The Blue Cross Book

For the advancement of the veterinary profession

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Schering-Plough Animal Health

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From Editor's Desk

Awaited 25 ! The Silver Jubilee Issue....

We would like to place on record our sincere apologies for the inconvenience caused to the readers because of non publication of the book for a long span of 5 years.

Finally we are happy to re-launch "The Blue Cross Book for the Advancement of Veterinary Profession", for the benefit of large Veterinary fraternity in India, who has been working tirelessly for the well being of the livestock and companion animals in the country, thereby contributing immensely to the health and happiness of the millions of the fellow countrymen.

Veterinary profession in India primarily provides services to the owners of small /large ruminants and companion animals, where a single animal is usually affected with one of the common diseases. The Veterinarian is also supposed to provide elective services like castration, spaying, vaccination, dehorning, deworming, artificial insemination, pregnancy diagnosis and infertility treatment. He also undertakes routine testing for diseases like brucellosis, tuberculosis, JD and mastitis etc. in large / small ruminants.

However, during the last few years, though companion animal Veterinary services remain unchanged, there has been a shift in large animal medicine from individual attention to planned herd health and production management, using the 'whole farm' or 'area / region' approach. Presently livestock sector in India is a major stakeholder in total agrarian economy of the country. There is a ever growing demand for livestock products due to increase in population, growing per capita income and health consciousness. However, the sector is facing the problems of growing unproductive/low productive population and deficiencies in basic requirements like feed, fodder and Veterinary services. The Indian Veterinarians, at large, have to play a vital role in bridging the gap between infrastructural demands and the available resources by judicious application of modern technologies in nutrition, reproduction, management and preventive medicine.

It shall be the endeavor of the new version of "The Blue Cross Book" to keep veterinarians abreast of the latest techniques and technologies emerging at national and international levels in all areas of productivity management and healthcare.

A feedback and opinions of fellow Veterinarians are highly appreciated.

Editors

Message

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MESSAGE

Veterinarians today have a lifelong obligation for the continual improvement of professional knowledge and competence required to serve the society through the protection of animal health, the relief of animal suffering, the conservation of animal resources, the promotion of public health, and the advancement of medical knowledge in keeping with the principles of veterinary medical ethics. The veterinary reactionaries not only care for pets, livestock, sporting and laboratory animals, but also protect humans against diseases carried by animals. Veterinarians also engage in research, food safety inspection and education. These multifarious duties require continuing veterinary education for updating on the various advances that are taking place globally in a lucid and succinct manner which is best provided by a professional magazine. The **Blue Cross Book** over the years. I am glad to learn that this very popular technical magazine was kept on hold for some reasons is going to be revived keeping in mind the huge demand and value of this priceless publication. I have the great pleasure to send herewith my congratulations to Dr. Manoj Sood for making this possible for the cause of the profession and to Intervet Schering-Plough Animal Health for bringing out the 25th issue of **Blue Cross Book** dedicated for the advancement of the veterinary profession. It is indeed heartening to learn that this issue also brings together 24 issues of this technical magazine as a soft version.

Since the inception of this magazine in 1993, I have had my long association with this professional magazine and I am sure that the journal will endeavour to spread quality and useful technical and practical knowledge through this publication, as ever.

I extend my best wishes and support for this noble cause

[M.C. SHARMA]

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Message

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Message

It gives me immense pleasure and satisfaction to note that Intervet India Private Ltd is coming up with its 25th issue of "The Blue Cross Book" after a gap of four year. This technical magazine has always served an excellent referral scientific literature for the academicians, researchers, veterinarian, field practitioners, students and famers through its quality articles on contemporary and emerging issues in the field of veterinary and animal sciences. Indian livestock sector has contributed tremendously in bringing the "White" and "Pink" revolution in post-independence era and ensured food as well as nutritional security to millions of people. With largest livestock population, in future also, this sector is poised to contribute significantly towards the Indian economy. In India during last five denade, the milk production has increased from 17 million ton to 110 million ton. But inspite of highest milk production and 4 time higher growth rate than world average growth rate, per animal productivity is very low, and 55% of total milk is still being contributed by huffaloes only. In order to make a remarkable presence in International market, Indian livestock sector needs major emphasis on quality and hygiene across the value chain. Further, launching of awareness programme on "Clean and Quality Milk Production" in major milk producing states by the Intervet is highly appreciable. I am hopeful that it will have far reaching positive impacts on the growth of indian dairy industry. There is urgent need to initiate such programmes by involving the all stakeholders throughout the country.

I congratulate Intervet for the Silver Juhilee issue of the book. I found that all articles have been compiled meticulously in the book and definitely meet the expectations of readers. I wish to convey my heartiest wishes to Intervet for their endeavour.

A.K. Srivastava 19/7/10

(A.K. Srivastava)

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Preface

Dr. Ernst Arndt
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Intervet/Schering-Plough Animal Health

Dear Colleagues

After 5 years it is indeed a proud moment for Intervet/Schering-Plough Animal Health of India, to relaunch the popular Blue Cross Book - For the advancement of Veterinary Profession.

In taking the Veterinarians Oath – we have all made the following commitment:

I accept as a lifelong obligation the continual improvement of my professional knowledge and competence.

With the launch of this new-look Blue Cross Book, we will endeavor to be an active partner in helping the Indian veterinary profession to live up to this promise. We will strive to select contributions that are current and of interest to as wide a sector of our readership as possible.

As a valuable reference we have included in this re-launch edition, a digital copy of all previous editions of the Blue Cross Book with a searchable index. I trust that you will find this valuable.

To make this new era of our publication successful, we rely on your valuable suggestions on how we can improve.

Sincerely yours,
Ernst Arndt

Vol. 25

Contents

Review Articles

Clinical Articles

Vol. 25

Contents

A Review : High lifetime productivity through early attainment of puberty in dairy heifers.

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Introduction

Early onset of puberty provides long breedable lifespan of females and thereby ensures possibilities of multiple and maximum number of pregnancies during the lifetime. Early induction of puberty is emphasized by many scientists for alleviation of infertility in young females. Early pubertal age is no barrier for first few pregnancies and remote possibilities of obstetrical problems can be overcome with skillful attempts. Under modern and scientific animal husbandry practices, the age of puberty is targeted to be the shortest in all breeds of dairy animals. Induction of puberty by using hormones have been standardized in animal reproductive biotechnologies.

It is essential to monitor pubertal heifers for structural normalcy of reproductive tract. Many heifers exhibiting prompt pubertal oestrus may carry many structural defects, leading to reproductive failures. Careful per rectal examinations, support of ultra sonographic screening and genetic studies at the age of puberty constitute basic pre-requisites before breeding of heifers. Such pre-requisites are helpful to cull all defective heifers in early part of life and thereby saving time, money and labour on infertile, unproductive heifers. It is clear that many important changes take place just prior to puberty to facilitate the successful completion of maturation process of genital and endocrine system for continued reproductive function thereafter. Many of these changes occur very rapidly during this peri-pubertal period. The major changes at puberty in heifers consist of endocrine mechanisms that are associated with the increased body growth and concomitant development of important reproductive organs.

Structural changes

As puberty approaches, the most obvious change is increase in body weight. Rate of body weight gain of heifers from birth to

puberty varies among different management systems, environmental influences and genetic background of animals.

Rate of growth of animal basically depends upon nourishment during the uterine. life, birth weight and expected target body weight of the animal. Hence management of heifers during calfhood stage and pre-pubertal period is most crucial. Growth hormone (GH) may be associated with pubertal development, though its specific role is not clear. Dramatic increase in the concentration of GH and the amplitude of pulses of GH immediatly preceding puberty have been observed.

Increasing concentration of circulating IGF-I (Insulin-like growth factor-I) has been observed at approaching puberty in association with increasing body weight in heifers. Heifers which were fed for a rapid gain (1.36 kg/day) resulted in hastened puberty. Increased IGF-I leading to puberty was detected and found to be associated with increasing LH, insulin and glucose concentrations. Heifers that had supplemental fat in the diet tended to delay puberty and showed decreased IGF-I concentrations. The changes in IGF-I levels are associated with the attainment of puberty and IGF-I is a potential key factor in the pubertal process.

The heifers fed on low energy diet show longer pubertal period, as in this period, they gradually prevail over estradiol negative feedback, which causes slow maturation of reproductive organs, but it allows suitable growth of all components of reproductive system. When the first ovulation occurs, heifers show normal length of estrus cycle. The heifers raised on the diet with greater energy content show abnormal length of luteal phase due to abnormal (aberrant) uterine secretion of PGF2α as compared to that in normal cycles.

The reproductive tract of heifers also goes through some dramatic changes in preparation for the initiation of pregnancy during pubertal phase. Several researchers have reported the observation that the size and weight of the uterus, cervix and vagina increases rapidly during the time just prior to attainment of puberty. This rapid growth of the reproductive tract leading to puberty is likely or at least partially due to stimulation from the increasing concentration of estradiol in circulation at this time.

