247-252.

Acott, TS and Hoskins, DD (1981). Biol. Reprod. **24**: 234-240.

Becker, WC, Senger, PL and Marshall, CE (1977). J. Anim. Sci. **44**: 1067-1071.

Brandt, H, Acott, TS, Johnson, DJ and Hoskins, DD (1978). Biol. Reprod. **19**: 830-835.

Chinnaiya, GP, Sarma, PA and Gangali, NC (1979). Indian J. Dairy Sci. **32**: 93-94.

Hoskins, DD, Brandt, H and Acott, TS (1978). Fed. Proc. **37**: 2534-2544. C.C.f. Sheth, *et al.* (1981)

Nagarcenkar, R (1979). Proc. Seminar Buff. Reprod. & A.I. FAO/SIDA, NDRI, Karnal.

Patil, DS, Hukeri, VB and Deshpande, BR (1981). Indian J. Anim. Reprod. **1**: 107.

Raizda, S, Singh, M and Chaudhary, KC (1980). J. Agri. Sci. Camb. **94**: 487-488.

Roy Chaudhary, PN (1979). Anim. Breed. Abstr. **47**(10): 5458.

Sengupta, BP and Chaube, LK (1972). Indian J. Anim. Sci. **42**: 165.

Shafi, CM and Stefan, W (1979). Proc. Seminar Buff. Reprod. & A.I. FAO/SIDA, NDRI, Karnal. pp. 315.

Sheth, AR, Gunjikar, AN and Shah, GV (1981). Andrologia, **13**: 142-146.

Shetti, AB, Hukeri, VB and Deshpande, BR (1981). Indian J. Dairy Sci. **34**(1): 108-110.

Vasanth, JK (1979). Proc. Seminar. Buff. Reprod. & A.I. FAO/SIDA, NDRI, Karnal.

IJAR 4: 2: 60-63

Fructolysis in Semen and its Relation to Breeding Performance in Buffalo—Bulls

KS Bedi, RK Biswas and YG Dugwekar

Department of Obstetrics & Gynaecology
College of Veterinary Science
Punjab Agricultural University, Ludhiana.

ABSTRACT

The mean initial fructose level and the fructolytic index (F.I.) during first and second hours of incubation were found to be 469.62±7.34 mg per 100 ml of semen, 1.75±0.06 and 1.25±0.04, respectively, in 141 ejaculates from 11 Murrah buffalo bulls. Semen volume was negatively correlated ($P<0.05$) with F.I. Fructolytic indices were significantly correlated with mass activity and sperm concentration, whereas individual spermatozoan motility was correlated with F.I. only during second hour of incubation. Significant correlations obtained between conception rate and fructolytic indices suggest that F.I. might indirectly reflect breeding performance of buffalo bulls.

* * *

Successful breeding with artificial insemination calls for efficient storage of spermatozoa. Utilization of the seminal sugar, fructose, that provides principal energy constituent for anaerobic spermatozoan survival, could possibly conform a basis for categorising seminal ejaculates to be selected for prolonged preservation. An attempt was made to evaluate the relevance of fructose content and fructolytic index of semen in respect of various seminal attributes and conception rate of Murrah buffalo bulls.

Materials and Methods

Eleven healthy Murrah buffalo bulls routinely engaged for breeding purposes between 47 and 145 months of age with body weight ranging from 500 to 800 kg comprised the material of the present investigation carried out during the period of November through February. All the buffalo bulls were maintained under standard managerial conditions. Semen was collected with the help of artificial vagina under hygienic conditions twice a week from each bull. At least 10 ejaculates from each fuffalo bull were studied. A total of 141 ejaculates were evaluated. Immediately after collection ejaculate volume was noted directly from the graduated semen collection tube. Mass activity and individual motility of spermatozoa were noted as per the methods of Zemjanis (1970), while live sperm count and concentration of spermatozoa were determined employing the methods of Blom (1950) and Herman and Madden (1953), respectively. Initial fructose content and fructolytic indices for first and second hours were estimated according to the methods described by Mann (1948) with slight modification that the ratio of semen to buffer was 1:2 instead of 2:1. Fertility rates of the bulls were obtained from the farm records. Standard

TABLE 1. Semen characteristics of buffalo bulls (Mean±SE)

Buffalo bull no.	No. of ejaculate	Semen volume (ml)	Mass activity (Scale 0-4)	Individual motility (%)	Live sperm (%)	Sperm concentration (millions/ml)	Normal sperm (%)	Conception rate (%)
535	14	2.70±0.20	2.68±0.09	53.57±2.64	87.21±1.84	1146±74	89.37±0.86	34.42
771	12	1.90±0.23	2.96±0.09	61.83±2.59	86.04±1.18	1205±61	89.24±1.10	33.33
751	12	2.18±0.27	2.75±0.13	61.83±1.90	85.75±1.16	1362±114	84.25±0.94	33.33
558	10	2.28±0.37	2.90±0.09	58.20±2.59	88.70±1.64	1351±113	90.15±0.70	43.33
589	13	2.58±0.29	2.73±0.14	59.23±3.12	88.42±1.62	1288±106	88.55±0.70	33.33
630	10	1.69±0.12	3.00±0.11	60.00±2.36	88.94±1.57	1155±46	86.72±0.80	25.60
905	13	2.66±0.24	3.11±0.09	64.25±1.90	89.73±0.84	1377±126	92.30±0.56	43.80
503	14	4.19±0.40	2.65±0.22	55.76±2.66	86.00±1.94	1662±121	90.78±0.61	49.00
730	13	2.88±0.41	3.00±0.14	60.00±2.59	87.65±2.66	1302±74	89.55±0.71	35.80
702	15	1.28±0.15	1.94±0.22	40.62±4.56	80.70±3.42	1184±63	71.39±1.29	23.75
689	15	2.28±0.21	2.77±0.17	57.00±2.90	82.53±3.71	1439±97	88.60±1.15	35.20
Overall mean	—	2.42±0.22	2.77±0.09	57.48±1.83	86.51±0.81	1316±44	87.30±1.64	35.53±2.16

statistical methods were followed for analysing all the data (Snedecor and Cochran, 1967).

Results and Discussion

The mean values of semen volume, mass activity, individual sperm motility live sperm count, sperm concentration, per cent normal sperm and conception rate for all the bulls are furnished in Table 1.

The mean initial fructose content and fructolytic indices during first and second hours of incubation for each of the buffalo bulls are given in Table 2. The mean initial fructose level of 469.62±7.34 mg per 100 ml of semen was within the range of fructose levels for buffalo bulls (Pal, 1957). However, Roy *et al.* (1960) and Salem and Osman (1972) obtained a lower fructose concentration while

TABLE 2. Fructose and fructolytic index in the semen of buffalo bulls (mean±SE)

Buffalo Bull no.	Average initial fructose (mg/100 ml semen)	Fructolytic index (1st hour)	Frctolytic. index (2nd hour)
535	454.71±12.31	1.86±0.05	1.33±0.06
771	497.50±17.16	1.97±0.06	1.40±0.07
751	499.75±18.38	1.80±0.16	1.28±0.13
558	470.70±20.54	1.77±0.08	1.23±0.07
589	470.00±19.85	1.78±0.08	1.34±0.07
630	495.22±16.21	2.04±0.04	1.52±0.04
905	412.61±11.55	1.65±0.11	1.14±0.08
503	456.00±12.25	1.32±0.06	0.95±0.06
730	469.92±17.22	1.80±0.09	1.29±0.14
702	454.00±16.80	1.60±0.12	1.12±0.09
689	470.70±20.54	1.71±0.06	1.17±0.04
Overall mean	479.62±7.34	1.75±0.06	1.25±0.04

Sayed and Oloufa (1957), Sengar and Sharma (1965), and Banerjee and Ganguli (1973) reported higher fructose levels. Differences in size, storage capacity and secretory activity of seminal vesicles (Mann, 1964), frequency of semen collection (Tomar, 1976), season (Kapoor 1982) and age (Alamy *et al.*, 1976) could possibly be attributed to the discrepancies.

The initial fructose content of semen varied significantly between the ejaculates and between the bulls. Mann (1949) also reported similar individual variations in fructose content. The mean fructolytic index obtained during the first hour was in concurrence with the findings of Alamy *et al.* (1976) and higher than that reported by Roy (1958) while the mean fructolytic index during the second hour was lower than that reported by Alamy *et al.* (1976). The variation in fructolytic index may be due to the difference in concentration of progressively motile spermatozoa and the initial level of fructose in semen. Season of study also might have influenced fructolytic index since Roy (1958) observed that fructolytic index was higher during spring and lower during summer months. Initial fructose content of semen correlated non-significantly with the semen volume which simulate the findings of Sato (1974) in Holstein bulls. Semen volume had significant negative correlation ($P<0.05$) with fructolytic index for first and second hours ($r = -0.63$ and -0.70, respectively). This might imply that utilization of fructose decreases with increase in semen volume thus conferring better survivability of spermatozia in ejaculates with higher volume. Fructolytic index was found to have significant ($P<0.10$) correlation with mass activity during the first and second hours of incubation ($r = 0.47$ and 0.49, respectively). Sperm concentration was significantly ($P<0.01$) correlated with fructolytic indices for first and second hours ($r = 0.78$ and 0.92, respectively) which might suggest that utilization of fructose was proportional to the number of spermatozoa. However, individual motility of spermatozoa significantly ($P<0.01$) correlated only during the second hour of incubation. This might imply that the utilization of fructose by spermatozoa would depend on activity of spermatozoa and the biochemical nature of the incubation media with the passage of time. Significant correlations reported by Erb *et al.* (1956) and Hopwood *et al.* (1956) support the observation. Conception rate was found to be significantly correlated with fructolytic index both during first and second hours (0.58 and 0.76, respectively) which might suggest the utility of fructolytic index in predicting the breeding performance of buffalo bulls.

Acknowledgements

The authors are thankful to the Director, Animal Husbandry, Punjab and his staff and the Heads of Departments of Animal Science and Obstetrics and Gynaecology, Punjab Agricultural University, Ludhiana for providing facilities for the study.

REFERENCES

Alamy, MA, Amin, SO, Danasoury, MS and Oloufa, MS (1976). Fructolysis in the semen of buffalo, Jersey and Friesian cattle at different ages. Indian J. Anim. Sci. **46**: 163-166.

Banerjee, AK and Ganguli, NC (1973). Some aspects of the composition of buffalo semen. J. Reprod. Fert. **33**: 171-173.

Blom, E (1950). The evaluation of bull semen with special reference to its use in artificial insemination. Copenhagen: AS Carl. Fr. Mortensen pp. 223 (Anim. Breed. Abstr. **19**: 648).

Erb, RE, Flerchinger, FH, Fhlers, MH and Gassner, FX (1956). Metabolism of bull semen. II. Fructolysis relationships with sperm concentration and fertility. J. Dairy Sci. **39**: 326-338.

Herman, HA and Madden, FW (1953). The A.I. of dairy cattle. Lncas Brothers Colnmbia, Missouri, U.S.A.

Hopwood, ML, Rntherford, ER and Gassner, FX (1956). The concept of fructose utilization by bull sperm and its relation to fertility. J. Dairy Sci. **39**: 51-59.

Kapoor, PD (1982). Seasonal variations in fructose content of Murrah buffalo bull semen. Livestock Advisor 7(2): 31.

Mann, T (1948). Fructose content and fructolysis in semen, practical application in the evaluation of semen quality. J. Agri. Sci. **38**: 323.

Mann, T (1949). Metabolism of semen. Adv. Eneymol. **9**: 329-390.

Mann, T (1964). The Biochemistry of Semen and of the Male Reproductive Tract. John Wiley and Sons Inc., New York.

Pal, K (1957). Biochemical studies on buffalo bull semen. Curr. Sci. **26**: 212.

Roy, A (1958). Cited by Cockrill, W Ross (1974) in The Husbandry and Health of the Domestic Bnffalo. First Ed. FAO, Rome.

Roy, A, Pandey, PMO and Rawat, JS (1960). Composition of bovine semen. Indian J. Dairy Sci. **13**: 122.

Salem, HM and Osman, SA (1972). Seasonal variation in the chemical constituents of blood and semen in buffalo and cattle. Alex. J. Agric. Res. **20**: 51-55.

Sato, K (1974). Observations on relationships between fructose concentration and bovine seminal characteristics over a 20 months period. Res. Bull. Obihiro Univ. **9**: 95-110. (Anim. Breed Abstr. **43**: 4001).

Sayed, AA and Oloufa, MMA (1957). Preliminary note on physico-chemical analysis of the semen of Egyptian cattle and buffalo. Vet. Med. J. **3**: 159-161.

Sengar, DPS and Sharma, UD (1965). Studies on successive semen ejaculates of buffalo bulls. I. Semen characteristics. India J. Dairy Sci. **18**: 54-60.

Snedecor, GW and Cochran, WG (1967). Statistical Methods. 6th Ed. The Iowa State Univ. Press, Ames, Iowa, U.S.A.

Tomar, NS (1976). Artificial insemination and reproduction of cattle and buffaloes. Second Edn. Saroj Prakashan 646 Katra, Allahabad, U.P. (India).

Zemjanis, R (1970). Diagnostic and therapeutic techniques in animal reproduction. Second Ed. The Williams and Wilkins Company, Baltimore.

IJAR 4: 2: 64-65

Mycoflora in Repeat Breeder Cows and Bull Semen

RISHENDRA VERMA, CR SANE, VL DEOPURKAR, RN SAMANT and VL PARANJAPE

Bombay Veterinary College, Parel, Bombay-400 012

ABSTRACT

Cervical mucous from 22 cows with repeat breeding history, 21 neat and 18 deep frozen bull semen samples were screened for mycotic agents. Of the 22 repeat breeder cows, 6 yielded fungal agents belonging to *Aspergillus fumigatus*, *Absidia* and *Rhizopus*; 5 semen samples yielded *Penicillium*, *Candida albicans*, *Rhizopus* and *Absidia* whereas 8 deep frozen straws revealed Zygomycete (non-sporulating), *Aspergillus niger*, *Aspergillus fumigatus*, *Mortierella* and *Absidia*.

* * *

Repeat breeding problem in cows inflicts the livestock economy. This condition may lead to delayed conecption and even sterility in milch animals. Of the various reasons to be assigned for this condition, the micro-flora of the reproductive tract may play an important role which may be altered either due to indiscriminate use of antibiotics for treatment of reproductive disorders or by inseminating the animals with contaminated semen (Elliot *et al.*, 1968; Raghvan *et al.*, 1971; Garg *et al.*, 1982 and Patgiri and Uppal, 1983). The present investigation describes the mycoflora of the genital tract of repeat breeder cows and neat and deep frozen bull semen.