Uterine weight increases quadratically as puberty is approached. A rapid increase in uterine weight occurs during the 50 days preceding the onset of puberty, which is associated with the increase in the maximum size of the dominant ovarian follicles and the associated increase in 17 ß-estradiol concentration. Uterine development during peripuberty is probably related to capacity to produce prostaglandin F2α which is involved in

luteolysis. Ovarian output of estradiol apparently increases during the period of rapidly increasing LH secretions in prepubertal period. Thus, the ability of estradiol to inhibit secretion of LH appears to be declining in the presence of increasing levels of estradiol. Uterine weight is greater in post pubertal than prepubertal heifers.

Major changes in ovarian morphology do not occur during the 130 days preceding puberty. Ovarian weight is not changed as puberty approaches. There is no change in number of small. medium, large or total follicles. Follicles larger than 12 mm in diameter are found only in the heifers those are closest to puberty. This indicates that minimum frequency of pulsatile secretion of LH might be necessary to stimulate follicles to grow to preovulatory size.

Endocrine changes

The stimulus required for the exhibition of puberty is an increase in LH secretion, as a result of increased LH releasing hormone from the hypothalamus. The interval over which LH increase occurs is referred as the peripubertal period.

This period is approximately 50 days preceding puberty in heifers. The inability of the hypothalamus to secrete sufficient LH releasing hormone and hence to stimulate sufficient secretion of LH in the presence of the ovary, is the primary factor that regulates the timing of puberty in many species.

Delay of the prepubertal increase in secretion of LH or immunization of heifers against LH releasing hormone postpones puberty. Factors such as under nutrition or inhibitory photoperiod that delay puberty postpone the prepubertal decline in estradiol negative feedback and the resultant peripubertal increase in LH secretion. The decline in estradiol negative feedback allows the secretion of GnRH to increase, as heifers approach puberty.

Increasing frequency of GnRH pulses is a major factor leading to the attainment of puberty. Pulsatile GnRH secretion plays an important role in the support of ovarian follicle growth and luteal activity in cattle. This is accomplished through stimulation of the release of LH and follicle-stimulating hormone (FSH) from the anterior pituitary.

Increasing LH pulse frequency appears to be the most consistent characteristic of LH secretion leading to puberty. Circulating concentrations of FSH also appear to increase slightly in heifers during the several months approaching the time of puberty. As puberty approaches, there will be increase in FSH concentrations with progressive waves of ovarian follicular development.

Clinical studies

It is necessary to assess each heifer approaching puberty through gynaecological

examination on the basis of optimum age and body weight. It is difficult to appreciate many conditions like infantile genitalia, hypoplastic ovaries or patency of reproductive tract on rectal examination. However, it is expected to record probability of reproductive normalcy of the heifers through such examination. Selection of probable respondents to remedies is always critical and crucial attempt.

Many studies have been reported in the literature to induce puberty in heifers with herbal, neutraceutical, therapeutic or hormonal approaches. Although the mechanism of action and hormonal interplay for onset of puberty and first post partum oestrus remains the same, the hormonal methods to induce post partum oestrus may not show similar results as for induction of puberty.

It is essential to analyse pubertal heifers with blood biochemical estimations for selecting proper therapeutic measures. Krupakaran et al., (2009) have reported low levels of glucose and urea nitrogen in anoestrus heifers as compared to cyclic crossbred heifers and also estimated lower levels of calcium, phosphorus, magnesium and iron concentration in these heifers. Das et al. (2005) observed that delayed pubertal crossbred heifers have low levels of TEC, Hb, PCV than the cyclic ones and haemato -biochemical profiles can be used as guideline for correcting the delayed phase of puberty.

Markandeya (1997) recorded phosphorus and mineral supplementation as effective remedy in delayed pubertal Deoni heifers for induction of estrus in 63 per cent cases with ovulations and establishment of cyclicity in 54 per cent heifers. Markandeya and Bharkad (2008) have reported induction of sexual maturity with phosphorus therapy in 69 per cent Deoni heifers with 87 per cent ovulations and 50 per cent overall conceptions.

Herbal treatments initiate the cyclicity of reproductive tract with ignition like effect. Markandeya et al., (2002, 2004) reported efficacy of herbal product for induction of estrus in delayed pubertal cow and buffalo heifers.

They also reported that heifers with 3 to 5 mm sized ovarian follicles in cows and buffalos treated with herbal heat inducer powder resulted in 71 and 61 per cent response of ovulatory oestrus with 55 and 41 per cent conceptions, respectively.

Hormonal treatment has been widely used in heifers for induction of cyclicity. Progesterone alone and in combination with different gonadotrophins or steroids is the first choice of treatment for safe induction of oestrus.

Mavi et al, (2007) treated Murah buffalo heifers with 100 mg progesterone daily for 10 days and 500 mg progesterone in two doses at an interval of 10 days with 1000 IU PMSG on day 12th of initiation of treatment and

reported 75 and 66 per cent induction of estrus, respectively.

Markandeya and Bharkad (2002) reported efficacy of progesterone (@ 250 mg, IM, day 1st) primed with GnRH (250 mg, IM, day 10th) therapy in Murah buffalo heifers as 83 per cent effective during summer season and 100 per cent in both winter and spring season with nil conceptions in summer, 100 per cent conceptions in winter and 50 per cent during spring season. Singh et al, (2003) recorded 100 per cent induction of estrus with 50 per cent conceptions on treatment with progesterone @ 500 mg and oestrodial valarate @ 5 mg on day 1st followed by 500 IU PMSG on day 8th.

Synchro-Mate B implants have been used by Joshi et al, (1992) in Red kandhari heifers and 100 per cent ovulatory estrus induction has been reported. Singh et al, (2003) reported use of CIDR intravaginally for 7 days with 500 IU PMSG on day 8th and reported 100 per cent induction of estrus within 24 hours of withdrawal of treatment in buffalo heifers with 33 per cent conceptions. Markandeya (1999) reported crester (norgestomet) implant therapy effective in 100 per cent heifers with 69 per cent overall conceptions.

It can be concluded that pubertal phase in heifers needs close monitoring and selected cases of late puberty could be treated successfully with herbal, neutraceutical or hormonal treatments.

References

Das,P.K.; Muthukumar,G.; Sanyal,S. ; Rajendran, D. and Ghosh, P.R. (2005). Studies on haemato-biochemical profile of adult Jersey crossbred heifers during anoestrus and non hormonal induction of estrus. *Indian J. Anim. Reprod.* **26** (2): 133-137.

Joshi,S.A.; Pargaonkar,D.R.; Bakshi,S.A.; Puranik,S.V. and Markandeya,N.M. (1992) Induction and synchronization of oestrus in red kandhari heifers treated with synchro-Mate B. *Indian Vet. J.* **69**, 170-171.

Krupakaran,R.P.; Kataria,M. and Mithal,A. (2009). Blood biochemical, enzymatic and mineral status in oestrus and anoestrus cross bred heifers. *Vet. Practitioner* **10** (1) : 18-19.

Markandeya N. M. (1997) studies on induction of puberty in Deoni heifers with phosphorus and mineral supplementation AGRESCO report, MAU, Parbhani, Compendium - p. 57

Markandeya, N.M. and Bharkad, G.P. (2002). Effect of progesterone primed gonadotrophin releasing hormone (GnRH) on induction of pubertal oestrus in Buffaloes during different seasons. *Indian Vet. J.* **79** (1) : 84-85.

'Markandeya,N.M.; Dhoble,R.L., Bhikane, A.U. and Bharkad,G.P. (2002). Ten years clinical trial experience with Prajana ; overview of its efficacy in true anoestrus cases. *Livestock Int.* 11 -13

Markandeya, N.M. ; Bharkad G.P. and Bhikane, A.U. (2004). Clinical response to herbal therapy in selected anoestrus cases. *Vet. Practitioner* **5** (1) : 29-30.

Mavi,P.S.; Bahga,C.S.; Singh,N. and Chimmea, R. (2007). Effect of hormonal treatment on induction of estrus and plasma mineral composition in true anestrus buffalo heifers. *Indian J. Anim. Reprod.* **28** (1) : 39-41.

Singh, R.; Dhanda, O.P. and Saini, M.S. (2003). Successful induction of estrus and establishment of pregnancy in pubertal buffalo heifers by hormonal therapy during off breeding season. *Indian Buffalo J.* **1** (2) : 78-80

Questions

1. What is the economic importance of attaining early puberty in dairy heifers ?
2. What is the basic prerequisite in monitoring early age puberty ?
3. What are the basic anatomical / physiological changes in heifers at pubertal age ?
4. What factors determine the appropriate body weight of heifers at pubertal age ?
5. What is peripubertal period ?
6. Name the primary / basic releasing hormones responsible for onset and exhibition of puberty.
7. What is the importance of gynaecological examination of heifers at pubertal age ?
8. Name the important blood biochemical parameters which may help in determining the puberty status in heifers ?
9. Which single mineral deficiency primarily affects onset of puberty as reported in the article ?
10. Which hormonal treatment regimen, out of various regimens reported in the article, you consider most appropriate for inducing puberty ?

For the Readers,

'The Blue Cross Book', in its every issue shall put forth questions on a review paper. The readers are appealed to answer these questions on line on the e-mail address of The Blue Cross Book. The answers shall be assessed at the end of the year and the readers who score highest in each publication shall be appropriately rewarded.

Role of prostaglandin F2α to improve breeding efficiency in dairy cows

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Introduction

For optimal production of both milk and calves, the target for every cow in the herd is to produce a live healthy calf each year i.e. to have a calving interval of 365 days. To achieve this target, the post parturition period is most critical. The rapid and uneventful involution of the uterus and resumption of normal ovarian activity must occur within a short period. This must then be followed by accurate estrus detection, artificial insemination or natural service and conception. Since high yielding early post partum dairy cows often suffer from one or another ovarian disorder, the situation is further aggravated during post partum period. In fact, regular cyclicity before 50 days postpartum is observed in only 20 to 30% of dairy cows. The problematic calving, clinical diseases, ketosis or severe negative energy balance during the post partum period are related to delayed cyclicity before service and most of the time, animal remains in anoestrus phase.

Anoestrus

In anoestrus, the cow is not observed in estrus either because she has not come into estrus (non-cyclic cows) or because the estrus is not detected (cyclic cows). This anoestrus is classified in two forms viz true anoestrus and subestrus.

In true anoestrus, the cow dose not come into estrus because of inactive ovaries. In subestrus form, the cow has normal cyclic activity, but it is not observed in estrus due to weak estrus behavior. The reason for true anoestrus is mostly due to nutritional and mineral deficiency, debility due to chronic diseases, freemartins, hypoplasia of ovaries, ovarian tumors, uterine pathology and pituitary disturbance.

Some common problem in true anoestrus

1) Persistent corpus luteum/Pyometra

Persistent corpora lutea are generally accompanied by a uterine disorder preventing the pre-release of sufficient prostaglandin for luteolysis. During the progesterone dominated phase, the uterus has a reduced resistance to infection. The pH of the uterus is low, which creates better conditions for the common uterine pathogens. The leucocyte activity is delayed and reduced. The uterine secretion has no detoxicating effect.

2) Cystic ovarian disease (COD)

Cystic ovarian disease is frequently defined as the presence of large fluid filled structures on one or both ovaries. In early postpartum period, the incidence is much higher. An insufficient pre-ovulatory LH surge is thought to be the principal cause of COD. Ovarian cyst can be differentiated as luteal or follicular cyst depending on the degree of luteinization. Follicular cysts are more common than luteal cysts. They have a thicker wall than follicular cysts and this luteal cysts are associated with anoestrus.

The role of PGF2α in anoestrus

Following calving, several ovarian disorders cause reduction in reproductive efficiency of post partum dairy cows. Poor estrus detection rate, silent estrus, ovarian disorders are the major problems which decrease the reproduction efficiency in a dairy farm. A prolonged luteal activity phase subsequent to resumption of ovarian activity in the previous period is one of the major disorders. This prolong luteal disorder is due to the inability of the uterus to produce prostaglandin. Effectiveness of prostaglandin treatment on post partum uterine disorder has been reported in cattle. The luteolytic effect of cloprostenol, a synthetic PGF2α, was reported in 1974 with a single intramascular dose of 500 milligrams.

The successful treatment of pyometra condition in postpartum dairy cows with prostaglandin treatment was reported in 1983. In this condition, the ovary bears a corpus luteum susceptible to prostaglandin. In metritis-pyometra cases, prostaglandin release from the uterus is insufficient to produce leuteolysis. In pyometra and chronic endometritis cases, the treatment of PGF2α helps corpus luteum regression, followed by maturation of a new follicle. The new follicular growth increases the estrogen secretion, followed by the secretion of progesterone. Estrogens stimulate blood flow to the uterus, uterine contraction and initiate leukocytic invasion of the uterus, thus facilitate the removal of any debris that remain from the previous parturition. Progesterone stimulates endometrial gland growth and prepares the uterus to receive and nourish a new embryo.

For the treatment of luteal cysts, a injection of PGF2α can be used around 12 days after GnRH or / HCG treatment to induce early regression of the luteinized cyst.

Role of PGF2α to improve breeding efficiency

The most effective method to accelerate genetic progress and maximize profitability in a dairy operation is to breed dairy animals using artificial insemination (AI). However, problems associated with accurate estrus detection,

especially during early postpartum period and cyclicity due to nutritional or health problem reduce the potential use of AI in dairy operation. Several studies have documented the link between poor estrus detection and reproductive efficiency. Reproductive efficiency is often a limiting factor in dairy herd productivity and profitability. For maximum reproductive efficiency to be achieved in a herd of cattle, each cow must reproduce as frequently as possible. Prolonged postpartum anestrus, a common cause for prolonged inter-calving period in dairy cows, is primarily due to the combination of a delayed interval to first estrus, silent estrus after parturition and poor detection of estrus. Certain physiologic factors also can reduce estrus behavior like illness, nutritional deficiency like ketosis and severe negative energy balance during the high milk yielding period.

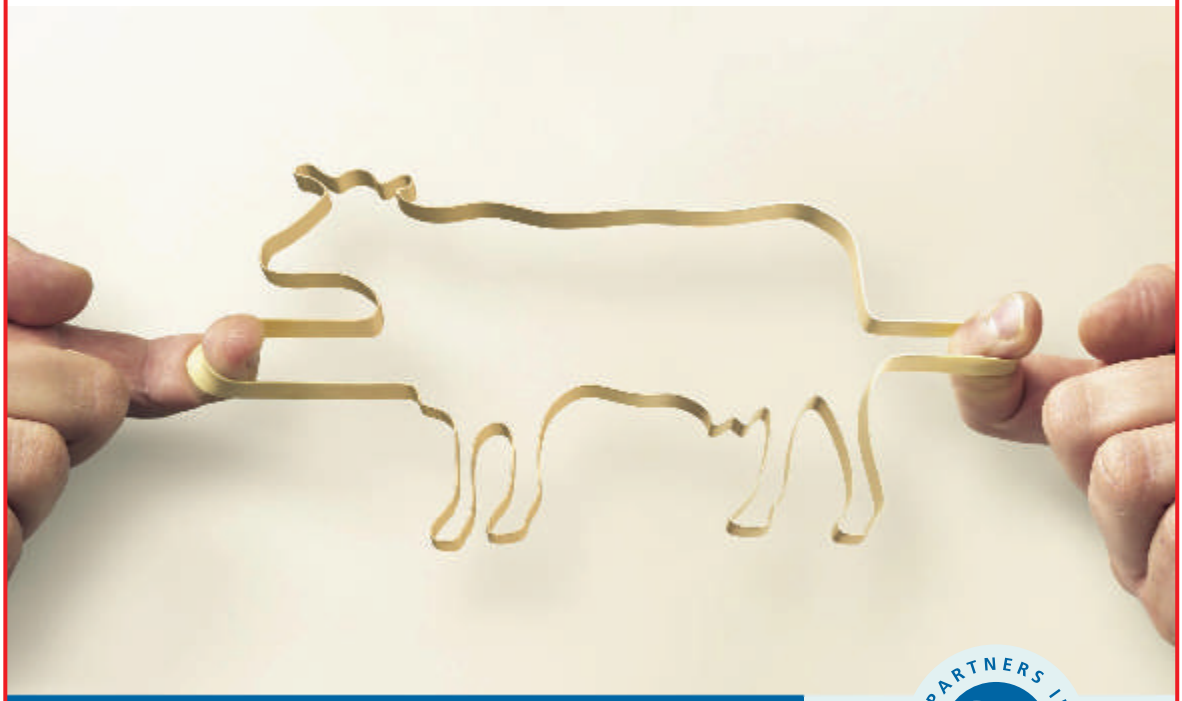
Estrus synchronization programs using Inj. Iliren (PGF2α analogues) to reduce the lifespan of the corpus luteum can be implemented. Synchronization of estrus behavior using prostaglandin analogue improves reproductive efficiency. Two injection of PGF2α analogues administered 11 days apart, are required to effectively synchronize estrus in cow. Several groups reported that Prostaglandin F2α regresses the corpus luteum when injected between day 5 to 16 of the estrus cycle. Synchronization of estrus using PGF2α can improve reproductive efficiency, provided oestrus detection efficiency is optimum.