Materials and Methods

A total of 22 cervical mucous samples from repeat breeder cows were collected using sterile tampoons as per method of Laing (1960). Twenty one freshly collected neat bull semen samples and 18 deep frozen semen straws were screened for mycotic agents. Each cervical and semen sample was inoculated in the Sabouraud's dextrose broth containing penicillin 20 units and streptomycin 40 mcg/ml followed by incubation at 27°C for one week. Subculturing was done on:

(i) Sabouraud's dextrose agar with antibiotics

(ii) Litman oxgall agar

Streaked plates were incubated at 27°C for one week. Fungal colonies were purified and indentified (Moss and McQuown, 1969).

Results and Discussion

Table I depicts fungi isolated from cervical mucous of repeat breeder cows, neat and deep frozen bull semen. In the present study 27.2% cervical mucous samples, 23.7% neat semen and 33.3% deep frozen semen straws were found positive for mycotic agents. Various workers have reported association of mycotic agents in different reproductive disorders in female genitalia of bovines (Kremlev and Banakova, 1979; Garg *et al.*, 1982 and Patgiri and Uppal, 1983). The percentage of positive cases for fungi in cows reported in this paper is in confor-

TABLE I. Mycotic agents isolated from cervical mucous and bull semen

Source	Total no. of samples	No. positive for fungi (percentage)	Isolated fungi
Repeat breeder cows-cervical mucous	22	6 (27.2%)	*A. fumigatus* (2) *Absidia* spp. (1) *Rhizopus* spp. (3)
Neat bull semen	21	5 (23.7%)	Penicillium spp. (1)* *Candida albicans* (1) *Rhizopus* spp. (1) *Absidia* spp. (2)
Deep frozen straws	18	8 (33.3%)	Zygomycete (1) (non sporulating) *Mortierella* spp. (1) *Rhizopus* spp. (1) *A. niger* (1) *A. fumigatus* (1) *Absidia* spp. (2)

* The bull was found to ejaculate blood tinged semen.
Penicillium spp. was isolated twice from the same bull at a gap of one week.

mity with Wawrzkiewicz and Galeza (1972) and Patgiri and Uppal (1983) who reported 35.5% and 16.06% different fungi in genitalia of cows.

There are also reports on the occurrence of various fungi in semen of bovines (Fejes, 1972; Kodagali, 1979 and Singh and Uppal, 1982). Mortierella spp. has been isolated from acutely inflammed placentae and lung of cattle (Cordes *et al.*, 1972) and from hepatic lesions of bovine foetus (Smith, 1968). It is interesting to note that Mortierella spp. seems to be the first record of isolation in semen in India. The fungi reported in this paper have been reported to be responsible for mycotic abortions (Anisworth and Austwick, 1973). It has been well documented that contaminated semen used for insemination purpose results in poor grade of fertility (Fejes, 1972, Kodagali, 1979). The high percentage of fungi in deep frozen straws reported here (Table I) indicates the possibility of contamination during collection and further processing.

REFERENCES

Ainsworth, GC and Austwick, PKC (1973). Fungal Diseases of Animals. 2nd Ed. Common wealth Agricultural Bureaux, Slough, England.

Codes, DO, Margaret, E di Meena and Maggery E Carter (1972). *Vety. Path.* 9, 131-141.

Elliot, J, McMahan, KJ, Gier, HT and Marien, GB (1968). *J. Am. Vet. Res.* 20, 77.

Fejes, J (1972). *Vet. Casopis*, 14, 187-190.

Garg, GM, Vadnere, SV and Sharma, VD (1982). *Indian J. Micro. Imm. & Inf. Dis.* 3, 103-104.

Kremlev, EP and Banakova, LA (1979). *Veterinarys Moscow.* 4, 45-46.

Kodagali, SB (1979). *Indian Vet J.* 56, 807-809.

Laing, JA (1960). *Vibrio foetus* infection of cattle. FAO, series No. 51, Rome.

Moses, SE and McQuowin, LA (1969). *Atlas of Medical Mycology.* 3rd Ed.

Patgiri, GP and Uppal, PK (1983). *Indian J. Comp. Micro. & Inf. Dis.* 4, 19-22.

Raghavan, R, Nilkantan, PR, Uppal, PK (1977). *Indian Vet J.* 48, 779.

Singh, KP and Uppal, PK (1982). *Indian Vet. J.* 59, 837-841.

Smith, JMB (1968). *Mycopath. Mycol. Appl.* 34, 353-358.

Wawrziewicz, K and Galeza, J (1972). *Med. Weteryn.* 28, 424-426.

IJAR 4: 2: 66-70

Observations on Calvings in a Herd of Holstein-Friesian and Jersey Cattle.

SP GANPULE

Krishi Gram Vikas Kendra, Usha Martin Black Ltd.
Tatisilwai, Ranchi, 835 103, Bihar.

ABSTRACT

169 calvings in a herd of H.F. and Jersey cows over the years 1979-82 were studied. Age at first calving was 29.5 and 28.5 months in H.F. and Jersey heifers, respectively. Average 1st and 2nd intercalving periods were 498 and 425 days in H.F. and 477 and 423 days in Jersey cows. Calving Rates for the last two years were 85% and 82%. Seasonal pattern of calving was not observed in Jersey cows, however, in H.F. cows 45% cialvings occured in winter, 62% of calvngs occured between 0 to 12 hours of the day. Average birth weight in male calves was higher than that in females, 30 kg vs 27 kg in H.F. and 19 kg vs: 18 kg in Jersey. Sex ratio was close to 50:50. Abortions occured at the rate of 6.6% in H.F. and 5.7% in Jerseys. 6% stillbirths were recorded in both the breeds. 53% H.F. and 83% Jersey cows did not require any assistance during calving. Dystokia rates were 1.6% in H.F. and nil in Jersey calvings. Retained placenta was observed in 17% H.F. and 4% Jersey calvings. Average time required for expulsion of placenta was 6 hours, with 85% expulsions occurring between 3 to 6 hours.

* * *

Krishi Gram Vikas Kendra (KGVK) is a voluntary organization engaged in Integrated Rural Development work in the Chotanagpur area of South Bihar. The Kendra has taken up a large scale crossbreeding programme since 1975 and has established a nucleus herd of Holstein-Friesian (H.F.) and Jersey cattle imported from Australia in 1978. Ranchi is situated at an altitude of 2000 ft, lies on the tropic of cancer and has tropical weather. It is a predominantly paddy growing area receiving about 60 inches annual rainfall during the period June to October. Maximum summer temperature goes upto 41°C while minimum in winter is 6°C.

Materials and Methods

Breeding and calving records of the herd for the period 1979-82 were studied. The herd comprised of 54 H.F. and 20 Jersey heifers imported in one batch from Australia in 1978. Calvings started from October 1979 onwards. Calvings took place in calving pens and every calving was attended either by a farm Veterinarian or a Stockman on duty. Natural calvings were encouraged and assistance was offered only when absolutely essential.

Results and Discussions

1. *Age at first calving:* Age at first calving ranged from 24 to 46 months. Maximum (41%) heifers calved between 24-27 months. The average age at first

TABLE 1. Age at first calving and Intercalving periods.

Item	H.F.		Jersey	
	Number	*Mean*	*Number*	*Mean*
1. Age at first calving (months)	53	29.5	20	28.5
2. 1st Intercalving period (days)	45	498	19	477
3. 2nd Intercalving period (days)	13	425	9	423
4. Frequency distribution	*Number*	%	*Number*	%
of age at first calving				
below 24 months	—	—	3	15
25 — 27 months	22	41	3	15
28 — 30 months	18	34	6	30
31 — 33 months	9	17	5	25
34 — 36 months	3	6	3	15
over 36 months	1	2	—	—

calving was 29.5 months. It was lower than that reported for Friesian heifers in Sri Lanka (Mahadevan, 1956), Friesian heifers of Danish origin in Egypt (Ragab and Asker 1959), H.F. heifers of Australian origin in India (Bhat *et. al.*, 1978, Kumar *et. al.* 1978). Verde (1972) reported age at first calving of 27.4 months in Holstein heifers in Florida.

Age at first calving ranged from 19 to 36 months in Jersey heifers, with maximum number (30%) of heifers calving between 27-30 months age. Average age at first calving was 28.5 months. Maule (1953) reported 36 months as age at first calving in Jersey heifers at Allahabad. Sundaresan *et. al.* (1954) found age at first calving in Kansas State College to be 30 months while Shivkumar *et. al.* (1979) estimated that Jersey heifers of Danish origin at Koorg (Karnataka) calved at 25.5 months age. The details have been presented in Table-1.

2. *Intercalving period:* The first and second intercalving periods were 498 days (16.5 months) and 425 days (14 months) in H.F. cows. In paired observations, improvement of 50 days was observed. Rao and Nagarcenkar (1979) had observed average intercalving period of 14 months in Friesian heifers in Northern India. Payne (1970) quoted Hernandez reporting 468 days calving interval in H.F. heifer in Venezuela, while Marples and Trail (1967) found it to be 447 days for Holstein heifers in Uganda. Kumar *et. al.* (1978) reported it to be 496 days for H.F. herd at IVRI, Izatnagar, while Bhat *et. al.* (1978) estimated it to be 516 days for IVRI herd

TABLE 2. Calving rates in different years

Year	H.F.		Jersey		Overall		
	No. of breedable females	No. of calving	Calving Rate	No. of breedable females	No. of Calvings	Calving Rate	Calving Rate
1980	45	30	66%	16	12	75%	68%
1981	46	40	87%	16	13	81%	85%
1982	40	32	80%	16	14	87%	82%

TABLE 3. Pattern of calving in different seasons.

Season	Months	% of total calvings		
		H.F.	Jersey	Overall
Summer	March—June	25%	37%	29%
Monsoon	July—October	30%	29%	30%
Winter	November—February	45%	34%	41%
Total no. of calvings		119	46	165

and 479 days for IARI, New Delhi herd.

The first and second intercalving periods in Jersey cows were 477 and 423 days respectively. Paired observations showed improvement of 42 days. Average intercalving period compares well with Maule (1953) for Jerseys in Jamaica, Sundaresan *et. al.* (1954) for Kansas State, U.S.A., Marples and Trail (1967) for Uganda, Shivkumar *et. al.* (1979) for Koorg in South India and Rao and Nagarcenkar (1979) for Gangetic plains in North India.

3. *Calving Rate* (Calf Crop): Calving rate is defined as the number of calves born in comparison to the number of breedable females in the herd that were subjected to breeding (Payne, 1970). Calvings in the herd started in November 1979. The year wise calving rates are given in Table 2.

TABLE 4. The distribution of calvings in different periods of the day.

Time of the day	Frequency of occurance of calvings					
	H.F.		Jersey		Over all	
	Number	%	Number	%	Number	%
0—6 hrs	44	36	17	35	61	36
6—12 hrs	38	31	6	12	44	26
12—18 hrs	22	18	14	28	36	21
18—24 hrs	18	15	12	25	30	17
Total	122	100%	49	100%	171	100%

TABLE 5. Birth weight and Sex ratio and other observations on calvings:

Observations		H.F.	Jersey	Overall
No. of calvings studied		122	47	169
% live calves born		94%	94%	94%
% Stillbirths		6%	6%	6%
Abortions		6.6%	5.7%	6.4%
Birth weight in Calves	Males	30kg	19 kg	
	Females	27 kg	18 kg	
Sex Ratio — ♂ : ♀		46:54	56:44	49:51
Normal calvings		53%	83%	62%
Mild assistance needed		26%	8%	21%
Major assistance needed		19.4%	9%	15.8%
Dystokia		1.6%	—	1.2%
Retained placenta		17%	4%	13%

Calving rate started picking up from 1981 onwards, and for the last two years it was above 80% in both H.F. and Jersey females, comparable to the optimum level of 80% suggested by Payne (1970) for successful beef breeds in the temperate climates.

4. *Seasonal pattern of calving:*

Seasonal trend in the incidence of calving was more marked in H.F. in which majority of the calvings (45%) occnrred during winter months. In Jersey cows such seasonal fluctuations were less and calvings were more or less evenly distributed in different seasons. Kumar and Singh (1979) had shown that maximum calvings (36%) in H.F. herd occured between August to October.

5. *Timing of claving:*

Incidence of calvings at different hours of the day were examined and results shown in Table 4. It appears that the day and night frequencies are equal, however, the period between 0 to 12 hrs is prefered by cows and 62% of the calvings take place between these hours. The highest frequency was between 0 to 6 hours, being the least disturbed hours of the day.

6. Average birth weight of male calves was higher than that of females in both the breeds, 30 kg versus 27 kg in H.F. and 19 kg versus 18 kg in Jerseys. These figures compare well with findings of Malik *et. al.* (1976). Sex Ratio in Male: Female was 46:54 in H.F., 56:44 in Jersey and 49:51 overall, which was statistically not different from 50:50. This compares well with Singh and Parekh (1982) for crossbred calves.

7. *Abortions and Stillbirths:* Abortion rates were 6.6% and 5.7% in H.F. and Jersey females. Out of total 12 abortions, 10 occured between 2 to 4 months gestation, while remaining 2 occured around 5 months gestation. Out of 12 abortions, 7 occured due to high fever associated with Theilariasis, remaining 5 were not associated with any pathological cause. Animals are vaccinated against Brucellosis and annual blood serum examinations have ruled out presence of Brucellosis in the herd. Present findings compare well with Asker and El-Itriby (1957), Hollon and Branton (1973) and Kumar and Singh (1979). Amble and Jain (1967) however reported abortion rate of 18% in higher grade corssbreds. Rao (1982) reported it to be 11% in Jersey cows on Livestock Farms in Andhra Pradesh.

6 % Stillbirths were recorded in both H.F. and Jersey cows which compares well with the findings of Amble and Jain (1967), Kumar and Singh (1979) and Rao (1982).

8. *Assistance required by cows during calving:* Incidence of natural unassisted calvings were 53% in H.F. and 83% in Jersey cows. Remaining cows needed assistance. 26% H.F. cows and 8% Jersey cows needed only a mild assistance. Major assistance consisting of pulling out a calf by applying traction was needed in 19.4% H.F. and 9% Jersey calvings. Neither epidural aneasthesia nor surgical interference was needed in any case. Dystokia with abnormal foetal presentation was observed in two out of 122 H.F. calvings (1.6%) and in none of the 47 Jersey calvings. Rao (1982) had reported 1.3% dystokia cases in Jersey cows on Livestock Farms in Andhra Pradesh.

9. *Expulsion of Placenta:* (Table 5). Incidence of retained placenta was 17% in H.F., 4% in Jersey and 13% overall calvings. Singh and Rao (1975) had observed 21.2% retained placenta cases in Red Sindhi and Non discript cows,

while Kharche *et. al.* (1982) reported it to be 24% in Gir cows. Average time required for complete expulsion of placenta was 6 hours with a range of 3 to 18 hours. 85% of the cows expelled the placenta between 3 to 6 hours, and by 18 hours after calving, all cows had expelled the placenta fully. Bhosrekar and Sharma (1972) noted that Brown Swiss-Sahiwal crossbred cows needed on an average 5 hrs 37 minutes to expell the placenta. Rao *et. al.* (1981) found that 76.7% Ongole cows expelled the placenta within 3 to 6 hrs. of calving. Average time was found to be 5 hrs with a range of 2.5 to 12 hours.