Conclusion

The PGF2α helps to induce regression of the corpus luteum which ends the luteal phase. A new follicular phase starts and the animal shows oestrus and ovulation. The injection of PGF2α during postparturm period promotes uterine involution. Administration of PGF2α is the treatment of choice for the luteinization of the luteal cystic follicle. The estrus synchronization with PGF2α is an effective program for fixed time AI in lactating dairy cows.

* Inj. Iliren : PGF2 analogue containing Tiaprost trometamol 0.196 mg/ml (Intervet/Schering-Plough Animal Health, Pune)

Flexibility and reliability



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Effect of minerals on reproduction of livestock — An overview —

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Introduction

Adequate nutrition is a pre-requisite for sound reproductive process in livestock. Requirement of most minerals are increased in gestation, lactation and growth, and deficiency of any of them may affect reproduction. Feeding of dairy cows should consist of not only supplying energy and crude protein according to requirements, but also macro and micro-elements.

Balakrishnan and Balagopal (1994) suggested that mineral imbalance could be a cause of infertility in repeat breeders. Reproductive problems in animals occurred in areas where deficiency of specific minerals in the soil has caused reduction of those minerals in naturally growing feedstuff. Following is a brief discussion on the effects of different minerals on reproduction.

Calcium and phosphorus

Although calcium deficiency may not directly cause reproductive failures in cattle, depletion of calcium in the dam may lead to defects in the development of fetal skeletal system during later gestations, if calcium is not replenished between successive pregnancies. However, most defects in the development of skeletal system of the fetus are due to lack of vitamin D that results in interference of calcium absorption.

Calcium is one of the major cations in cervical mucus, which stimulates glycolysis, thereby sustaining the viability, motility and metabolism of sperm in the cervix (Sidhu and Guraya, 1985) whereas excessive levels of calcium can inhibit sperm motility (Vadodaria and Prabhu, 1990).

Phosphorus deficiency results in subnormal fertility associated with prolonged anestrus, sub estrus or depressed estrus, irregular estrus, aberration in estrous cycle and delayed sexual maturity in cattle (Blood et al, 1994) but not in sheep (Read et al., 1986). Subnormal fertility due to phosphorus deficiency arises from inadequate supplementation in feed rather than from low concentration in soil, the effect of which remained at subclinical level. Poor lamb and calf crop was a recurring feature in

animals confined to grazing in severely phosphorus-deficient land but responses to supplement were inconsistent. Significantly lower levels of serum inorganic phosphorus in repeat breeders were observed by Khan and lyre (1993) and Das et al. (2001). Sukhajia and Sengupta (1986) observed that certain level of inorganic phosphorus was emphatically needed for secretion of estrogen. However, conception rate appeared to be lesser sensitive than milk yield due to phosphorus deficiency in dairy cows.

Calcium and phosphorus are intimately related and instead of the absolute level of one particular mineral, the ratio of calcium and phosphorus appeared to be more relevant in reproduction. For efficient reproduction, the serum calcium-phosphorus ratio should be between 1.5: 1 and 2.5:1.

Low level of serum calcium and phosphorus may either cause lack of tone of muscles of genitalia and/or weakness and excessive relaxation of pelvic ligaments leading to prepartum or postpartum prolapse.

Cobalt:

Deficiency of cobalt during pregnancy in the ewes resulted in the reduction in lambing rate as compared to non- deficient ewes (Duncan *et al.,* 1981). Lambs from cobalt deficient ewes were slower to start suckling. In cattle, cobalt deficiency might cause delayed onset of puberty and irregular estrus. Judson el al. (1997) reported that beef cows reared under cobalt-deficient areas suffered from infertility.

Copper:

Low fertility associated with delayed estrus or subestrus occurs in cattle grazing on copper-deficient pastures. Shah et al. (2003) found higher plasma copper level in post parturient buffaloes and cows that conceived within 120 days post partum as compared to non-conceived ones. This indicates possible role of plasma copper level in reducing the interval to first post partum estrus. Copper level in circulation appeares to be influenced by hormones of reproduction and its concentration in blood serves as an indicator of status of gonadal hormones and pituitary gonadotropins (Desai et al,. 1982). The association of copper with resumption oi ovarian activity and fertility has been documented. In cattle less than 10 ppm of copper in blood resultes in anoestrus. Infertility in terms of abortion, delivery of small dead fetus was observed in experimental copper deprivation in ewes. However, copper deficiency symptoms were found to be related to molybdenum supplementation. The antagonistic effect of molybdenum and sulphur on copper had been noted in grass, hay and silage. Antagonism between copper and iron also influenced copper absorption. Impaired pulsatile release of LH was detected in infertile heifers following molybdenum-induced copper deficiency but not in those with severe hypocupraemia induced by iron. This suggests that infertility is attributable to excessive molybdenum rather than copper deprivation.

Iron:

Ramakrishna (1997) recorded higher iron levels in normal cyclic cows as compared to non-cyclic or irregular breeders. Low level of iron could possibly result in improper tissue

oxygenation in the uterus for the conceptus causing death of embryo. A deficiency of iron might also interfere with enzymatic reaction on the release of LH, which was highly essential for pregnancy in cows (Reddy and Reddy. 1988).

Iodine :

Iodine deficiency resultes from either less supplementation of iodine in the diet or from selenium deficiency, which impaired the formation of T3 from T4 and could give rise to secondary or induced iodine deficiency. Fetal development may be arrested during any stage of thyroid dysfunction leading to early death, resorption, stillbirth or birth of weak hairless calf with subnormal birth weight. Delayed development of reproductive tract, irregular estrus and retained placenta are some of the important disorders occurring in iodine deficiency. Infertitly or sterility and poor conception rate were found lo be common features of thyroid dysfunction in cows and were attributable to more losses of iodine at peak lactation. The need of thyroid hormones to produce lung surfactants may be an important factor determining viability of newborn. Iodine deficiency resultes in a decline in libido and deterioration in semen quality of the ram, bull and stallion. Toxic effects of high iodine supplementation were found to be associated with abortion and fetal deformities.

Manganese:

Manganese has possible role in the functioning of corpus luteum. Lack of manganese may inhibit the synthesis of cholesterol and may thus limit the synthesis of sex hormones and other steroids and result in infertility. Cows, buffaloes, goats and ewes deficient in manganese suffer from delayed or depressed estrus and poor conception rate. Level of manganese less than 40 ppm in the serum of cows results in irregular estrus or anoestrus. Manganese deficiency necessitated more number of services per conception in cows (Rajas et al., 1965). A significant negative correlation of manganese with the periods of uterine and cervical involution was recorded in buffaloes (Shah et al. 2003). Low dietary concentration of manganese results in slow testicular growth, which might be caused by hormonal insufficiency.

Selenium:

In ruminants, selenium deficiency results in increased early embryonic death, birth of immature, weak and dead calves and increased incidence of retained placenta.

Selenium supplementation in cows reduces

the incidence of endometritis and cystic ovary. Increase in litter size, conception rate and decrease in piglet mortality could be achieved by selenium supplementation. Low sperm survivability has been observed in selenium deficient bulls. Low sperm motility and increased incidence of tail abnormalities with low fertilization rate has been observed in boar when diet was deficient in selenium.

Zinc:

Higher values of plasma zinc has been observed in regular breeders than repeal breeder cows, optimum level of zinc is essential to maintain activity of FSH and LH thereby facilitating normal reproductive performance. Binding of prostaglandin with zinc facilitates transport of prostaglandin. A reduction in zinc level might impair the action of prostaglandin receptors and consequently affects the luteolytic process, which in turn causes reproductive disorders. Zinc deficiency results in decreased intake of protein and energy because of loss of appetite and eventually causes reduction in testicular size. Males those have free access to water containing zinc sulphate have higher semen volume, sperm concentration and sperm motilily. Deficiency of zinc in males results in impaired spermatogensis and testosterone production.

Other minerals:

Nickel has been found to improve growth and fertility in pigs. Arsenic deprivation decreases growth, impaires fertility and increases mortality in goats and piglets. Reproduction in female goats is impaired in cadmium-depleted females and offspring born from those females are less likely to survive. Low bromine diet significantly decreases the first insemination conception rate and increases the abortion rate in ruminants.

From the above discussion it may be inferred that different minerals are essential for normal growth and maintenance of various events of reproduction in animals. Hence these should be supplied in the ration of livestock and if not supplied extraneously, normal feedstuff routinely offered to animals must provide the required minerals for enhancing growth and reproduction. However, excessive supplementation of minerals may lead to toxicity in animals. Therefore it is imperative that different minerals be supplied at optimum concentration in order to meet the normal body functions of livestock.

References

Balakrishnan,V. and R.Balagopal (1994), *Indian Vet. J.,* **71**(1): P.: 23-25

Blood, B.C., O. M. Radostits, J. H. Arundel and C. C. Gay (1994). In: *Veterinary Medicine.* 9th edn. ELBS, Oxford.

Das, S., S.Bandopadhya, S. Basu,B. B. Ghosh and R Dattagupta (2001). *Indian J. Anim Reprod.,* **23**(2): p.: 167 169

Desai,M. C., T. P.Thakkur, R. Amin Darshoane and J. Janakiramon (1982). *Indian J. Anim Sci.,* **52**: p.: 443-444.

Duncan,W.R.H., E.R.Morrison and G.A.Garton (1981). *British J. Nutri.,* **46**: p.: 337-343.

Judson, G. J., J. D. Mcfarlane, A. Mitsioulis and P. Z'viedrans (1997). *Austra. Vet.J.,* **75**: p.: 660-662.

Khan, J. R. and V. J, lyre (1993). *Indian Vet. J.,* **70**: p.: 675-676.

Pankaj Sood,N. K. Vasistha, M. M.Singh and J. M. Nigam (2000). *Indian J. Anim. Reprod.* **21**(1): p.: 57-58.

Ramakrishna,K.V. (1997). *Indian J. Anim Reprod,.* **18**(1): p.: 33-35.

Rajas,M. A., I. A. Dyer and W. A. Cassatt (1965). *J. Anim Sci.,* **24**: p.: 664-667.

Read,M.P.,E. A.N.Engels and W.A.Smith (1986) *South African J. Anim. ,Sci.,* **16**: p.: 1-6.

Reddy,L. Y. S. and S.M.Reddy (1988). *Indian J Dairy Sci.,* **41**(1): p.: 18-20.

Shah, R.G., A.J.Dhami,K. P.Patel, N. V.Patil and F. S. Karani (2003). *Indian J. Anim. Reprod.* **24**(1): p.: 16-21.

Sharma.V. K., and S. S.Tripathi (1989). *Indian J. Anim. Reprod.* **12**: p.: 1522-1533.

Sidhu,K. S. and S.S.Guraya (1985). Buffalo Bull Semen 1st edn. USG Publishers and Distributors, Ludhiana. P.: 137.

Small, J.A.,E. Charmley, A.V. Rodd and A.H. Freeden (1997). *J. Anim .Sci.,* **77**; p.: 55-62.

Sukhajia,S.S. and Sengupta (1986). *Indian Farming*, **36**(8): p.: 35.

Trinder.N., C.D.Woodhouse and C.P.Renton (1969). *Vet. Rec.,* **85**: p.: 550-553.

Vadodaria,V.P., and G.A. Prabhu (1990). *Indian J. Anim. Reprod,* **11**: p.: 130-135.

Indian Livestock Scenario - 1

Trend in Livestock Population (1950-51 to 2003-04)
(Figures in Millions)

Livestock	1950-51	1970-71	1990-91	2003-04	% Change per annum
Cattle (Indigenous)	155	178	189	160	+ 0.06
Cross Bred Cattle	-	-	15	27	4.60
Total Cattle	155	178	204	185	+ 0.37
Buffaloes	43	57	84	98	+ 2.51
Goats	47	67	115	124	+ 3.26
Sheep	39	40	50	61	+ 1.14
Horses	1.5	0.9	0.82	0.75	- 1
Asses	1.3	1	0.97	0.85	- 0.6
Mules	0.06	0.08	0.17	0.19	+ 4.3
Pigs	4	7	12	13	+ 4.5
Camles	0.6	1.1	1.03	1.13	+ 1.76
Others	-	0.04	0.21	0.34	+ 18
Total Livestock	293	353	471	485	+ 1.31
Poultry	24	138	307	489	+ 11.2

The population of indigenous cattle has decreased with simultaneous increase in crossbred cattle population. Buffaloes , Sheep and Goat population has increased in spite of heavy neonatal mortality in buffaloes and slaughter rate around 40 % in small ruminants. Pigs are assuming importance as meat animals. Growth in poultry population is attributable to large scale commercialization.

Reference : Dairy India 2007, 6th Edition

Emerging Livestock Diseases In India - 1
Classical Swine Fever : A Glimpse

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Classical Swine Fever (CSF), also known as hog cholera, is a highly contagious febrile viral disease of pigs. It was first described in 1810 in North America and shortly thereafter in the European continent. The disease is present in Asia, Southern Mexico, South and Central America. The Caribbean, and parts of Africa (Madagascar, Mauritius). The disease is listed under Group A list of diseases by OIE and has importance from international trade point of view. Classical swine fever (CSF) is caused by classical swine fever virus which is a small, enveloped RNA virus of the pestivirus group belonging to family Flaviviridae. Classical swine fever virus is antigenically related to other pestiviruses, namely Bovine Viral Diarrhoea (BVD) virus of cattle and Border Disease virus of sheep(OIE). There is only one serotype of CSF virus (CSFV), however some minor antigenic variability between strains can be shown.

Epidemiology in India

Classical swine fever has the potential to cause devastating epidemics, particularly in countries that are free of the disease and do not practice vaccination, as their total pig population is susceptible. The disease was reported for the first time in India in 1962 by Dr. Sapre in Maharashtra, Since then outbreaks of the disease have been reported from almost all the States of India. The disease surfaced as re-emerging disease in the country from 1988 in the form of outbreaks. The details of incidence of CSF in India is given in Table I

Transmission

The main source of infection is the pig, either live animals or uncooked pig products. In endemic areas, the major concern is spread of disease by movement of infected pigs, which can be a cause of remote outbreaks where there is large-scale transport of pigs for finishing. Infected pigs are the only reservoir of

virus. Blood, secretions and excretions (including oronasal and lacrimal secretions, urine, feces and semen) and tissues contain infectious virus. Virus shedding can begin before the onset of clinical signs, and occurs throughout the course of acute or subclinical disease. Chronically or persistently infected pigs can shed virus continuously or intermittently for months.

The virus is moderately fragile and does not persist in the environment or spread long distances by the airborne route. It can survive for prolonged periods in a moist, protein-rich medium such as meat, other tissues, and body fluids, particularly if kept cold or frozen. Virus survival time of several years in frozen pig meat, or months in chilled or cured meat, have been reported. If sows are infected with low to moderately virulent strains of virus during pregnancy and then recover, there is a high risk that their offspring may be carriers. Not all such carriers will show clinical signs of disease. Therefore, it is particularly important to investigate herds that have a high level of unexplained reproductive failure, congenital tremors or other congenital abnormalities.

Classical Changes in Kidneys

Pathogenesis

The severity of the disease depends on the virulence of strain and host factors such as age, breed, nutritional status and immune status of the animal. More virulent strains cause acute disease; less virulent strains can result in a high percentage of chronic, mild or asymptomatic infections. The incubation period of the disease can range from 2 to 10 days.

The virus enters through the oronasal route with primary replication in the epithelial cells and later in lymph reticular tissue of the tonsil. From the tonsils, it spreads to regional lymph nodes and lymphoid structure associated with small intestine, The virus has the affinity for vascular endothelium. In the blood stream, CSFV replicates in monocytes giving rise to high titer of the viremia. Leukopenia, in particular lymphopenia, is classic early event. Interaction between the macrophages and the CSFV results in the release of mediator molecules that promote the progression of disease. Changes in the haemostatic balance are thought to be caused by proinflammatory and antiviral factor that mediates the thrombocytopenia and hemorrhagic characteristic of CSFV infection. CSFV can cross placenta and infect sow at any stage of gestation. Congenital infections may be limited to few piglets in the herd. Infection can cause fetal death, resorption, mummification, birth defects and stillbirth.

Clinical signs

The disease has acute and chronic forms, and the virulence varies from severe to mild or even subclinical. The typical symptoms are not developed in many cases .In the acute form, the clinical signs includes high fever [41°, 105°F], huddling, weakness, drowsiness, anorexia, conjunctivitis and constipation followed by diarrhoea. Systemic vasculitis with petechial to ecchymotic hemorrhages and in late stages skin hemorrhage and cyanotic areas in axilla, abdomen and ears are seen. The young animals are affected more severely than the old animals. High mortality rate is observed (up to 100% in piglets) with death in 10-20 days if caused by virulent strains. In chronic form, the same clinical signs are observed but the pigs survive for 2-3 months. The animals appear normal but they develop recurrent symptoms like intermittent fever, anorexia, periods of constipation or diarrhoea, wasting or stunted growth and skin problems. Infection can cause fetal death, resorption, mummification, birth defects, stillbirth or (rarely) abortion. Sow can give birth to live, congenitally affected piglets that are persistently infected and have congenital tremors with generalized weakness. Mortality rate is up to 100%, with death in 6 months to 1 year in persistently infected animals.