REFERENCES

Amble, VN and Jain, JP (1967). J. Dairy Sci. **50:** 1695-1702

Asker, AA and El Itriby, AA (1957). Indian J. Dairy Sci. **10:** 191-200.

Bhat, PN, Gurcharan Singh, Biswas, JC, Singhal, RA, Garg, RC and Satish Kumar (1978). Indian J. Animal Sci. **48:** 643-647.

Hollon, BF and Branton, C (1973). J. Dairy Sci. **56:** 309.

Kharche, KG, Singh HN and Thakur, MS (1982). Livestock Adviser **7:** 3:31-35.

Kumar, S and Singh, H (1978). Holstein Friesian at I.V.R.I. Izatnagar, Livestock Production Research, Indian Veterinary Research Institute, Izatnagar.

Kumar, S, Pandey, HS, Sharma, NC and Katpatal, BG (1980). Indian Vet. Medical J. **4:** 1-7.

Mahadevan, P (1956). J. Agric. Sci. **48:** 164-170.

Malik, BS, Sri Ram and Chaudhary, AL (1976). Indian J. Dairy Sci. **29:** 67-69.

Marples, HJS and Trail, JCM (1967). Trop. Agric. Trin. **44:** 69.

Maule, JP (1953). Anim. Breed. Abstr. **21:** 105.

Payne, WJA (1970). Cattle Production in the tropics. Vol. I. pp. 307. Longman Group Ltd. London.

Ragab, MT and Asker, AA (1959). Indian J. Dairy Sci. **12:** 18-26.

Rao, GN and Nagarcenkar, R (1979). Indian J. Dairy Sci. **32:** 355-361.

Rao, AV Narsimha (1982). Indian J. Anim. Reproduction **2:** 29-31.

Shivkumar, KS, Hegde, GR and Swami, MN (1979). Livestock Advisor, **4:** 12:19-22.

Singh, A and Parekh, HKB (1982). Livestock Advisor **7:** 11:5-7.

Sundarsan, D, Eldridge, FE and Atkinson, FW (1954). J. Dairy Sci. **37:** 1273-1282.

Singh, SB and Rao, MM (1975). Indian Vet. J. **34:** 194-204.

Verde, OG (1972). J. Dairy Sci. **55:** 1010-1012.

IJAR 4: 2: 71-74

Certain Reproductive Traits of Cross Bred Cows

E MADHAVAN, K. PRABHAKARAN NAIR, N RAVINDRANATHAN and PA DEVASSIA

College of Veterinary and Animal Sciences
Kerala Agricultural University
Mannuthy, Trichur — Kerala

ABSTRACT

Reproductive traits of 162 Jersey, 40 Brown Swiss and 17 Holstein Cross bred Cows belonging to the Livestock farm attached to the Kerala Agricultural University were studied. Post-partum Oestrous interval, Number of A.I. per conception, Gestatoin period, inter-calving period and weight of calf at birth did not vary significantly between different genetic groups. Parity of cows did not influence the various reproductive traits. Sex of calf did not influence the gestation length. Number of inseminations per conception was significantly higher in abnormal calving. Post insemination antibiotic therapy in repeaters significantly reduced the number of insemination per conception and inter-calving period.

* * *

Materials and Methods

One hundred and sixty two Jersey, 40 Brown Swiss and 17 Holstein Cross bred cows belonging to the Livestock farm attached to the Kerala Agricultural University formed the material for the study. All these cows were maintained under identical conditions of feed and management. The data pertaining to post-partum oestrous interval, number of A.I. per conception, gestation period, service period and inter calving period were collected and grouped according to different genetic groups and parity of animals and then analysed. (Snedecor and Cochram 1967). The gestation period of these cows were grouped according to the sex of calf born and analysed to study the influence of sex of calf on gestation length. The number of animals in different genetic groups which became pregnant during different months were analysed to study the effect of season on conception rate. The calvings were grouped as normal and abnormal and number of inseminations per conception, service period and inter calving period between two groups were compared. Similarly, the service period and inter calving period of the repeat breeding animals which received various antibiotic treatments were compared with those which did not receive any treatment.

Results and Discussion

The post partum oestrus occurred in 77.42 days in Jersey, 75.40 days in Brown Swiss and 88.28 days in Holstein Crosses. Analysis of the data revealed that variation in the post partum oestrous interval in different genetic groups was not at variance. Similar observations were made by Bhaskaran *et al.* (1983) in cows of similar genetic groups. The number of inseminations per conception for Jersey, Brown Swiss and Holstein crosses were 2.48, 2.70 and 2.14 respectively which also

TABLE 1. Correlation between different reproductive traits

	Parity	Post partum oestrus	No. of A.I, per conception	Service	Inter calving period	Gestation length
Parity	1.0	0.0082	0.3270	0.1074	0.1654	0.0089
Post partum oestrus		1.0	0.1299	0.5508*	0.5574*	0.300
No. of A-I per conception			1.0	0.5281*	0.4722*	0.0357
Service period				1.0	0.9555**	0.1138
Intercalving period					1.0	0.0276
Gestation period						1.0

* Significant at 5% level ** Significant at 1% level

did not show significant variation. In the above respective genetic groups of Cows the mean gestation length was 275.87, 277.38 and 282.00 days which also did not vary significantly between genetic groups. This is consistent with the observation of Madhavan *et al.* (1979) in Cows of similar genetic groups. In Jersey Crosses, the service period and inter calving period were 111.64 and 391.98 days respectively, while the respective values were 120.75 and 399.20 days in Brown swiss Crosses and 114.00 and 381.33 days for Holstein crosses. The different genetic groups of cows did not show significant variation in the above reproductive traits. The birth weight of calves also did not vary significantly between different genetic groups, the values being 24.22, 26.00 and 30.33 kgm respectively in Jersey, Brown swiss and Holstein crosses. On the contrary, Madhavan *et al.* (1979) reported significant variation in the birth weight of calves in different genetic groups and found that Holstein Friesian cross bred calves weighed significantly more at birth than Brown swiss and Jersey cross bred calves. This variation might be due to wide variation in the level of exotic inheritance of the calves in different genetic groups in the two studies. The present study also did not reveal any significant variation in the reproductive traits due to parity of the cows in different genetic groups. This is consistent

TABLE 2. Reproductive traits in normal and abnormal calving and the effect of antibiotic treatment in repeaters.

Characters	Normal calving	Abnormal calving	't' value	With post A.I. Antibiotic treatment	Without post A.I, Antibiotic treatment	't' value
Number of insemination per conception	2.957	3.630	4.07*	3.61	5.820	2.67*
Service Period	112.068	127.458	0.88	146.781	177.739	1.87
Inter calving Period	380.502	432.818	0.35	392.418	463.711	2.59*

* Significant at 1% level.

with that of Kadu and Kaikini (1976) in Sahiwal crosses. But Jana and Mishra (1978) and Bhaskaran *et al.* (1983) reported that primiparous cows took significantly more days for the onset of post partum oestrum while Marion *et al.* (1968) noticed longer post partum oestrous interval in pluriparous cows.

Correlation of different reproductive traits in cross bred cows (Table I) revealed that post partum oestrous interval, and number of A.I. per conception had significant positive correlation with service period and inter calving period. Similarly sequence of calving showed positive correlation to number of A.I. per conception, service period and inter calving period. However, gestation length had negative correlation to all the reproductive traits studied.

The mean gestation length did not vary significantly between the sex of the calves born, the values being, 277.02 days and 276.71 days for male and female calves respectively. This concurs with earlier reports of Weaver (1947) and Madhavan *et al.* (1979). On the contrary, Vyas *et al.* (1971) and Tomar and Arora (1972) indicated definite variation in the length of gestation due to sex of calf and observed that male calves were carried longer than female calves. According to Bhim Reddy and Ramakrishna (1960) female calves were carried longer than males.

Conception rate showed definite variation between different season. The rate of conception was lowest in December and January in Jersey (21%) and Brown Swiss crosses (14%). The rate of conception was 21 per cent and 32 per cent during February to April in Jersey and Brown Swiss Crosses respectively while the respective values were 51% and 50 per cent during May to November in Jersey and Brown Swiss crosses. On analysis it was observed that pregnancy rate during May to November was significantly higher than other months in both the genetic groups. Daspurakayastha (1981) reported that conception rate was lowest in Jersey crosses during October and highest during September while in Brown swiss crosses the lowest was during December and highest during November to February.

It was further observed that abnormal calving significantly altered the various reproductive traits (Table-2). The number of A.I. per conception after normal calving (2.957) was significantly lower than in abnormal calving (3.630). Service period and inter calving period were also shorter in normal calving than in abnormal calving. Similar observation were also made by Bhaskaran *et al.* (1983). Results of treatment with antibiotics in repeaters which did not conceive even after three A.I. showed that number of A.I. for conception (3.61) and inter calving period (392.418 days) was significantly lower than those which did not receive antibiotic therapy (5.82 and 463.711 days respectively). This would suggest that post insemination antibiotic therapy was beneficial for improving the reproductive efficiency of repeaters as reported by Ramadas *et al.* (1978) and Choudhary and Purbey (1983).

Acknowledgement

Grateful acknowledgement is made to the Dean, Faculty of Veterinary and Animal Sciences for permission to publish this paper.

REFERENCES

Bhaskaran, KV, Neelakanta Iyer, CP and Madhavan, E (1983). Studies on the post partum Reproductive performance of Cross bred cows. Kerala J. Vet. Sci. **14**: 38-43.

Bhim Reddy, D and Ramakrishna, K (1961). Factors influencing the length of gestation period. Indian Vet J. **37**: 202-209.

Choudhary, SK and Purbey, LN (1983). Therapeutical trials with some antibiotics for restoring fertility in repeat breeding cattle. Livestock Adviser **8**: 42-44.

Daspurakayastha, PC (1981). Role of seasonal changes in breeding behaviour of cross bred and Hariana Type cows under farm condition. Livestock Adviser **6**: 29-37.

Jana, D and Mishra, RR (1978). Studies on uterine involution and post partum oestrum and Dairy cows. Indian J. Dairy Sci. **31**: 145-149.

Kadu, MS and Kaikini, AS (1976). Studies on post partum oestrus in Sahiwal cows. J Maharashtra Agri. Univ. **1**: 2-6.

Madhavan, E, Neelakanta Iyer, CP and Francis, UT (1979). Influence of cross breeding on Gestation length and birth weight of calves. Kerala J. Vet. Sci. **10**: 332-334.

Marion, GB, Now wood, JS and Gier, HT (1968). Uterus of the cow after parturition. Factors affecting regression. Am. J. Vet. Res. **29**: 71-75.

Ramadas, K, Neelakanta yer, CP and Raja CKSV (1978). Studies on the efficacy of Intra uterine administration of antibiotics to improve conception in cows. Kerala J. Vet. Sci. **9**: 311-314.

Snedecor, GW and Cochran, WG (1967). *Statistical methods*. Oxford and IBH publishing Co. Calcutta-5 6th ed. pp. 162-171.

Tomar, NS and Arora, KL (1972). The influence of different breeds of exotic sires on gestation length in Hariyana cows. Indian Vet. J. **49**: 512-517.

Vyas, SH, Patel, MD and Patel BM (1971). Factors affecting gestation period in cattle. Indian J. Dairy Sci. **24**: 38-41.

Weaver, E., Wettesen, ED and Hor wood, EE (1947). Mich. Agri. Station. Bulletin **30**: 180.

IJAR 4: 2: 75-77

Expulsion of Placenta in Kankrej Cows.

KS Patel, JP Patel, SR Bhagwat, AD Dave and GP Bhagoji

Livestock Research Station
Gujarat Agricultural University
Anand Campus, Anand-388 001

ABSTRACT

A study on weight of placenta, time taken for expulsion of placenta and birth weight of the calves was made by recording 133 calvings in Kankrej cows mated to Jersey and Holstein Friesian sires. Average weight of the placenta was 2.63 kg. Neither the breed group nor the sex of the calves affected the placental weight. There was a tendency to have heavier placenta from the cows mated to Holstein Friesian sires only. Average birth weight of Kankrej × Jersey (F_1) and Kankrje × Holstein (F_1) calves was 22.3766 ± 0.3379 kg and 26.0054 ± 0.4397kg respectively. The difference in birth weight between the breed groups was significant. ($P<0.05$). The average time taken for expulsion of placenta was 5.3872 hours and was neither affected by the breed group nor the sex of the calves. The time taken for expulsion of placenta had non-significant association with placental weight of the cows giving birth to $K \times JF_1$ male and $K \times HF_1$ male and female calves. About 6 per cent of the cows retained placenta longer than 24 hours.

* * *

Expulsion of placenta is considered as third stage of parturition phenomenon. It is having significance for its closer relationship with post-partum sexual health of the cows. An attempt has been made to find out sire effect on placental size and time taken for expulsion of placenta.

Materials and Methods

Time taken for complete expulsion of placenta starting from expulsion of calf was recorded for 133 calvings in Kankrej cows mated to Jersey and Holstein Friesian sires. The study included the calvings occurring between 1st May 1981 to 1st August, 1982. The placenta retained for more than 18 hours were not included in the study. Only in 6 out of 133 calvings the cows took more than 12 hours, but less than 18 hours for expulsion of placenta.

The placental membranes were collected immediately after complete expulsion and were weighed on a spring balance to nearest 100 g. Birth weight of the calves was recorded immediately on drying and before colostrum feeding.

Results and Discussion

Average weight of placenta, birth weight of the calves and time taken in expulsion of placenta have been presented in table 1.

Placental size:

On an average the placenta of Kankrej cows weighed 2.63 kg. The placenta from the cows giving birth to Kankrej × Jersey F_1 ($K \times JF_1$) calves was slightly lighter

TABLE 1. Average placental weight, birth weight of the calves and time taken in expulsion of placenta by Kankrej cows.

	Breed group of the calves delivered		Sex of the calves delivered		C.V.
	K × JF_1	K × HF_1	Male	Female	%
Placental weight Mean ± S.E. (Kg)	2.5506 ±0.0679 (76)	2.7482 ±0.0723 (56)	2.5700 ±0.0702 (69)	2.7048 ±0.0714 (63)	21.78
Birth weight Mean ± S.E. (Kg)	22.3766 ±0.3379 (76)	26.0054 ±0.4397 (56)	23.5400 ±0.4420 (69)	24.3095 ±0.4315 (63)	12.99
Time taken in expulsion of placenta Mean ± S.E. (hours)	5.0455 ±0.2284 (76)	5.8571 ±0.3775 (65)	5.2036 ±0.2525 (69)	5.5913 ±0.3387 (63)	44.25

Figures in the parenthesis indicate number of observations.