Post Mortem Lesions

The lesions vary in severity with the course of the disease. No gross lesions are seen on necropsy if death is soon after infection. In acute form, the pathological picture is often hemorrhagic. Petechial or ecchymotic hemorrhages can often be seen on serosal and mucosal surfaces, particularly on the kidney, urinary bladder, epicardium, larynx, trachea, intestines, and subcutaneous tissues. **Multifocal infarction of the margin of the spleen is considered highly characteristic** but not always present. Edematous to hemorrhagic lymph nodes are common. Infarction and hemorrhage in lungs can be seen. The skin may be discolored purple and the lymph nodes may be swollen and hemorrhagic. In chronic forms, button ulcers in cecum and large intestine may be present. The secondary bacterial infection often complicates the condition and enhances the severity of lesions. Bone lesions can also occur at the costochondral junction of the ribs and the growth plates of the long bones. In congenitally infected piglets, common lesions include cerebellar hyperplasia, thymic atrophy, ascites, and deformities of the head and legs. Edema and petechial hemorrhages may be seen in the skin and internal organs.

Clinical diagnosis

The clinical diagnosis is based on the recognition of clinical symptoms. The hyperthermia is constantly associated with the Classical Swine Fever. Because there is no pathognomic clinical sign, laboratory diagnosis is always required for confirmation.

Differential diagnosis

CSF is indistinguishable clinically or pathologically from other pig disease. It is essential to send samples for laboratory examination. Conditions to consider in differential diagnosis include:

- Infection with bovine viral diarrhea (BVD) virus, pestivirus
- Salmonellosis *(Salmonella typhimuriun* or *Salmonella choleraesuis)*
- Acute Pasteurellosis
- Erysipelas *(Erysipelothrix rhusiopathiae)*
- *Haemophilus suis* infection
- Leptospirosis (*Leptospira pomona* or *Leptospira bratislava)*
- Water-deprivation / sodium ion toxicosis (salt poisoning)

Laboratory Diagnosis

In the laboratory, classical swine fever can be diagnosed by detecting the virus, its antigens or nucleic acids in whole blood or tissue samples. Advice on sample submission should be brought from the laboratory.

Suitable tissues are tonsils, maxillary or submandibular lymph nodes, mesenteric lymph nodes, spleen, ileum and kidney.
Whole blood with EDTA as anticoagulant can be used for virus isolation from a live acute case, or for antigen or nucleic acid detection.

Control and Prevention

Quarantine, movement bans and good surveillance are important in controlling outbreaks. Strict biosecurity on a farm can reduce the risk of infection. During an outbreak, confirmed cases and contact animals may be slaughtered. Although CSFV can be spread over long distances by animal transportation and other forms of dissemination, farms within a 500 meter radius of an infected farm have particularly a high risk. Culling of all pigs in an area may be practiced due to this 'neighborhood effect.'Infected premises are thoroughly cleaned and disinfected. In phase of outbreak, control can be achieved by stamping out, vaccination, or a combination of the two. The stamping-out method is best used in outbreaks that are detected early and that involve areas with low pig density. Vaccination programs (alone or combined with stamping out) are best used in enzootic regions or areas with high pig density.

Prevention :

Vaccination may be used as a tool to assist in controlling an outbreak and eradicating the disease. In India, Classical Swine Fever

lapinised vaccine prepared by Indian Veterinary Research Institute is used. :

Following are the best methods of prevention:

- Protection of CSF-free areas by control of animal movement and surveillance
- Quarantine and import restrictions on feed, animal products, and livestock from non-CSF-free areas
- Serologic surveillance program at slaughter and breeding facilities

Important :

The World Organization for Animal Health definition of 'CSF-free areas' requires:

- No CSF cases for 2 years
- At least 1 year since control of an outbreak by stamping out and vaccination
- At least 6 months since control of an outbreak by stamping out and no vaccination.

CSF does not cause infection in humans; therefore, there are no public health issues to be considered.

Table I. Detail Incidences of Classical Swine Fever in India (1996-2008)

Sr. No.	Year	Number			States
		Outbreaks	Infected	Deaths	
1	1996	93	1860	426 (22.9)	Sporadic
2	1997	58	2656	539 (20.2)	Sporadic
3	1998	142	5669	1633 (28.8)	Sporadic
4	1999	142	8800	1424 (16.1)	Sporadic
5	2000	53	1305	75 (5.7)	Sporadic
6	2001	536	13224	1195 (9.0)	Sporadic
7	2002	190	9546	753 (7.8)	A*
8	2003	53	1156	520 (44.9)	B*
9	2004	59	635	117 (18.4)	C*
10	2005	54	4487	2529 (53.9)	D*
11	2006	40	5092	2327 (45.6)	E*
12	2007	81	2985	945 (31.6)	F*
13	2008	89	1942	904 (46.5)	G*
Total		1290	59357	13387 (22.5)	

The figure In parantheis are the percentage death

Note *

A - Bihar, Goa, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal.

B - Arunachal Pradesh, Goa, Manipur, Mizoram, Nagaland, Tripura and West Bengal.

C - Arunachal Pradesh, Delhi, Manipur, Mizoram, Nagaland and West Bengal.

D - Arunachal Pradesh, Goa, Manipur, Mizoram, Nagaland, Rajasthan and Punjab.

E - Arunachal Pradesh, Haryana, Maharashtra, Manipur, Mizoram, Nagaland, Rajasthan and West Bengal.

F - Arunachal Pradesh, Haryana, Maharashtra, Mizoram, Nagaland, Orrisa, Rajasthan, West Bengal, Punjab and Uttranchal

G - Haryana, Maharashtra, Manipur, Mizoram, Nagaland, Orrisa, Rajasthan, Tripura, West Bengal, Punjab and Uttranchal.

FMD in Pigs : A serious concern

Pigs are reared in the villages and around towns and cities along with other livestock like large and small ruminants. Pig farming in India has a special relevance as it has the potential to improve the economic status of the rural poor, who usually rear pigs. Foot and Mouth diseases is one of the important viral diseases of pigs. It is known that pigs are amplifier host of FMD virus and can transmit the disease among other susceptible livestock, very rapidly, Pigs produce 300 times more virus particles in their respiratory secretions than bovines do.

The matter of concern is that pigs are never included in the vaccination programme of FMD and it is mainly restricted to cattle and buffaloes only. **To control the outrages of FMD among small and large ruminants, the pigs in the locality must also be included in the vaccination programme.**

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Efficacy of 'Panacur' (Fenbendazole 10%) in pigeon nematodiasis.

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Introduction :

Pigeons act as reservoir host or carrier and an important source of infection for other avian species, which share the common parasitic fauna. There are quite a large number of problems related to management of parasitic infestation in birds. Clinical or sub clinical form of nematodiasis leads to anemia as a result of continuous suckling of blood by parasites. Clinically, birds show partial or complete anorexia, diarrhoea, dehydration, loss of weight and alteration in body microelements, resulting into immunosuppresion. *Ascaridia columbae* and *Capillaria obsignata* are the most common nematode in pigeons. The present study was undertaken to evaluate efficacy of "Panacur" (Fenbendazole suspesnion 10%) in pigeons naturally infected with nematodes.

Materials and Methods :

Studies were conducted in pigeons at Kamla Nehru Zoological Garden, Kandria Zoo, Ahmedabad. Faecal samples examined for parasites were positive for *Ascaridia columbae* and *Capillaria obsignata* nematode infection. Two groups of birds, having 30 pigeons in each, were housed in seperate cages. Group I, which served as Control group, had pigeons with an avarage EPG of 1800, while Group II, which was a Treatment group, had an average EPG of 2000. This group was treated with Panacur* (Fenbendazole 10% suspension.) at the dose rate of 1ml/15 birds for three days in drinking water. EPG count of fecal samples of both the groups was carried out at 7, 14, 21 and 30 days post treatment. (Table-I.)

Results and Discussion :

Group-I of pigeons having EPG count of 1800 before treatment indicated rise in the count during the subsequent period of 30 days. Group II of pigeons having EPG count of 2000 before treatment showed decrease in the

* Panacur : Fenbendazole 10% suspension (Intervet/Schering-Plough Animal Health, Pune)

count at 7, 14, 21 and 30 days after treatment with count of 200, 500, 800 and 900 EPG respectively, indicating efficacy of drug to the extent of 90, 75, 60 and 55 respectively. Kirsch et al (1978), Vindevogel et al., (1978) and Scupin and Nannen (1980) have treated pigeon nematodiasis with Fenbendazole at different dose rates in feed and observed 90 to 100 percent efficacy.

The results of the present investigation indicate that the efficacy of drug was only 90 percent during, the first week, probably due to low intake of dose as some pigeons did not take water having an unpleasant taste of drug. Subsequent rise in EPG count suggests that infection remains in cages and all the pigeons become reinfected. It is concluded that Fenbendazole supension (10%) is quite effective in pigeon nematodiasis. Increase in dose and period of treatment may be useful to prevent the reinfection.