TABLE 2. Association of time of expulsion with placental weight and birth weight of the calves

Breed group of the calf	Sex of the calf	Correlation coefficients Placental weight	Birth weight
K × JF_1	Male	—0.2469N.S.	—0.0073N.S.
	Female	—0.4026*	—0.3041N.S.
K × HF_1	Male	—0.0617N.S.	0.5114N.S.
	Female	0.0261N.S.	0.1587N.S.

* $P<0.05$ N.S. = Non-significant.

by 7.19% than that from the cows delivering Kankrej × Holstein (K × HF_1) calves. The difference in placental weight due to breed group was statistically non-significant. Similarly the difference in the placental weight due to sex of the calves was also non-significant.

Rao *et al.* (1966) observed higher weight of placenta in Ongole cattle (3.36±0.22 and 3.33±0.039 kg respectively with male and female calves) than that observed in this study.

Weight of the placenta had highly significant association with the birth weight of the K × JF_1 calves of both the sexes. The correlation coefficients for this breed group were r=0.4132 and r=0.4691 respectively for male and female calves. This indicated that there was a tendency to have heavier placenta from the cows delivering heavier calves.

However, the correlation coefficients between the placental weight and birth weigh of K × HF_1 calves were statistically non-significant in both the sexes (r=0.1031 and r=0.3606 for male and female calves respectively).

Significant positive correlation for placental weight with birth weight of the calves was recorded by Rao *et al.* (1966).

Birth weight:

Average weight at birth for the $K \times JF_1$ and $K \times HF_1$ crossbred calves was 22.3766 $\pm$0.3379 kg and 26.0054$\pm$0.4397 kg respectively. The difference in birth weight due to breed group was significant ($P<0.05$). Patel *et al.* (1983) reported significantly different birth weight for $K \times JF_1$ (21.71 kg) and $K \times HF_1$ (27.42 kg) calves. They reported significant effect of sex on the birth weight of the calves.

Expulsion of placenta:

The average time taken for expulsion of placenta by the Kankrej cows was 5.3872 hours and was neither affected by the breed group nor the sex differences of the calves.

Rao *et al.* (1981) reported average time in expulsion of placenta by Ongole and its crosses to be 5 hours and 9 minutes. Jana *et al.* (1983) recorded average time in expulsion of placenta by Exotic, Zebu and their crossbred cows to be 5 hours and 19 minutes. However, Rao *et al.* (1966) and Karche *et al.* (1982) observed slightly shorter time required for expulsion of placenta in Ongole (4 hours and 22 minutes) and Gir (4 hours and 12 minutes) breeds of cows respectively.

Time taken for expulsion of placenta with placental weight and birth weight of the calves is presented in table 2.

The time required for expulsion of placenta had non-significant correlation with placental weight of the cows giving birth to $K \times JF_1$ male and $K \times HF_1$ male and female calves. The correlation coefficient between the placental weight and time taken in expulsion of placenta was negative and significant in case of cows giving birth to $K \times JF_1$ female calves indicating tendency of heavier placenta to drop earlier. Birth weight of the calves did not affect the time required in expulsion of placenta of all the cows giving birth either to $K \times JF_1$ or $K \times HF_1$ calves.

Retension of placenta:

Six per cent of the cows retained placenta in utero longer than 24 hours after expulsion of fetus, and required veterinary aid.

Acknowledgement

The statistical help received from Shri K. H. Prajapati, Jr. Statistician, A.I. C.R.P. (Tobacco), GAU, Anand Campus, is gratefully acknowledged.

REFERENCES

Jana, DN, Mishra, RR and Dash, PC (1983). Parturition behaviour in exotic, zebu and exotic × zebu cows. Indian J. Anim. Sci. 53: 69-70,

Karche, KG, Singh, HN and Thaker, MS (1982). Studies on symptom and process of parturition in Gir cows. Cherion: 11: 5-10

Patel, JM, Patel, KS and Patel, JP (1983). A note on birth weight of Kankrej × Jersey and Kankrej × Holstein Friesian halfbreds. GAU Res. J. 8: 139-141

Rao, AR, Rao, PN and Rao, ASP (1966). Studies on parturition of Ongole cattle. Indian Vet. J. 43: 44-49.

Rao, Chalapati, Rao, AR and Krishna, VJ (1981). Studies on parturition of Ongole and crossbred cows. Indian Vet. J. 58: 135-138.

IJAR 4: 2: 78-80

Studies on Fertility Status of Crossbred Cows

GP CHINNAIYA, SA SATTAR and TG VENKATARAMAN

Southern Regional Station
National Dairy Research Institute, Bangalore.

ABSTRACT

The economics of crossbred cattle is not only based on milk production but largely on breeding efficiency. There is paucity of data concerning the reproductive efficiency of crossbred cattle. A study was undertaken to know the fertility level through Artificial Insemination in Jersey, Holstein Friesian and Red Dane crossbred animals maintained under farm condition and by private urban cattle breeders of Bangalore. It was observed that crossbreds with Jersey exotic inheritance recorded higher conception rate compared to crossbreds with Friesians. Further it was noted that animals with 50 per cent exotic inheritance were having higher rate of conception than crossbreds with 75 per cent exotic inheritance. This trend was similar for both Jersey as well as for Friesian crosses. The conception rate among Red Dane crosses was the lowest and they took more number of services per conception compared to the other two types of crossbreds studied. The fertility status of crossbred animals maintained by the private breeders was high in all the three groups of crossbreds. This was observed in relation to the result of first service only whereas in subsequent services it was low and most of the repeat breeders were found to be disposed of at the earliest. Further it was noted that the choice of the private breeders in Bangalore area was to maintain Friesian crosses compared to Jersey and Red-Dane crossbred animals.

* * *

Materials and Methods

The study was undertaken to know the fertility level through Artificial Insemination in a total of 2419 Jersey, Holstein and Red Dane crossbred cows maintained at the Southern Regional Station of National Dairy Research Institute Bangalore, and the private breeders in Bangalore area. The data pertains to the period from 1979 to 1981 and the Genetics groups were crossbreds of Jersey (J) Holstein Friesian (HF) and Red Dane (RD) with the local non descript cattle of the area, whereas in the Farm Tharparkar (Thari) was the foundation stock. Inseminations were carried out on these animals during oestrus in the Farm herd as well as outside the farm in the insemination centres controlled by the Institute. The identity of the Animals was kept and rectal palpation was carried out 60-90 days of insemination to confirm pregnancy.

Results and Discussion

The number of animals and the results of pregnancy tests are presented in Table I and II for the different groups of crossbred animals in the farm and with private breeders respectively.

Table I gives the details of the pregnancy particulars for different genetics

TABLE 1. Conception rate and number of inseminations per conception in different genetic groups of cows under farm conditions

Genetic Group	Total Number of Animals	Conception rate (Per cent) with number of insemination				Numbers not pregnant	Number of inseminations per conception
		I_1	I_2	I_3	I_4		
1. ½ Jersey ½ Thari	25	44.0	12.0	16.0	20.0	2	1.9
2. ¾ Jersey ¼ Thari	213	41.78	30.04	13.61	13.61	2	1.9
3. ½ HF¼T ¾ Jersey	103	38.83	22.33	13.59	23.30	2	2.1
4. ¾ HF¼ Thari	50	36.0	22.00	20.0	22.0	—	2.2
5. ½ RD¼ J ¼ Thari	21	14.28	23.8	28.57	33.3	—	2.4
6. ¾ RD¼HF	18	44.44	11.11	5.55	38.88	—	2.3
GRAND TOTAL	430						

groups in the farm herd at Southern Regional Station of National Dairy Research Institute, Bangalore. It was observed that the crossbreds with Jersey exotic inheritance have a better conception rate (44%) compared to the crossbreds with Holstein Friesian breeds (38.8%). Further it was noted that the half breds both in Jersey and Holstein Friesian crosses were having higher rate of conception based on first service. It was 44% vs. 41.7% for half breds and ¾ crosses with Jersey; and for Holstein Friesian crosses it was 38.8% vs. 36.0% for half breds and ¾ crosses respectively. Reduction for the reproductive efficiency has been reported from F_1 to F_2 generation (Gill 1979) and the present observation is in agreement of the same. No additional advantage in the production performance also has been observed by increasing the level of exotic inheritance beyond 50% in Tharparkar Jersey crosses (Obi Reddy and Sampath, 1981). The number of services per conception for crossbred groups ranged between 1.9 (Jersey crosses) and 2.4 (Red Dane crosses). Bhatnagar *et al* (1979) reported 1.8 services per

TABLE 2. Conception rate and number of insemination per conception in different genetic groups of cows with private breeders

Breed	Total number of animals	Pregnant with number of insemination (Per cent)			Animals not varified (Per cent)	Number of inseminations per conception
		I_1	I_2	I_3		
1. Jersey Cross	820	73.6	3.7	0.9	21.8	1.4
2. HF Crosses	1072	73.2	3.6	1.1	22.10	1.4
3. Red Dane Crosses	97	57.7	2.0	0	40.3	1.9
GRAND TOTAL	1989					

conception in Brown Swiss Sahiwal crossbreds. The conception rate among Red Dane crosses was the lowest (14.3%) and they took more number of services (2.4) per conception. Gill *et al* (1978) also recorded low performance (2.2 service/conception) in Red Dane Sahiwal crosses. This is comparatively low, where as among Indian Dairy Breeds viz. Sahiwal, Tharparkar and Red Sindhi they have taken as high as 3.8 insemination per conception (Basu *et al* 1975). On the whole higher percentage of animals were found to have become pregnant on first insemination and the percentage of animals conceiving with more number of inseminations decreased with the increase in number of inseminations except in $\frac{1}{2}$ Red Dane $\frac{1}{4}$ Jersey and $\frac{1}{4}$ Thari group in which the conception rate was low and took 2.4 inseminations per conception.

Table II gives the particulars of conception rate among the three groups of crossbreds varified with the animals maintained by the private dairy farms in Bangalore area. It was observed that the conception rate was high (73.6%) in Jersey and Holstein Friesian crosses based on first inseminations but the result of subsequent inseminations was very low Low conception rate (36%) has been observed (Kaikini *et al* 1981) in Holstein Friesian × Gir F_1 crossbred cows also. It may be due to elimination of animals when they do not conceive and improper recording and early disopsal of repeaters. Higher conception rate (67.4%) has been observed by Singh *et al* (1980) in Jersey local crossbred cows as compared to Holstein local crosses and report that Jersey local crossbred cows are superior to Holstein local cows with regard to breeding efficiency and the present observations confirm the same. Further it was noted that the choice of the breeders was to maintain Holstein crosses compared to Jersey and Red Dane crosses in this area.

Acknowledgement

The authors sincerely wish to thank the Director of the Institute and the Head, Southern Regional Station of National Dairy Research Institute, Bangalore, for the facilities made available for the project.

REFERENCES

Basu, SB, Bhatnagar, DS, Taneja, VK and Rao VP (1979). Indian J. Dairy Sci. XXXII 4 497.
Bhatnagar, DS, Taneja, VK, Basu, SB and Rao VP (1979). Indian J. Dairy Sci. XXXII 4 491.
Gill, GS and Jain AK (1978). Indian J. Dairy Sci. 31 4326.
Gill, GS (1979). Indian Dairyman XXXI 2 83.
Kaikini AS, Chikhalikar GK, and Dindorkar CV (1981). Indian J. Animal Reproduction 1 1, 80.
Sharma RS and Bhatnagar DS (1975). Indian J. Dairy Sci. 28 17-84.
Singh EB, Bhaduri JZ and Patel RK (1980). Indian Dairyman XXXII 2 105.
Obi Reddy A and Sampath SR (1981). Indian Dairyman XXXIII 6 341.

SHORT COMMUNICATIONS

IJAR 4: 2: 81-82

A Note On Estrus Synchronization with Prostaglandin F2alpha in Goats

TARIQ AHMED and M BHATTACHARYA

Departments of Obstetrics and Gynaecology & Anatomy and Histology
Punjab Agricultural University
Ludhiana-141004 (India)

Synchronization of estrous in the goat has been accomplished with the use of progestagens. Withdrawal of progesterone therapy promptly resulted into estrus. One of the major disadvantages with progestagen treatment is the impaired sperm transport and survival in the female genital tract resulting in poor conception rate. Alternative methods of estrus control, therefore, are of enormous value to livestock industry. Protaglandin F_2 alpha (PG) has found much use in estrus control in cattle and sheep (Inskecp 1973). Sporadic attempts have been made to control estrus in goats with the use of PG The paucity of literature on this subject in this species prompted us to report the present communication.

Seven healthy, adult mixed-breed goats (breeding history unknown) declared non-pregnant upon abdominal palpation comprised the experimental animals. Prostaglandin $F_{2\alpha}$ ('Lutalyse' obtained gratis from Upjohn Ltd. Sussex, U.K.) was administered subcutaneously on two occasions 11 days apart. The first injection (8 mg) was given on the same day to all the seven goats, followed 11 days later by another injection of 'Lutalyse' (8 mg) to only six goats. One goat, aborting on the third day of first injection, was excluded from the experiment. With the use of a male goat the does were inspected twice daily till the onset of estrus. Only one goat (1/6) came into estrus about 70 hours after first injection. All the goats (6/6) given second injection of prostaglandin $F_{2\alpha}$ came into estrus between 60-72 hours after injection.

A major limitation to the use of PG for estrus control is its ineffectiveness during first few days of estrous cycle. This has been overcome by a double injection regimen in cows. Presence of a functional corpus luteum (CL) on the ovary is essential for luteolytic response. Thus, in the present study the first 'PG' injection found only one goat with a CL on the ovary, which underwent luteolysis and resulted into estrus. The second injection of PG found all the six goats with CL on their ovaries. The mean$\pm$ SD interval (66.40 ± 4.22 hrs) from PG injection to onset of estrus in the prseent study was longer than that reported by Ott *et al.* 1980 hut fell well within the range reported by Moore and Eppleston 1979b using 'Estrumate' — a prostaglandin analogue. The discrepancy with Ott *et al.* 1980 may reside in the breed differences. It is suggested

that double injection scheme of $PGF_{2\alpha}$ administered 11 days apart is an efficient means of estrus synchronization in the goat.

Summary

Synchronization of estrus in goats was accomplished efficiently by a double injection regimen (8 mg each) of $PGF_{2\alpha}$ ('Lutalyse') administered i.m. 11 days apart. The mean$\pm$SD interval from $PGF_{2\alpha}$ injection to onset of estrus was 66.40$\pm$4.22 hrs.

REFERENCES

Ahmed, Tariq and Maurya, SN (1979). Multiple ovulation in the goat. Acta. Vet. Hung. **29**(1): 471-475.

Barker, CAVS (1966). Synchronization of estrous in dairy goats by progestin impregnated vaginal pessaries. Cand. Vet. J. **7**: 215-218.

Dhindsa, DS, Hoversland, AS and Metcalfe, J (1971). Reproductive performance in goats treated with progestogen-impregnated sponges and gonadotrophins. J. Anim. Sci. **32**: 301-305.

Inskeep, EK (1973). Potential uses of prostaglandins in control of reproductive cycle of domestic animals. J Anim. Sci. **36**: 1149-1156.

King, GS, Robsertson, HA (1974). A two injection schedule with PGF_2 for the regulation of the ovulation cycle in cattle. Theriogenology **1**: 123-128.

Moore, NW and Eppleston, J (1979a). The control of oestrous, ovulation and fertility in relation to artificial insemination in the Angora goat. Aust. J. Agri. Res. **30**: 965-972.

Moore, NW and Eppleston, J (1979b). Embryo transfer in the Angora goat. Aust. J. Agri. Res. **30**: 973-981.

Ott, RS, Nelson, DR and Hixon, JE (1980). Peripheral serum progesterone and lutenizing hormone concentration of goat during synchronization of estrous and ovulation with PGF_2. Amer. J. Vet. Res. **41**(9): 1332-34.

Shutt, DA, Smith, LD and Sherman, RP (1976). Progestaglandins Prostaglandins and luteolysis in the goat and human. Theriogenology. **6**: 610.

IJAR 4: 2: 83-84

Performance of Exotic Bulls

MR BHOSREKAR, SN CHAR and DV RANGNEKAR

The Bharatiya Agro Industries Foundation,
Uruli Kanchan Dist. Pune 412202, Maharashtra.

Performance of exotic bulls in relation to their age was analysed in order to get the information on the production life of exotic bulls in tropics. The exotic bulls under study were those used for semen production by the BAIF for its cattle development work in the field. These bulls were born and brought up at Uruli Kanchan.

The bulls of Holstein Friesian and Jersey were introduced to collection after testing and screening between 15 to 20 months of age. Upto 24 months of age they were collected once a week and thereafter on an average twice a week. Their performance was studied upto 62 months of age. In each age group minimum of 6 to a maximum of 29 bulls of each breed were studied. In Jersey bulls significant differences exist in semen ejaculate volume between different age groups, while no significant differences were recorded for sperm concentration (Table 1 & 2). On the contrary in Holstein Friesian (HF) bulls no significant effect of age on both the parameters, was observed. However, increasing trend was seen in both the parameters, as the age advanced upto 62 months in Jersey and 50 months in HF. Similar trend was also observed by Gryzlov and Krupko (1977) and Sangaev (1977). Foote *et al* (1976) measured testosterone by Radio immunoassay in blood plasma in 195 Holstein Friesian bulls ranging from 8 months to 13.5 years. They found that there was tendency for testosterone to in crease with age of the bulls upto 6 to 7 years.

The authors are thankful to Dr. Manibhai Desai and Dr. D. S. Gorhe for their interest in study and permission to publish the results.

TABLE 1. Effect of age on semen ejaculate volume & sperm concentration.

	Group No.	Age group	Bulls under collection	Mean eja. vol. (ml.)±S.E.	% Covariance N.S.	Sperm Concentration $\times 10^9$/ml.	% Covariance N.S.
HOLSTEIN FRIESIAN	1.	15 — 20	17	5.00±0.33	27.20	1.00±0.063	18.12
	2.	21 — 26	22	5.31±0.218	19.25	1.00±0.084	27.10
	3.	27 — 32	21	5.47±0.0306	25.63	1.00±0.085	26.77
	4.	33 — 38	18	5.52±0.311	23.96	1.10±0.056	15.20
	5.	39 — 44	14	5.73±0.329	21.49	1.14±0.056	13.37
	6.	45 — 50	10	5.33±0.480	28.77	1.20±0.17	38.80
	7.	51 — 56	7	5.39±0.418	20.75	1.07±0.028	5.05
	8.	57 — 62	6	5.21±0.423	19.89	1.07±0.029	4.95

TABLE 2.

— JERSEY —

Group No.	Age group	Bulls under Collection	Mean eja. vol (ml) ±S.E.	% Covariance N.S.	Sperm Concentration $\times 10^9$/ml	% Covariance N.S.
1.	21 — 16	14	3.73a ±0.263	26.37	1.10 ±0.210	19.83
2.	27 — 32	26	4.25b ±0.187	22.48	1.21 ±0.070	22.05
3.	33 — 38	29	4.52c ±0.162	19.38	1.33 ±0.077	23.40
4.	39 — 44	23	4.83d ±0.212	21.05	1.15 ±0.098	30.60
5.	45 — 50	20	5.04d ±0.201	17.89	1.21 ±0.084	22.31
6.	51 — 56	16	5.19d ±0.241	18.55	1.21 ±0.063	14.64
7.	57 — 62	10	5.04d ±0.316	19.87	1.29 ±0.077	14.93
8.	63 — 68	8	4.88d ±0.398	23.05	1.36 ±0.084	14.62

The means with unlike superscripts differ significantly at 5% level.

REFERENCES

Gryzlov, UP and Krupko, VG (1977). Anim. Breed Abstr. 45: 3197.

Foote, RH, Nancy Munken Back and WA Greens (1976). J. Dairy Sci. 59 (11) 2011-2013.

Sangaev, BE (1977). Anim. Breed Abstr. 45: 752.

IJAR 4: 2: 85-88

Conception Rate in Zebu Cows as Influenced by Sire and Inseminator in Rural Areas

SV PACHALAG* and JZ BAHADURE**

ABSTRACT

A study was undertaken to evaluate 4487 A.I. to find the influence of sire and inseminator on conception rate. From eight bulls (7 exotic and 1 crossbred) CR on Ist insemination basis worked out to be 44.3 per cent ranging between 39.7 and 52.0 per cent. The sire differences were non-significant. While 48 A.I. done by 11 inseminators offerred CR from 32.6 to 59.0 per cent. On Ist A.I. basis. The number of services per conception required also varied from 1.7 to 2.9. These differences were also non-significant. It was concluded that sires used in A.I. had an optimum fertility and that efficiency of the inseminator did not differ significantly because of periodical refreshing of their skill.

* * *

In the last more than a decade increasing emphasis has been placed on the advantages of crossing low-producing but hardly, indigenous village cattle with temperate breeds such as Holstein Friesian, Brown Swiss, Jersey etc. for dairy purpose. The owner of the cow in most part of the country is probably dependent on A.I. services, the success of which mainly depends upon three operations. These are collection of good quality semen, its preservation and storage and finally deposition of the extended semen at a right place and at a right time in the reproductive tract of a cow. In other words for getting good conceptions good pedigree bulls, efficient inseminators besides sexually healthy cows are essential. It is thus the interaction of the above will result into a viable conceived product i.e. crossbred calf.

Earlier Pachalag *et al* (1982) reported frequency of inseminations and conceptions recorded in different seasons besides A.I. services required for each conception. Present communication deals with the results of A.I. from different bulls carried out by different inseminators posted in villages around Karnal.

Materials and Methods

Eleven centres covering 21 villages of the Operational Research Project formed the focal point of study. Each centre was manned by a stockman who was involved in A.I. work. Chilled extended semen from seven exotic and one crossbred bulls was made available by Institute Vehicle on alternate day to each centre. Cows in heat were, inseminated twice during oestrus and these inseminations were verified for conception by rectal palpations. The data were recorded for a period of three years (June 1975 to May 1978) and were subjected to analysis of variance ('F' test) and critical differences according to Snedecor and Cochran (1967).

* Scientist-S-2(LPM), Krishi Vigyan Kendra, National Dairy Research Institute, Karnal-132001, (Haryana).

** Rural Development Officer, State Bank of India, Gondia-441601, (Maharashtra).

TABLE 1. Sirewise performance of artificial inseminations, conception rate (1975-768)

Sire*	Insemination			Conception rate (%)					No. of insemination per conception
	I	II	III	Total	I	II	III	Overall	
HF 148	1055	153	43	1251	42.4	53.6	46.5	43.9	2.3
HF 45	875	161	39	1075	39.7	39.8	53.8	40.2	2.5
HF 20	628	86	30	744	45.0	44.2	43.3	44.9	2.2
HF 10	267	34	8	309	52.0	41.2	75.0	51.5	1.9
HF 8215	124	16	3	143	47.6	62.5	100.0	50.3	2.0
HF 9214	88	21	11	120	47.7	57.1	63.6	50.8	2.0
B 12	584	101	35	720	49.0	56.4	62.9	50.7	2.0
BC 848	92	22	11	125	46.7	45.5	72.7	48.8	2.0
Total	3713	594	180	4487	44.3	48.3	55.5	45.3	2.2

*HF — Holstein Friesian B — Brown Swiss BC — Brown Swiss × Sahiwal Cross

Results and Discussion

Sire-wise inseminations, conception rate and number of inseminations required for each conception is recorded in Table 1. From eight bulls CR on Ist inseminations worked out to be 44.3 per cent in the range between 39.7 and 52.0 per cent. CR from all the inseminations was 45.3 per cent varied from 40.2 to 51.5 per cent. Number of inseminations required for each conception from eight bulls ranged between 1.9 and 2.5. These differences were non-significant. However significant differences were observed when the data were analysed according to services (i.e. I, II, III services etc.). This indicated that there was likeness of bulls in their performance and that service differences might be due to either cows or to inseminators, Table 2. Breed differences could not be studied in view of the small number of bulls in particular breed/s.

Available literature indicate that not much work has been done to critically study the breeding efficiency of cows in terms of bull or inseminator under village conditions. Kotayya and Narasimha Rao (1978) reported technician-wise CR in buffaloes which ranged between 34.8 and 71.0 per cent for the seven centres in Andhra Pradesh. The differences recorded were highly significant. Bullwise CR (nine-bulls) was non-significant which varied from 36.2 to 49.2 per cent. While Kodagali and Madhu Rao (1983) recorded significant differences in fertility between Surti bulls used in A.I. in Gujarat. Qureshi (1979) while using frozen semen of Brown Swiss bulls in Kumaon hill

TABLE 2. Analysis of variance showing the effect of bull and services on conception rate

Source of variation	d.f.	S.S.	m.s.s.	F value
Between bulls	7	881.93	125.99	1.79N.S.
Between services	2	750.83	375.40	5.34*

N.S. Not Significant *$P < 0.05$

TABLE 3. Inseminatorwise performance of artificial insemination, conception rate (1975-78)

Centre / Inseminator	Insemination I	II	III	Total	Conception rate % I	II	III	Total	No. of inseminations per conception Overall
Sanghoa	721	104	25	850	47.2	46.1	56.0	47.3	2.1
Shamgarh	599	145	36	780	40.2	40.0	47.2	40.5	2.5
Uchana	519	91	27	637	47.2	59.3	59.3	49.5	2.0
Darar	489	105	30	624	43.1	49.5	66.7	45.4	2.2
Bhani Khurd	367	102	76	545	48.8	37.3	39.5	45.3	2.2
Samora	359	40	12	411	42.9	37.5	50.0	42.6	2.3
Nagla	278	46	8	332	46.0	56.5	25.0	47.0	2.1
Janesaron	208	34	3	245	39.9	44.1	—	39.18	2.5
Kamalpur	190	23	5	218	32.6	43.5	40.0	33.9	2.9
Churni	152	15	—	167	42.8	60.0	—	44.3	2.3
Padhana	100	15	4	119	59.0	46.7	75.0	58.0	1.7
Total	3982	720	226	4928	44.3	46.1	48.7	44.7	2.2

cattle of Uttar Pradesh recorded 28.26 to 54.76 per cent CR on Ist inseminations and 34.52 to 68.27 per cent CR on over all inseminations from eleven centres. Number of services per conception required ranged between 2.07 and 3.55. The present findings are comparable with the above work in U.P. and thus indicate that efficiency of inseminator has definite reflection on conceptions in rural cattle which also corroborates with King (1973).

The results thus showed that over-all fertility of eight bulls under study was of the same level. Inseminator differences were non-significant, which might be due to periodical refreshing of skill of inseminators besides follow-up work taken up intensively in rural areas.

Acknowledgement

The authors acknowledge gratefully their indebtedness to the Director, National Dairy Research Institute and to Dr. RK Patel, Senior Scientist, N.D.R.I., Karnal for encouragement in this study.

TABLE 4. Analysis of variance showing the effects of inseminators and services on conception rate

S.V.	d.f.	S.S.	M.S.S.	F. Value
Between Inseminators	10	1561.40	156.15	1.09N.S.
Between services	2	223.88	11.94	0.78N.S.
Error	20	2866.03	28.66	—

N.S. Not Significant

REFERENCES

King, GJ (1973). The most important link in the frozen semen chain, workshop Reprod. Physiol. Dairy Animals at NDRI, Karnal.

Kodagali, SB and Madhu Rao, N (1983). Influence of bulls and the periods of inseminations on fertility in buffaloes. Indian J. Anim. Reprod. **3**: 1-85.

Kotayya, K. and Narasimha Rao, AV (1978). Conception & claving rates in A.I. bred Buffaloes in Andhra Pradesh. Indian Vet. J. **55**: 7:586-87.

Pachalag, SV, Bahadure, JZ and Patel, RK (1982). Breeding efficiency in zebu cows through artificial insemination under field conditions. Indian J. Dairy Sci. (In Press).

Quresbi, SH (1979). A study on the conception rate in Kumaon hill cattle insemined by deep frozen semen of Brown Swiss bull. Indian Vet. J. **56**: 1:37-40.

Snedecor, GW and Cochrau, WA (1967). Statistical methods, Iowa State Uni. Press Amer. Iowa, U.S.A.

IJAR 4: 2: 89-81

Parturition in Cross bred Cows

VM Jose, CP Neelakanta Iyer, E Madhavan

Department of Animal Reproduction

and N Ravindranathan

Department of Statistics
College of Veterinary and Animal Sciences
Mannuthy, Trichur, Kerala.

ABSTRACT

Parturition was observed in 17 Jersey × Sindhi, 6 Brown Swiss × local and 17 Jersey × Local Cows. The total duration of parturition was 534.68±68.75, 668.2±97.17 and 912.5±182.68 minutes respectively for Jersey × Sindhi, Jersey × Local and Brown Swiss × Local Cows. This variation was statistically significant. But the differences in the duration of different stages of parturition was not at variance between different groups. Sex of calf did not influence the duration of different stages. Diurnal variation of calving was noticed with 60.63 per cent during day time and 39.47 per cent during night time. All the cows except one (97.43 per cent) were recumbent at the time of expulsion of foetus. Breed and sex of calf had no influence on the weight of placenta and the number of Cotyledons. The total number of cotyledons and large sized cotyledons were significantly higher in the gravid horn than the non gravid horn where as small sized cotyledons were significantly lower in the non gravid horn than the gravid horn.

* * *

Materials and Methods

Forty cross bred cows comprising 17 Jersey × Sindhi, 17 Jersey × Local and 6 Brown Swiss × local of the Livestock Farm attached to the Kerala Agricultural University, which calved during the period from June 80 to May 81 formed the material for the study. All the cows were maintained under conditions of feeding and management. One month before the expected date of calving, the cows were watched periodically for prepartum changes. Cows showing signs of approaching parturition were closely observed for studying the different stages of parturition. The posture of the dam at the time of expulsion of foetus and the diurnal variation of calving were also observed. The placenta was collected, cleaned and weighed. It was spread out and the number of cotyledons were counted. The diameter of each cotyledon was measured and classified as large (more than 5 cm.) medium (2.5 to 5 cm) and small (less than 2.5 cm.). The data were subjected to statistical analysis (Snedecor and Cochran, 1967).