Table I : Efficacy of Panacur in Pigeon nemetodiasis

Group	EPG Count before treatment	EPG count on days after treatment			
		7	14	21	30
Group I Control Group	1800	2000	2200	2200	2000
Group II Treatment Group	2000	200 (90%)	500 (35%)	800 (60%)	900 (55%)
Figures in parenthesis indicate % efficacy					

AcKnowledgement :

The authors are thankful to Zoo authority for granting permission to conduct the trial and the Dean. Veterinary college, S.D. Agricultural University, Sardar Krushinagar, for providing the facilities.

References :

Kirsch, R., Petri, K. and Degenhardt, H. (1978) Abst. ***Vet. Bull.* 49** : 2077

Kirsch, R. and Degenhardt, H. (1979) Abst. ***Helminthol.* 49** : 325

Scupin, E and Nannen R. (1980) Abst. ***Vet. Bull.* 51** : 3367

Vindevogel, H., Duchatel, I. P. and Fieveg, L (1978) Abst. ***Helminthol.* 48** : 3081

Indian Livestock Scenario - 2

Selected Indian Livestock at World Level						
Category	**World population (million)**	**No. of breeds**	**Indian population (million)**	**Breeds**	**% of world population**	**Ranking**
Cattle	1368	787	185	30	14	1
Buffaloes	171	72	98	15	57	1
Goats	783	351	125	20	16	2
Sheep	1029	920	61	42	6	3
Pigs	1335	353	13.5	3	1	11
Camels	21	56	1.13	8	5	-
Poultry	12273	606	489	18	4	-

Reference : Livestock & Livelihood, The Indian Context : published by Centre for Environment Education, Ahmedabad (2004)

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Studies on non-infectious repeat breeder cases with reference to CL development and efficacy of GnRH treatment

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Introduction

Repeat breeding is a major constraint in dairy farming. Clinical studies on repeat breeding problem have been carried out by Bhosrekar et al.(1986); Amin Deen, (1995); Markandeya et al.(2002) and Rangnekar et al.(2002). Treatment of non-infectious repeat breeder animals depends upon causes of the problem. GnRH treatment has significant effect on timely induction of ovulatory heat and improvement in conception rate in case of non-infectious repeat breeder animals. However. increasing LH level by exogenous stimulation has been attempted extensively.

Materials and Methods

The present study was carried out in fourteen cows and twelve buffaloes presented to 'Teaching Veterianry Clinical Complex', Veterinary College, Udgir. The animals were investigated thoroughly. Oestrus discharge of all selected animals were sent for cultural and sensitivity examination and only non infectious cases were selected for the present trial. Balanced nutritional standard, adequate managemental practices and optimum body score conditions were confirmed before treatment.

All the selected animals were examined on the day of oestrus for confirmation of follicular development, on day one of oestrus for confirmation of ovulation and subsequent to oestrus on day 10th for CL development. Selected animals were treated with Inj. Receptal* @ 0.105 mg (2.5 ml) intramuscularly

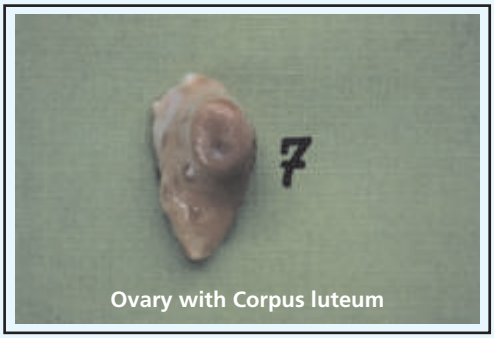
* Inj. Receptal : Buserelin acetate 0.0042 mg/ml (Intervet/Schering-Plough Animal Health, Pune)

on the day of oestrus before breeding. Subsequent ovarian events and follow up observations were recorded. The palpable CL size of 0.5, 1.0, 1.5 and 2.0 cm in diameter was considered as grade I, II, III & IV respectively.

Results and Discussion

The treated clinical cases of non-infectious repeat breeders showed 85.71 per cent ovulations in cows and 91. 67 per cent ovulations in buffaloes. The non ovulated animals were examined per-rectally and the follicular degenerations were recorded without formation of palpable corpus luteum. Although twelve cows and eleven buffaloes were recorded with ovulatory oestrus, only seven cows and six buffaloes conceived to first breeding after treatment. Subsequent cycles were ovulatory in treatment responded animals and 83.33 per cent cows settled with 1.4 services per conception whereas 81.81 per cent buffaloes settled with 1.33 services per conception. Rangnekar et al (2002) reported 70 per cent conception rate in cows with similar treatment. Bhosrekar et al (1986) and Amin Deen (1995) reported that the treatment with GnRH analogue significantly improved the breeding efficiency in repeat breeders. Clomiphene citrate was used in non infectious repeat breeder cases and 67.44 per cent and 58.33 per cent success conception rates in cows and buffaloes were reported by Markandeya et al. (2002).

inactive ovary and ovary with dominant follicle



Ovary with Corpus luteum

The treatment cases were monitored by regular per-rectal examinations and the development of corpora lutea were assessed. It was observed that the size of the CL has definite correlation with the conception. Treated clinical cases with CL size of grade III were only settled. Those animals which showed small sized CL of grade I and grade II failed to settle even after timely ovulation and breeding. Development of optimum sized corpus luteum for adequate progesterone secretion was found to be necessary. The animals which failed to settle at treatment oestrus, were settled only after development of grade III CL in subsequent cycles.

Summary

Non-infectious repeat breeder clinical cases were treated with GnRH therapy and were monitored for the development of corpora lutea under the present study. The GnRH treatment was found to be suitable for inducing ovulations in 85.71 per cent cows and 91.67 per cent buffaloes and also for better development of CL and subsequent conceptions. 83.33 per cent cows and 81.81 per cent buffaloes conceived after GnRH treatment.

References

Amin Deen (1995). Gonadotropin Releasing Hormone therapy in infertile cows and buffaloes. *Indian J. Anim. reprod;* **16** (1) 69-70

.

Bhosrekar,M.R.; Inamdar,A.J.; Joshi,B.M., Phadnis,Y.P.; Lokhande,S.M. and Mangurkar, B.R. (1986). Treatment with a GnRH analogue(Buserelin) at midluteal phase in repeat breeding dairy cows. *Indian Vet. J.* **63** (10) : 833-837.

Markandeya,N.M. Bhikane, A.U. and Bharkad, G.P. (2002). Clinical studies on treatment of infectious and non - infectious repeat breeder Cows and Buffaloes. *Intas Polivet,* **3 :** 74-77.

Rangnekar,M.N.: Dhoble,R.L.; Sawale, A.G.; Gacche,M.G.; Ingawale,M.V. and Jadhav,J.M. (2002). Effect of Fertagyl, Gonadotropin Releasing Hormone (GnRH), administration on conception rate in repeat breeding cows. *The Blue Cross Book*. 20-21.

Comparison of GnRH, HCG and Clomiphene citrate for induction of ovulation in cows

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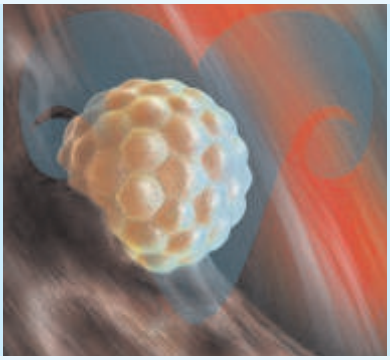

Introduction :

Repeat breeding is the most commonly encountered infertility problem in cattle. Of all causes, delayed ovulation and anovulation are two important causes of repeat breeding. Various hormonal treatments have been used to improve conception rate in repeat breeding cows. In anovulatory condition, there is always a delayed or low surge of LH (Bage et al., 2002). Both GnRH and HCG can effectively synchronize ovulation time and thereby increase the conception rate. (Kaltenbatch et al., 1974). Clomiphene citrate has also been advocated by various authors for induction of estrus and ovulation (Tandle et al., 1999). Present study was conducted to determine separately the effects of GnRH, HCG and Clomiphene citrate in induction of ovulation in cows suffering from anovulation.

Materials and Methods :

A total of 132 repeat breeding cows, presented to the Clinical Complex of the Faculty during the period from November 2007 to May 2009, constituted the subject of the study. All the animals had conception failure even after 3 or more consecutive natural or artificial breeding. From these 132 animals, those with abnormal estrual discharge were excluded. Subclinical endometritis was ruled out by conducting White Side Test. Animals with delayed ovulation were also excluded. Only animals with anovulatory problem were taken in the study. For this purpose, the animals were put to per-rectal examination for 2 occasions i.e. one within 24 hours of estrus to ensure the presence of follicle on one of the ovaries, and second, at 8-12 days after onset of estrus to ensure the presence of corpus luteum (CL) at the site of follicle. Animals with no corpus leuteum were diagnosed as anovulatory .