Results and Discussion

The first stage of parturition was found to last for 534.68±68.75, 668.2±97.17 and 912.5±182.68 minutes respectively in Jersey × Sindhi, Jersey × Local and Brown Swiss × Local cows. This variation was found to be statistically significant.

In the above respective genetic groups the first stage averaged 131.31±25.84, 114.40±15.49 and 184.00±77.32 minutes, the second stage 53.12±8.19, 147.33± 69.15 and 62.83±16.23 minutes and the third stage 369.625±54.08, 413.13± 79.13 and 665.66±192.29 minutes. The duration of different stage were not at variance between the three genetic groups. The total duration of parturition was reported to be 261.01±0.62 minutes (Agasthi *et al.* 1977) and 449.17±14.78 minutes (Rao *et al.* 1981) in cross bred cows which shows slight variation from the preesent observation. Similarly the duration of different stages of parturition reported by earlier workers (Dahiya *et al.*, 1976; Kadu and Kaikini 1975); also showed variation from the present study. This variation might be due to difference in the genetic groups of cows studied. The present study did not reveal any significant influence of the sex of calf on the duration of parturition. This is akin to that of Dahiya *et al* (1976).

It could also be observed that 60.53 per cent of cows calved during the day time as against 39.47 per cent during the night hours. Baccari (1978) reported 42.40 per cent day time calving and 57.60 per cent night time calving. McDonald (1971) and Rao *et al.* (1981) noted majority of calving during night hours while Edwards (1979) found an even distribution throughout the 24 hours.

Observation on the posture of the cows during calving revealed that 97.43 per cent cows were in recumbent position at the time of expulsion of foetus. This is in accordance with that of Roberts 1971, Kadu and Kaikini, (1975) and Rao *et al.* (1981).

The mean weight of foetal membranes and the number of cotyledons were 3.064 ±0.03656 kg and 54.2857±7.8549 in Jersey×Sindhi, 2.8.9±0.2667 kg and 73.778±8.4849 in Jersey×Local and 2.86±0.33 kg and 84.25±7.087 in Brown Swiss×Local cows. The weight of placenta and the number of cotyledons did not vary significantly between different genetic groups Dahiya *et al.* (1976) also found that the number of cotyledons did not vary significantly between genetic groups. However, Bhosrekar and Sharma (1972) reported that the weight of placenta and the number of cotyledons varied between different genetic groups. The mean weight of placenta and the number of cotyledons in those carrying male calves were 3.0778±0.3391 kg and 71.889± 7.9347 and for those carrying females the values were 2.8318±0.1814 kg and 66.7272±7.5787 respectively. On analysis, it was found that neither the weight of placenta nor the number of cotyledons were influenced by the sex of calf. Though, Bhosrekar (1972) also did not find any influence of sex of calf on the weight of placenta, Dahiya *et al* (1975) and Nair *et al.* (1983) found that sex of calf influenced the number of cotyledons. The large sized cotyledons were significantly higher in the gravid horn than the non gravid horn while the reverse trend was observed in the case of small sized cotyledons. However, the number of medium sized cotyledons did not vary significantly between gravid and non gravid horns. It was also observed that the total number of cotyledons were significantly higher in the gravid horn. Similar observations were made by Bhosrekar and Sharma (1972) and Dahiya *et al.* (1975).

Acknowledgement

The authors are thankful to the Dean, College of Veterinary and Animal Sciences for permission to puhlish this paper.

REFERENCES

Agasthi, M, Choudhury, G, Banerjee, CC and Ghosh, MN (1977). Studies on certain aspects of parturition in Jersey × Hariyana females at first calving. Indian J. Anim. **16:** 119-122.

Baccari, F Jr, Obveira, MR and Barros, MM (1978). Diurnal and nocturnal distribution of parturition in Zebu cows. Anim. Breed Abstr. **47:** Abst. 132.

Bhosrekar, MR and Sharma, KNS (1972). Studies on foetal placenta of cattle and Murrah buffaloes of different breeds. Indian J. Anim. Prod. **3:** 8-15.

Dahiya, NS, Tomar, SS and Arora KL (1976). A note on the process of parturitionin Hariyana cows inseminated with semen from exotic bulls. Indian J. Anim. Sci. **44:** 338-341.

Edwards, SA (1979). The timing of parturitiion in dairy cattle. *J. Agric. Sci.* **93:** 359-363.

Kadu, MS and Kaikini, AS (1975). Studies on parturition in Sahival cows. *Indian J. Dairy Sci.* **28:** 206-208.

McDonald, LE (1971). *Veterinary Endocrinology and Reproduction* Lea. Febiger Philadelphia. 1st Ed. pp 402-403.

Nair, MS, Madhavan, E and Neelakanta Iyer, CP (1983). Influeuce of cross breeding on the placental cotyledons in Jersey × Sindhi cows. *Livestock adviser* **8:** 15-18.

Rao, Ch C, Rao, AR and Jayaramakrishna, V (1981). Studies on parturition of Ongole and cross bred cows. *Indian Vet. J.* **58:** 135-138.

Roberts, SJ (1971). *Veterinary obstetrics and Gental diseases.* Scientific book agency Calcutta. 1 2ud Ed. pp 201-212.

Snedecor, GW and Cochran, WG (1967). Statistical Methods, Oxford and IBH Publishing Co., Calcutta-5 6th Ed. pp 163-171.

IJAR 4: 2: 92-93

Some Factors Influencing Gestation period in Cross Breeding Progrmme

LD MOHANTY

Deputy Director
Frozen Semen Bank, Cuttack-10

ABSTRACT

A total number of 252 gestation periods in Crossbred Jersey, Crossbred Holstein and Indigenous cows were studied against the inseminations of Holstein, Jersey and Crossbred bull semen. The gestation lengths were significantly lowered when the Holstein semen was used in Crossbred Jersey cows. Shorter gestation periods were also recorded for Crossbred and Jersey bulls indicating influence of Cross breeding and local effects of small desi cows of Orissa. 23% calvings were observed below the average range of gestation period of 280±10 for cows, and the Crossbred cows had an average range gestation period of 275±15 days.

* * *

The use of frozen semen in rural and urban areas of Orissa for cross breeding programme revealed significant variation in gestation period than the normal range of 280±10. As shorter gestation period has significant economic importance for the farmers an attempt was made to collect the data from organised dairy farm and field centres where cross breeding is in progress.

Materials and Methods

A total no. of 252 gestation periods were taken into consideration which included the use of the frozen semen of Holstein, Jersey & Crossbred bulls in Crossbred Holstein, Crossbred-Jersey & Desi cows. The gestation periods were divided into three groups basing on the length of gestation:

1. Group A. short (Range-243 to 270 days).

1. Group A. Short (Range-243 to 270 days).
2. Group B. Medium (Range-271 to 275 days).
3. Group C. Long (Range-276 to 289 days).

The groups were further divided on the influence of the bulls and cows on gestation periods.

Result and Discussion

Taking the bull factor into account it is seen that 59 calvings occured in group A being 23.41% of total calvings where as 58 calvings were in Group B being 23.01% and 135 calvings were in Group C being 53.57%. Majority of calvings have occurred in between 276 days and 289 days.

In Group A, out of 59 calvings Holstein bulls attributed 34 calvings 57.62% which indicated a significant role of Holstein bulls in comparison to Jersey and Cross Bred bulls, no. of calvings being 16 & 9 respectively. However these 25 calvings in Group A having a lower

gestation period than normal, may be due to genetic or local effects. In Group B out of 58 calvings Jersey bulls attributed 30 calvings 51.72% which indicated a significant role of Jersey bulls in comparison to Holstein and Crossbred bulls, calvings being 19 & 9 respectively. In group C out of 135 calvings Jersey bulls attributed 83 calvings 61.48% which indicated a significant role of Jersey bulls in comparison to Holstein and Crossbred bulls, calvings being 19 & 33 respectively.

Holstein bulls figured highest 34 (57.62%) in Group A, whereas in Group C it figured lowest 19(14.07%). It may be inferred that the figures indicate that Holstein bulls influenced for a shorter gestation period in comparison to other bulls. In group B & C, Jersey bulls figured highest indicating an average gestation period range of 271 to 289 days.

Taking the cow factor into account it is observed that in group A when Holstein, Jersey and Crossbred bulls semen was used in Crossbred Holstein, Crossbred Jersey & Desi cows, the Holstein pnogeny in Crossbred Jersey cows figured highest calving being 22 out of 59(37.28%). Similarly in Group B when Jersey semen was used for crossbred jersey cows it figured 17 calvings out of 58(29.31%). In group C when Jersey semen was used for desi cows it figured 49 calvings out of 135(36.29%).

From the above data it may be seen that in Crossbred Jersey cows when Holstein semen is used the length of the gestation period was proportionately reduced probably due to the larger size of the foetus and quick growth. In case of crossbred Jersey and desi cows which are almost of same size, when Jersey semen was used probably the foetal growth was not faster and foetus was not larger, for which the gestation period was continued in between the range 271 to 289 days.

The present findings however do not agree with the findings of Rao (1979) as the cows were of Ongole breed which are quite larger than the Indigenous Crossbred Jersey, Red Sindhi, Desi Jersey and Desi cows of Orissa. The size of the foetus probably affects the gestation length by hastening the time of parturition initiation. The small variation in pregnancy duration among breeds may be due to genetic or local effect, (Hafez and Jainudeen 1980).

REFERENCES

Hafez, ESE and Jainudeen MR (1980). Reproduction in Farm Animals. 4th Ed. Lea & Febriger, Philadelphia.
Chalapati Rao (1979). M.Sc. (Vety. Science) Thesis A.P.A.U.

IJAR 4: 2: 94-95

Chemical Composition of Semen & Seminal Plasma of Holstein Friesian and Jersey Bulls

MR Bhosrekar, VC Badve, SN Char, and DV Rangnekar

The Bharatiya Agro Industries Foundation
Uruli Kanchan Dist Pune-412202, Maharashtra

There is paucity of information on the normal values of chemical composition of semen of exotic breeds whch are commonly used for cross breeding in India. The present study was undertaken to determine the norms of certain chemical and bio-chemical constituents of semen under tropical condition.

Twelve adult bulls of Holstein and twelve adult bulls of Jersey breed were taken for the study and were divided equally into three groups of once, twice and thrice a week collection programme. Initial fructose content and fructolytic index was estimated in whole semen as per the method of Mann (1954) calcium, magnesium, inorganic phosphrous were determined by the methods described by Hawk (1954) total nitrogen and non protein nitrogen were estimated in seminal plasma by microkjeldnal method. Sodium and potassium in seminal plasma was estimated by flame photometer.

No significant differences were observed between breeds and groups in any of the parameters studied.

The authors are thankful to Dr. Manibhai Desai and Dr. D. S. Gorhe for their interest in the studies and permission to publish the results. (page: 95).

REFERENCES

Hawk, PB, Oser, BL and Summerson Wst (1954). Practical Physiological Chemistry 13th Ed.McGraw Hill Book Co. INC. New York.

Mann, T (1954). The biochemistry of semen London, Matheun & Co. Ltd. New York.

TABLE Semen composition of exotic bulls as affected by frequency of collection

Frequency of collection	Initial* fructose content	Fructo-lytic* index	Ca mg. %	Inorganic phospho-rus mg%	Mg. mg. %	Na mg %	K mg %	Total nitrogen mg %	Non-protein nitrogen mg %
HOLSTEIN									
Once/wk	416.45	1.68	55.8	6.72	11.86	237.47	146.1	945.6	75.72
	±26.53	±0.14	±1.59	±0.32	±0.53	±13.94	±10.72	±40.0	±9.32
Twice/wk	462.42	1.95	59.83	6.66	12.55	221.00	145.00	990.4	73.66
	±27.09	±0.34	±4.39	±0.33	±0.62	±28.58	±42.21	±48.0	±7.18
Thrice/wk	483.57	2.07	59.38	7.34	11.77	228.61	147.05	1003.2	63.25
	±36.24	±0.18	±2.37	±0.48	±0.41	±10.98	±14.07	±30.4	±4.82
JERSEY									
Once/wk	379.85	1.93	55.41	7.37	11.96	232.27	117.88	929.6	76.01
	±29.86	±0.13	±3.13	±0.34	±0.36	±15.02	±10.68	±27.2	±3.83
Twice/wk	424.16	1.89	54.00	7.06	11.97	241.22	124.22	1001.16	87.92
	±40.07	±0.21	±2,96	±0.46	±0.46	±10.41	±8.24	±41.6	±4.92
Thrice/wk	454.14	2.21	57.04	7.75	11.85	255.95	146.79	1035.2	97.01
	±24.19	±0.16	±1.94	±0.30	±0.34	±10.95	±11.09	±38.4	±3.03

Analysis was carried out in whole semen. Rest of the parameters were estimated in semen plasma.

IJAR 4: 2: 96-97

A Method for Freezing Human Spermatozoa

BS NAGARAJA* and K NARAYANA**

* Karnataka Dairy Development Corporation
87, Almas Centre, M.G. Road, Bangalore-560001

** Female Infertility Scheme, Department of Gynaecology & Obstetrics
Veterinary College, Bangalore-560024

Despite the sociological impediments, preservation of human spermatozoa by means of freezing could be useful in overcoming some forms of infertility problems and in persons who desire to have a child after vasectomy without a feasibility of recanalisation. It aids in developing the human artificial insemination. The freezability of semen differs from individual to individual. The frozen semen could be preserved in cryogenic containers for a number of years.

Methodology

The semen was collected from human volunteers using a nirodh (a condom) after the natural copulation. Immediately after collection, the semen was divided into two aliquots and kept in a water bath maintained at 36°C. One aliquot of this neat semen was assessed for the mass activity and the motility. If the mass activity and the motility was good, another 1 ml. aliquot of the neat semen was diluted using 1.5 ml. of Tris-dilutor, the flask being placed in a water bath maintained at 36°C. The composition of the Tris-dilutor was as follows:

Tris-(hydroxymethyl)-aminomethane	6.05 g
Citric acid	3.4 g
Fructose	2.5 g
Glycerol	16.0 ml
Dihydrostreptomycin sulphate	0.25 g

Initially 20 ml boiling distilled water was added and vortexed. The solution was made upto 50 ml using cold distilled water. To 10 ml of this Tris-buffer, 30 ml distilled water and 10 ml fresh egg yolk was added vortexed and warmed to 36°C before mixing with semen.

A drop of this diluted semen was examined under a phase contrast microscope using a biotherm at 36°C. When the diluted semen exhibited good motility, the semen was loaded into French mini straws of 0.25 ml capacity and slowly cooled to 4°C and kept at 4°C for 5 hours for equilibration. The straw were placed on racks and exposed to the fumes of liquid nitrogen in a freezer container (LR320 union carbide) at — 130 to — 140°C for 10 minutes and then plunged into liquid nitrogen containers maintained at — 196°C.

The frozen semen showed good progressive motility, very little or no pathological abnormalities and about 40 to 45% live spermatozoa at random (i.e. at 2, 5, 7, 10, 28, 60 and 100 days) after thawing a straw at 36°C for 20 seconds.

Depending on the survival rate, one or two straws of frozen semen could be enough for the human artificial insemi-

nation through the French or German cattle artificial insemination guns.

Acknowledgements

1. Ministry of Agriculture, Govt. of India.
2. Claus M Willadsen DVM, MPVM, Ph.D., Advisor Indo-Danish Training Institute, Frozen Semen Bank, Hessarghatta-562 113.

REFERENCES

P Bromwich, M Kilpatrick and JR Newton — Artificial Insemination with Frozen Stored Donor Semen, British Journal of Obstetrics and Gynaecology, Vol. 85, No. 9, Sept. 1978.

IJAR 4: 2: 98

Incidence of Various Reproductive Disorders in Black and White Danish Cattle in Meghalaya

JC Dutta and CK Rajkonwar

Department of Gynaecology, Obstetrics & A. I.
College of Veterinary Science
Assam Agricultural University
Khanapara: Gauhati-22

Reproductive inefficiency is of economic concern to dairy farmers. Infertility in cows on account of various reproductive disorder is an important factor adversely affecting the dairy industry. The present investigation is taken up to report the incidence of various reproductive disorders in Black and White Danish Cattle in Meghalaya.

Sixty Black and White Danish Cows of 1st to 6th Lactation were included in this study. All these animals belonged to the Indo-Danish Cattle Development Project, Upper Shillong, Meghalaya and were maintained under similar managerial condition. The animals were examined for various forms of reproductive disorder by rectal and vaginal examination. The various forms of abnormalities of reproductive organs were found to be as follows. Cervicitis 11.69%; Pyometra 1.67%; endometritis 1.67% inactive ovaries 18.33%; hypoplastic ovaries 6.67%; atrophic ovaries 8.33%; irregular shaped ovaries 16.67%, and cystic ovaries 3.33%.

IJAR 4: 2: 99-100

THESIS

ABSTRACT

Some Aspects of Gestation and Abortion in Surti Buffaloes

Student: DM PATEL Major Advisor: PROF SB KODAGALI

Department of Veterinary Gynaecology and Obstetrics
Gujarat College of Veterinary Science and Animal Husbandry
Gujarat Agricultural University, Anand Campus, Anand. 1983

Gestation:

The mean gestation length in Surti breed buffaloes was 307.15±0.63 days. The mean gestation period for Surti buffaloes carrying male and female calves was 307.48±0.89 and 306.70+0.87 days respectively. Primipara gave birth one day earlier than the multipara.

Sex of calf and age of the dam had no significant effect on gestation length. Season of breeding and calving had significant influence on gestation length.

Abortion:

1. *Incidence of abortion:*

The mean incidence of abortion was 1.91%. Season had significant effect on the occurrence of abortion. Highest number of abortion cases were recorded during the summer season next in order were monsoon and the winter season.

2. *Causes of abortion:*

Out of 32 paired sera samples tested Sera sample testing by: Animal Disease diagnostic Laboratory N.D.D.B., Anand from aborted buffaloes, 24 sera samples were positive for Infectious bovine rhinotracheitis (IBR) virus and four sera samples were positive for both Blue tongue and IBR virus. All the sera samples were negative for antibodies against brucella, chlamydia and *L. monocytogenes* organisms. Serological testing however revealed more than one viral entity in the sera samples examined.

Out of 12 foetuses examined two were positive for Aspergillus and Mucor spp., one for Pseudomonas spp.

3. *Post-abortal sexual behaviour:*

Under the farm condition highest incidence of abortion was recorded at three to five months stage of pregnancy whereas under field condition mostly early abortions (2-3 months) were recorded.

It was observed that buffaloes exhibited heat symptoms on the day of abortion in early gestation (2-3 months). Retention of foetal membranes did not occur in early abortions (1-4 months). In very early abortions foetuses along with intact foetal membranes were usually expelled. Retention of foetal membranes was observed when abortion took place in later half of the pregnancy. Usually the foetus was expelled with ruptured foetal membranes.

In 12 aborted foetuses, 7 (58.3%) were male and 5 (41.7%) were female fetuses. Aborted female foetuses were carried longer than aborted male fetuses (189 ♀ vs 94 ♂ days).

4. *Post-abortion treatment trials:*

Two Chemozine boluses (P.C.I. Pharmaceuticals Pvt. Ltd.) I/U for three days gave better results than Oxysteclin (Sarabhai Chem.) 20 c.c. I/M for three days when aborted animals were treated. In chemozine trial group 12 buffaloes aborted during early stage of gestation (1-3 months) were included while in oxysteclin trial group 20 buffaloes aborted during 2-7 months stage were included. Out of 20 animals treated with oxysteclin (I/M); 12 (60.0%) animals became pregnant; requiring on an average 4.3 AI/ conception. Out of 12 animals treated with chemozine boluses nine animals (75.0%) became pregnant with 2.5 AI/ conception.

5. *Clinical biochemistry of aborted and pregnant buffaloes:*

The levels of total cholesterol, free cholesterol and esterified cholesterol in aborted buffaloes were significantly low when compared with 3-6 months pregnant buffaloes.

The levels of total protein and albumin and globulin fraction of protein in aborted buffaloes were significantly lower than pregnant buffaloes. The A/G ratio when compared between aborted and pregnant buffaloes was found statistically non-significant.

Prenatal Sex Determination in Buffaloes and Cows

Student: MA Jawaz Ahmed Sheriff Guide: B Munilal Dubey

Department of Gynaecology and Obstetrics
Veterinary College, Hebbal, Bangalore-560024

ABSTRACT

Prenatal sex determination was attempted in cows and buffaloes using foetal fluids, layers and tissues.

The amniotic fluid cells exhibited sex related cytoplasmic colour reaction with Papanicolaou's stain. In cows and buffaloes the eosinophils were significantly higher ($P<0.01$), the basophils were significantly lower ($P<0.01$) with male foetus than with female foetus whereas orangeophils showed no significant variation.

The mean percentage of eosinophils, basophils and orangeophils in amniotic fluid of cows with female foetus were 56.77 ± 2.67, 40.85 ± 0.71 and 2.34 ± 0.71 with male foetus were 74.28 ± 1.44, 22.98 ± 1.34 and 2.73 ± 0.32 whereas in buffaloes with female foetus they were 54.89 ± 2.56, 41.72 ± 5.18 and 2.38 ± 0.25 and with male foetus they were 76.09 ± 1.33, 20.22 ± 1.86 and 3.88 ± 0.65, respectively.

In buffaloes for the first time Barr-body was demonstrable using the hematoxylene-eosin. The Barr-body positive cells in amniotic fluid, allantoic and amniotic membranes and in foetal skin and buccal mucosa were significantly higher ($P<0.01$) both in cows and buffaloes with female than with male foetus.

The mean percentage of Barr-body positive cells in cows with female and male foetus were 30.21 ± 1.11 and 3.72 ± 0.36 in amniotic fluid, 31.39 ± 1.84 and 3.34 ± 0.30 in allantoic layer, 31.39 ± 1.84 and 3.19 ± 0.40 in amniotic layer, 28.98 ± 1.44 and 2.61 ± 0.29 in foetal skin and 33.39 ± 1.49 and 3.37 ± 0.22 in foetal buccal mucosa respectively. Similarly, in buffaloes with female and male foetus they were 27.42 ± 1.83 3.80 ± 0.32 in amniotic fluid, 29.75 ± 1.45 and 3.76 ± 0.38 in allantoic layer, 29.99 ± 2.20 and 4.48 ± 0.81 in amniotic layer, 28.34 ± 1.39 and 3.45 ± 1.95 in foetal skin and 31.62 ± 1.74 and 4.00 ± 0.32 in foetal buccal mucosa respectively.

Irrespective of male or female foetus in cows and buffaloes the maternal endometrium gave a constant Barr-body positive cell percentage characteristic of female. In the maternal endometrium and amniotic fluid Barr-body positive cells with female foetus were 30.98 ± 1.79 and 30.21 ± 1.11, with male foetus were 34.51 ± 1.42 and 3.72 ± 0.36 in cows; whereas they were with female 32.01 ± 2.25 and 27.42 ± 1.83 and with male foetus 32.89 ± 1.90 and 3.80 ± 0.32 in buffaloes respectively.

While sexing, if Barr-body positive cells were more than 16% it will be a female foetus whereas if they were less than 7% it will be a male foetus.

Prenatal sex determination with Papanicolaou's staining technique certain times gave ambiguous results whereas the Barr-body technique gave accurate results.

Foetal fluids, membranes and tissues except allantoic fluid can be used for prenatal sex determination by Barr-body technique.

FARM NEWS

Leucaena Leucocephala as Livestock feed

MC Desai and Dr PC Shukla

Animal Nutrition Department
Gujarat Agricultural University, Anand Campus, Anand. 388 001.

Leucaena leucocephala also locally known as *koobabul, soobabul, shamoo* is a vigorous perennial legume shrub or tree. It is palatable to most of the livestock and can either be used for fodder or for energy plantation. The chemical composition of *koobabul* fodder varies from 18.0-30.0% c. protein; 2.0-3.7% ether extract; 10.4-33.0% c.fibre; 39.7-47.4% N.F.E.; 3.5-8.9% ash; 0.2-1.3% P and 1.1-1.9% Ca. From proximate composition *koobabul* seems to be a good fodder as it is rich in protein, calcium and carotene. However, *koobabul* contains higher amount of mimosine which limits its value as fodder. Earlier it was believed to be toxic to monogastric animals only but recently toxicity in ruminants has also been observed. Mimosine causes depilation in many species of animals. Since mimosine is metabolized to 3, 4-dihydroxypyridone (DHP) in rumen it leads to goitre and other problems in ruminants. *Koobabul* feeding leads to reproductive problems in ruminants and other animals. (Hamilton *et al.* 1971; Little and Hamilton, 1971; Jones *et al.* 1978). They reported abortions, still birth and birth of under sized off springs. Recently toxicity of *L. leucocephala* as regards to reduced fertility in heifers grazing *L. leucocephala* has been reported by Holmes (1980). Twenty four heifers (12-18) months of age) grazing on *L. leucocephala* variety, Peru and the experiment was conducted for two and half years. Eleven heifers serving as control group grazing only native pasture grasses other than *leucaena*. All the heifers were mated to the bulls of proven fertility. All the 11 heifers conceived with in short intervals (30 ± 7 days). However, of 24 heifers grazing *Leucaena* only eight conceived in short interval (65 ± 11 day), ten conceived within 9-11 months interval and six heifers did not conceive at all even after 12-27 months. All the calves born to heifers grazing *leucaena* had some degree of goitre. A defect is suspected on establishment or maintenance of pregnancy (Holmes, 1980).

Therefore it is suggested that *koobabul* fodder should not be fed more than 30% of roughage ration of animals. Continuous feeding of *koobabul* should be avoided. While feeding *koobabul* adequate mineral mixture rich in ferrous sulphate and potassium iodide should be supplemented. Feeding of *koobabul* to pregnant animals, high producing cattle and buffaloes and to very young calves should be avoided. Further, it is not recommended to grow *koobabul* in cultivated land where other high yielding fodders can be grown successfully.

REFERENCES

Hamilton, RI, Donaldson, LE and Lambourne, EJ (1971). Aust. J. Agri. Res. **22**: 681.
Holmes JHG (1980). Papua New Guinea Agri. J. **31** (1-4:) 47-50.
Jones, RJ, Blung, CG and Nurnnberg, BL (1978). Aust. Vet. J. **54**: 387.
Little, DA and Hamilton, RI (1971). Aust. Vet. J. **47**: 457.

IJAR 4: 2: 103-104

Milk Co-operatives and Tribal Poverty in Gujarat

JM Heredero

Director, Behavioural Science Centre, St Xavier's College, Ahmedabad

Summary and Conclusions

This paper has examined the extent to which milk cooperatives have relieved tribal poverty. The results show that only the milk cooperatives of one society (5 per cent of the population surveyed) have helped their members to cross the proverty line by providing them with an average increase of 37 per cent in their annual income. The milk cooperatives of three other societies (33 per cent of the respondents) have not helped their members to cross the poverty line, although they have given their members an average net income equal to one-fourth of their former annual income. The remaining milk cooperatives (62 per cent of the respondents and 68 per cent of the villages) have not made any substantial contribution to the income of their tribal constituents.

The second issue raised in this paper was whether the milk cooperatives *could* remedy tribal poverty. To answer this question, the factors contributing to increased milk production were studied. The buffalo mortality rate was high while the pregnancy rate and the milk yield were low. The quality of milk was more or less the same in all milk cooperatives, although the procurement price differed significantly because of the different rates offered by the Union Cooperatives and because of malpractices.

Several factors related to low productivity were identified: purchase of poor quality buffaloes due mainly to collusion between dishonest traders and government officials; lack of medical facilities; poor knowledge of animal husbandry; and, most decisive of all, lack of proper nutrition. Special emphasis was laid on a better relationship between agriculture and animal husbandry and improved fodder harvesting and feeding practices. To remedy the fodder situation, especially in the case of landless people, some community action was suggested like building common silos and growing green fodder on village pasture land.

It has also been pointed out that a high degree of watchfulness is required to see that the Union Cooperatives do not exploit the tribals.

Thus, for milk cooperatives to function effectively on a large scale, it is not enough to grant subsidies and to import buffaloes in large numbers. There is need, at the same time, to have a sufficiently large number of competent and committed educators and managers who will teach people the intricacies of animals husbandry, the working of a cooperative, its relation with the Union Cooperative, the means to improve the fodder situation and the need to remain ever alert to avoid being cheated by outsiders and insiders as well. Managers are needed to organise medical facilities at present not adequately provided by the Union Dairies; to orga-

nise a better fodder production and distribution system; to maintain and study the accounts of the cooperative so as to promote a clean and efficient administration. These managers should be sufficiently sophisticated to deal efficiently with the Mother Dairies, government officials and funding agencies. Most of these functions should be taken over, within a reasonable amount of time, by local cooperatives; but, at a certain level, professional managers may always be necessary. In the meantime, competent and committed people will be required until dairy farming becomes as much a tradition in the tribal heartland as it is in Kaira district and until the tirbals develop the skills to struggle against the greed of the so-called progressive societies.

REFERENCE

Social Action Vol 33 July-Sept. 1983.

ISSAR NEWS

Report on: Fourth World Congress on Human Reproductionn held at Bombay from 27th Nov. to 2nd Dec. 1983.

The Fourth World Congress on Human Reproduction, organised by the Indian Association of Fertility and Sterility was held at Oberoi Towers, Bombay from 27th Nov. to 2nd Dec. 1983. The Indian Society for the Study of Animal Reproduction was one of the supporting National Organizations.

The Congress was inaugurated by the Hon. Minister for Health, Govt. of India, Shri B. Shankaranandaji on 27-11-83 in the morning. During the inaugural function, Prof. Dr. K. Semm (West Germany), and Prof CL Jhaveri (India), Vice-President and President, International Organising Committee emphasised the contribution of Veterinarians towards Scientific knowledge of Reproduction. They pointedly referred to the strides made in Deep Freezing of Semen and Embryo Transfer in Animal Reproduction. They also expressed happiness that Veterinarians are participating in this World Congress.

There were about 700 delegates attending the congress, out of which 100 were from abroad. There was one Dr. Henriete, a Veterinarian from Belgium. It is a matter of gratitude that a number of ISSAR members actively participated in the congress. The following Veterinarians from Agril. Universities and State Depts. attended the congress.

Prof CR Sane	BGM Bombay
Dr BR Deshpande	Bombay Vety. College (KKV)
Dr DP Velhankar	,,
Dr VB Hukeri	,,
Dr AM Das	,,
Dr AS Kaikini	PKV Akola
Dr SB Kodagali	Guj. Vet. College, Anand (GAU)
Dr ML Madan	NDRI Karnal
Dr SP Arora	NDRI Karnal
Dr Kakkar	HAU Hissar
Dr SS Sukhija	HAU Hissar
Dr PV Dixit	HAU Hissar
Dr BN De	Directorate West Bengal
Dr Dixitalu	Directorate of Madhya Pradesh
Dr TA Harsulkar	Directorate of Madhya Pradesh
Dr Revanna	KDDC Bengalore
Dr Nagraj	KDDC Bengalore
Dr AK Sinha	Veterinary College Ranchi
Dr JN Panda	IVRI Izatnagar
Dr Vijaykumar	IVRI Izatnagar

Dr SN Maurya	GB Pant University of Agri Pantnagar
Dr GS Sahi	Intercare
Dr SG Zanwar	Raymond's Bilaspur
Dr M Rehman	Assam

The daily programme consisted of Commemorative lecture, Symposium and Technical session in the morning followed by Technical session, Symposium and Guest lecture in the afternoon. Prof CR Sane, participated in the Symposium on Artificial Insemination and described the advances made in "AI in Farm Animals".

Prof BR Deshpande participated in the symposium on "In-Vitro Fertilization and Embroyo Transfer" and presented the information about the recent advances which have taken place regarding "Super-ovulation and Embryo Transfer in Farm Animals" in India.

There were 36 sessions and 11 were involing the subject of Animal Reproduction. Dr ML Madan and Dr SP Arora had the previledge of chairing one session each. Out of 240 technical papers presented at the congress about 25 were from the Veterinarians.

DR BR DESHPANDE
Hon Secretary, ISSAR

Notification

All the members of the Indian Society for the study of Animal Reproduction are informed that the Election of the Office bearers for the next Term will be held during the business session of ISSAR at the time of Fifth National Congress on Animal Reproduction to be held at GB Pant Agril. University at Pantnagar on 28th February 1984.

Interested members are requested to send in their nominations on plain papers to Dr SN Maurya, organising Secretary at Pantnagar.

DR BR DESHPANDE
Hon. Secretary

AYURVEDIC RESEARCH

Fourth World Congress on Human Reproduction held at Bombay, 27th Nov. - 2nd Dec. 1983.

Research work done on Ayurvedic drugs in human and animal infertility and lactation at various research centres was one of the highlights of the 4th World Congress on Human Reproduction which concluded in Bombay.

Dr A Padma Rao, Prof and Director of Postgraduate Medical Studies, Kasturba Medical College, Manipal, presented findings of 20 clinical trials by 40 senior Gynaecologists including her own findings on the usefulness of a herbal drug Leptaden in lactation and pregnancy. According to these research studies, Leptaden promotes lactation, prevents abortion and premature labour and has no toxic effects.

Veterinarians supported the role of Leptaden in the Veterinary field.

Dr CR Sane, FRVCS (Sweden), an eminent Veterinarian and Director of Research and Veterinary Adviser, Gow Rakshak Mandali, Bombay presented the results of 4 research studies on Ayurvedic drug Aloes Compound in buffaloes, cross-bred cows and pedigree mares and referred to 10 research studies in female infertility. These studies show that Aloes Compound increases conception rate both in human and veterinary fields.

The above research studies were sponsored by Alarsin, Bombay, who are pioneers of Ayurvedic research in medical, dental and veterinary fields since 1947.

Obituary

Late Dr SK Diwan

Joint Director Veterinary Services MP & Executive Committee Member ISSAR MP Chapter

The members of the ISSAR will be shocked to learn the sad demise of DR SK Diwan, Joint Director of Veterinary Services, Bhopal Madhya Pradesh & Executive Committee member ISSAR, MP Chapter on 17th July 1983 at Madras.

Dr SK Diwan was born on 12-7-1936 at Jabalpur. He passed his BVSc from Jabalpur Veterinary College in June 1955. He joined as Veterinary Assistant Surgeon on 22-7-1955 in MP State Veterinary Dept. He obtained National Diploma in Animal Gynaecology at IVRI in the Year 1961-62. He worked in the Dept. of Gynaecology, Veterinary College, Jabalpur. In the year 1964 he was selected as AI Officer through MP Public Service Commission. In the year 1966-67 he went to Sweden for attending a course in Gynaecology at the Royal Veterinary College. In 1970 he was posted as Dy. Director of Veterinary Services, ICDP, Raipur (MP). In 1973-74 he attended course on Frozen Semen Technology at Denmark. His special training in the Field of Artificial Insemination proved beneficial in the Expansion of AI Activities in MP. He was further promoted as Joint Director of Veterinary Services, Bhopal Division in June 1979. He established the ISSAR Chapter in MP. He had a deep sense of responsibility in discharging his duties. Dr Diwan was a friend to one and all. His passing away right in harness has snatched away a young, active and experienced scientist and an administrator in the field of Animal Reproduction. He has left behind his wife, two daughters and a son. May his soul rest in peace.

DECLARATION

Statement about ownership and other particulars about THE INDIAN JOURNAL OF ANIMAL REPRODUCTION as required under Rules No 8 of the Registration of News papers (Central) Rules 1956.

FORM NO. IV (Rule No. 8)

1.	Place of Publication	Editorial Office: Dept. of Gynaecology & Obstetrics Gujarat Veterinary College, Anand
2.	Periodicity of Publication	Bi-annual FEBRUARY & AUGUST)
3.	Printer's Name Nationality Address	Prof Dr SB Kodagali Indian Gujarat Veterinary College, Anand-388 001
4.	Publishers Name Nationality Address	Prof Dr SB Kodagali Indian Gujarat Veterinary College, Anand-388 001
5.	Editor's Name Nationality Address	As above
	Names and addresses of individual who own the news-paper and partners, share-holders holding more than 1 per cent of the total capital	Official Organ of THE INDIAN SOCIETY FOR THE STUDY OF ANIMAL REPRODUCTION Regd. No.: Bom. 253/78 Office: Dept. fo Animal Reproduction Bombay Veterinary College Parel, Bombay-400 012

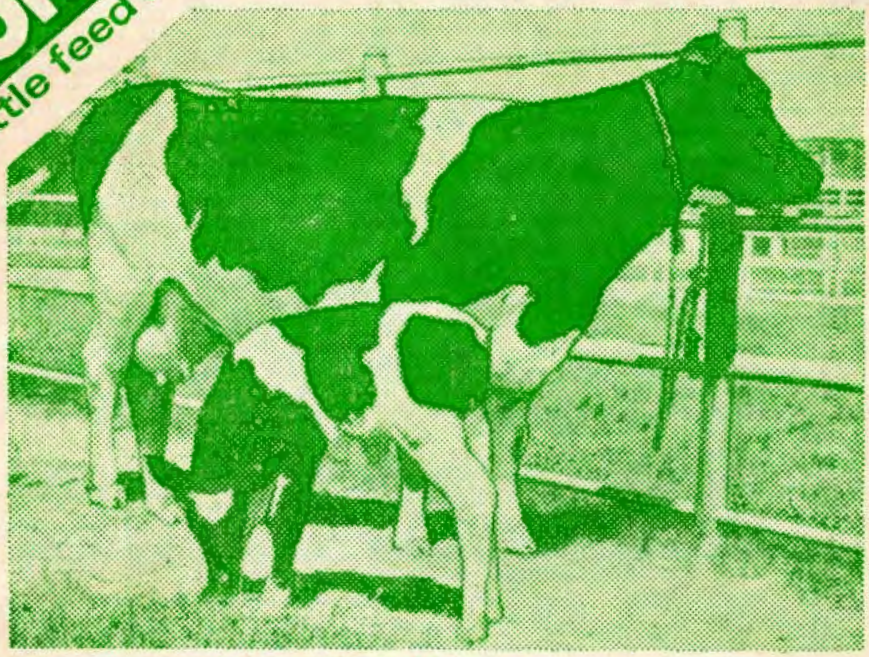
I Prof Dr SB Kodagali, Editor of THE INDIAN JOURNAL OF ANIMAL REPRODUCTION hereby declare that the particulars given above are true to the best of my knowledge and belief.

PROF DR SB KODAGALI
Editor
The Indian Journal of Animal Reproduction
The Indian Society for the Study of Animal Reproduction

ARIES FLAVOURED BOON-O-MILK

Cattle feed suplement

IMPROVES
BUTTER FAT
MILK YIELD
PALATABILITY-PROFITS



ARIES BOON-O-MILK fortified with

- 6 Non-Hormonal Galactogogues to increase Milk Yield - Volatile Fatty Acids - Butyrates & Acetates to increase Butter-Fat content.
- Booster Doses of Trace Minerals, Calcium, Phosphorus & Vitamin D
- Plus a FLAVOUR which makes BOON-O-MILK deliciously Palatable and most welcome to your cattle.

SCIENTISTS CONFIRM:

- At Pantnagar University - Milk yield increased by 18.33%
- At Aarey Milk Colony - Milk yield increased by 16%
- At Iraq, Dr. S.K.Sharma, College of Vet. Medicine, Mosul.

"..... milk appeared thicker and fattier ..... thick fat layer on top of cold, boiled milk ....."

ARIES AGRO-VET INDUSTRIES PVT. LTD. POST BAG No. 1, BOMBAY-400 043

Preserving the prime of life

During the past 25 years, controlled propagation of livestock by means of artificial insemination (AI) has progressed from being a subject of purely academic interest to an extremely reliable, highly effective method of large-scale breeding of healthy cattle.

In this advance, cryogenic storage of spermatozoa has helped considerably. This technique exploits the sub-zero freezing properties of liquid nitrogen to preserve prime bull semen at temperatures down to —196° Centigrade, for virtually indefinite periods.

In fact, perfectly healthy calves have been produced from semen that has been frozen for ten years or more. And considering the fact that as many as 10,000 calves per bull can be produced annually, artificial insemination has become one of the most important methods of meeting increasing world demands for livestock products.

Philips liquid nitrogen plants are in use in artificial insemination stations the world over; in highly industrialised countries as well as in remote regions.

For further details contact:-
Philips India
Product Division, Science & Industry
Shivsagar Estate, Block 'A' Worli
Bombay-400 018. Telephone: 391431

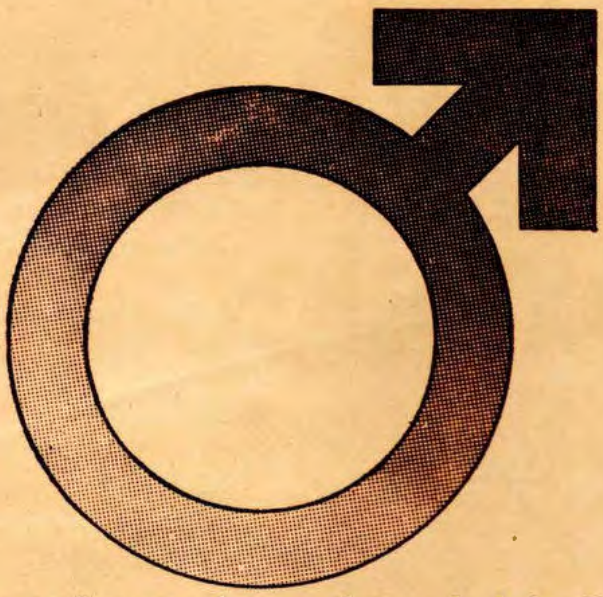
PESI/4974R

PHILIPS

PHILIPS

Philips — the trusted Indian household name for over fifty years.

Testoviron Depot



effective androgen therapy for male infertility and the male climacteric

Already at 40 years of age, relative androgen deficiency can be a problem

- Outstanding efficacy- proven in daily practice all over the world
- Reliable and powerful depot effect
- Stimulates spermatogenesis
- Increases vigour, zest, libido and potency
- Is excellently tolerated

Composition:
Testoviron Depot 100 mg:
1 ml of oily solution contains 25 mg testosterone propionate and 110 mg testosterone enanthate. (equiv. together to 100 mg testosterone approx.)

Testoviron Depot 250 mg:
1 ml of oily solution contains 250 mg testosterone enanthate. (equiv. to 180 mg testosterone approx.)

Presentation: Ampoules of 1 ml.

For further information please consult our scientific literature

Schering

German Remedies Limited
P. O. Box 6570 Bombay 400 018.

3BF-83.

Regd. No. Bom. 253/78

THE DRUGS YOU NEED FOR PERFORMANCE YOU WANT

S. No.	MEDICINES	INDICATIONS
1.	GALOG (Non-hormonal herbal Galactagogue)	Irregular Lactation, Reduction in Milk Yield, conditioned Hypogalactia and Failure of Lactation.
2.	HIMALAYAN BATISA (Stomachic & Tonic-cum-feed supplement) VMS No. P02029	Indigestion, Anorexia, Dyspepsia Impaction, Constipation, Off-feed, debility, metabolic disorders, convalescence etc.
3.	HIMAX (Antiseptic Ointment) VMS No. P02117	Mange, Ring worm, Eczema, wounds, Burns, Foot Lesions in Foot and Mouth.
4.	LIVOL (Liver-Tonic)	Torpidity of Liver, Enlargement of Liver, Hepatitis, Jaundice, Debility, Anorexia.
5.	PRAJANA (Oestrogenic) VMS No. P02115	Anoestrus due to non-specific reasons, delayed maturity, retained placenta.
6.	REPLANTA (Uterine Stimulant)	Retention of placenta, less or complete absence of Lochial discharge, Uterine Inertia etc.

And many other specialities, write for literature to:–

MANUFACTURERS :—

The Indian Herbs Research & Supply Co.,
P. O. Box No. 5,
Sharda Nagar,
SAHARANPUR-247 001 (U.P.)

Printed at Anand Press, Gamdi-Anand 388001