These animals were randomly divided into 3 groups. Group-I animals were treated with GnRH* (10 g upto 200 kg body weight and 20 g beyond 200 kg body weight) intravenously and inseminated 4 hours later. Group II animals were treated with HCG** (1500 IU upto 200 kg body weight and 3000 IU beyond 200 kg body weight) intravenously and inseminated 4 hours later. Animals of group-III were treated with Clomiphene citrate*** daily orally for 5 days on mid cycle (10-14 days) and routine insemination was done during next estrus. Before administering Clomiphene citrate, animals were drenched with 1% $CuSO_4$ solution to close ruminoreticular groove. Animals which failed to conceive on 1st insemination in all the three groups, were subjected to second insemination without any treatment. Conception rate was determined by pregnancy diagnosis per-rectally conducted on 60-70 days post-insemination.

Results and Discussion :

A total of 43 cows (32%) were diagnosed to be suffering from anovulation,. The incidence was higher than reported by Kaya et al., 2005. In Group-I, all animals conceived in first insemination (Table I). Earlier conception of 50% was recorded by Abhilas et al. (2006) in repeat breeder cows with GnRH administration close to onset of estrus coupled with insemination 6 hours later. GnRH results in preovulatory surge release of LH which in turn terminates maturation of oocyte causing ovulation within normal range of time (Moore and Thatcher, 2006). GnRH also has the capacity to elicit synchronization of ovulation by initiating PGF2 pulses (Abhilas et al., 2006).

In Group-II, 20 animals conceived at first and rest 5 in second insemination; thereby showing overall conception rate of 100%. Abhilas et al (2006) recorded 65% conception rate in repeat breeder cow using HCG. Administration of HCG close to onset of estrus induces early and direct preovulatory LH surges which lead to maturation of follicle and decrease ovulation time. The continuous action of HCG due to its long half life results in more proliferation and differentiation of luteal tissue by recruiting more granulosa cells (Babler and Hoffman, 1974). However, repeated use of HCG is detrimental as it may cause antihormone production and allergic reaction. Therefore GnRH is more beneficial than HCG.

* GnRH - Inj Receptal : Buserelin acetale 0.0042 mg/ml (Intervet/Schering-Plough Animal Health, Pune)
** HCG - Inj. Chorulon (Intervet/Schering-Plough Animal Health, Pune) : HCG crystalline powder 1500 IU/vial
*** Clomiphene citrate : Ovulenta Kit (Mankind)

All 8 animals of group-III showed longer estrus duration (48-72 hours) with pronounced behavioural estrus following Clomiphene citrate administration. Hence, in these animals 2-3 inseminations had to be carried out in a single estrus period to synchronize the time of ovulation. 3 animals in this group conceived showing a conception rate of only 37.50%. In the third estrus, these animals were treated with 3000 IU HCG intravenoulsy, followed by insemination 4 hours later and all of them were found conceived. Clomiphene citrate increases GnRH secretion and thereby results in release of both FSH and LH, simulating ovulation. Tandle et al. (1999) recorded 50% success rate in terms of estrus and ovulation induction in crossbred subfertile ewes.

Table I : Comparative efficacy of GnRH, HCG and Clomiphene Citrate in induction of ovulation in cows.

Group	No. of animals	Animals conceived at 1st insemination (% conception rate)	Animals conceived at 2nd insemination (% conception rate)	Overall conception (%)
Group - I (GnRH treatment)	10	10 (100)	0	100
Group-II (HCG treatment)	25	20 (80)	5 (20)	100
Group III (Clomiphene citrate treatment)	8	3 (37.50)	0	37.50

Conclusion :

It is concluded that both GnRH and HCG administration is superior to Clomiphene citrate and can effectively synchronize duration of estrus and ovulation time within normal range.

References :

Abhilas,R. S., Seshagiri Rao, A., Mouli Krishna, K. and Suresh Kumar,R.V. (2006). Effect of different therapeutic protocol on estrus, ovulation and conception in repeat breeding cows. *Indian Vet. J.* **83**: 178-180.

Babler,C.D. and Hoffman,W.F. (1974). Effect of human chorionic gonadotrophin hormone

upon conception in the dairy heifer. *J. Dairy Sci.* **57** : 627-631.

Bage R., Gustafsson H., Larsson B., Forsberg M. and Rodriguez-Martinez H. (2002). Repeat breeding in dairy heifers: follicular dynamics and estrous cycle characteristics in relation to sexual hormone patterns. Theriogenology. **57**: 2257-2269.

Kaltenbatch,C.C., Dunn,T.G., Kiser,T.E., Corah,L. R., Akbar,A. M. and Niswender,G. G. (1974). Release of FSH and LH in beef heifers by synthetic gonadotrophin releasing hormone. *J. Anim. Sci* **38**: 357-362.

Kaya, Mustafa, Gulyuz Feith, Tasal Ibrahim and Uslu Baris Atalay. (2005). Reproduction and causes of infertility in Anatolian cow in Turkey. *Indian Vet. J.* **82**: 957-958.

Moore, K. and Thatcher, W. W. (2006). Major advances associated with reproduction in dairy cattle. *J. Dairy Sci.* **89**: 1254-1266.

Tandle,M.K., Shivaprakash,B.V., Honnappagol,S.S., Manjunath,M.G. and Appanavar,M.M. (1999). Superovulation using Clomiphene citrate in subfertile ewes *Indian Vet. J.* **76**: 344-345.

Ovsynch method of oestrus and ovulation synchronization

Heat detection being troublesome in buffaloes, synchronization technique using prostaglandin F2 administration was tried earlier. However, great variations have been observed in oestrus manifestation (36 to 90 hr) after prostaglandin administration. So oestrus and ovulation are not precisely synchronized. Thus fixed time insemination after prostaglandin administration has not yielded good result. Hence

Ovsynach method

- GnRH - Inj. Receptal 2.5 ml on day 0
- PGF2 analogue - Inj. Iliren 5 ml on day 7
- 2nd GnRH - Inj. Receptal 2.5 ml on day 9
- Inseminate 16th hr post second GnRH and again on 24th hr second GnRH

Overall 70-77 % conception rate after 3 inseminations was observed.

This technique should be made an integral part of buffalo breeding, as there is a large variation in timing of ovulation after cessation of heat.

National Symposium on Buffalo for Rural Development,
Mumbai, Dec. 2005, Compendium, PP 72 - 73

Synchronization of estrus and study of estrus behaviour in Black Bengal goats

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Introduction :

Goats make an important contribution in Indian economy through meat, milk, skin, fiber and manure. Synchronization of estrus is expected to bring about estrus in large percentage of treated females (Shiv Kumar and Thomas, 1994). Estrus synchronization allows for parturition/kidding at suitable time to take advantage of niche markets, feed supplies, labour and rising price trend. The expanded popularity of meat goat production has led to the increased interest in reliable methods to synchronize estrus in meat goats. With this technique, producers are able to more efficiently use complementary techniques for reproductive management including, AI and embryo transfer. In the past, synchronization of estrus in goats has focused primarily on dairy goats to allow for optimal timing of milk production, but very less interest had been shown in meat goats like Black Bengal Goats. Black Bengal goat is known for its prolificacy (Rao and Bhattacharya, 1980), fast growth and excellent meat quality. The present study was conducted with the objective to develop efficient and effective estrus synchronization and estrus detection methods.

Material and Methods :

Fourteen cyclic Black Bengal goats of 1-2 years age were selected. Estrous cycle was synchronized with two injections of 10 mg of prostaglandin PGF2 (Lutalyse) intramuscularly at 10 days apart. Estrus behaviour was observed twice daily for two consecutive cycles with the help of an approned mature breeding buck. Estrus was defined as the moment when the goat stands to be mounted by the buck. Daily rectal temperature was recorded for the whole study period.

Results and Discussion:

In present study, out of 14 animals, 12 animals responded to the treatment (85.6%) exhibiting the signs of estrus 48-72 hr after the 2nd dose of PGF2 . These findings are in close agreement to the estrus synchronization response recorded as 84% by Ogungiyi et al. (1980). Perera et al. (1978) first induced estrus in six goats with 100% synchronization. Our results are marginally on lower side than above reports and one by Mahmood and Koul (1990) of 100% synchronization. Mane et al. (1992) stated that the low response to the hormone used for induction of estrus might be due to variation in breed, plane of nutrition, environmental factors, managemental practices and hormonal profile of individual animals.

Goats exhibit very prominent signs of estrus in comparison to other domestic animals. In this study, following signs of estrus were observed: change in attitude, frequent urination, increased activity, reduced appetite, restlessness, standing while mounted by the buck, tail wagging, vocalization (yelling and moaning), vaginal discharge, redness and swelling of vagina. It has been explained that most of the estrus signs are mediated by circulating estradiol, as increased level of estradiol (26.5±0.38 pg/ml) during estrus in comparison to basal level (2.2 to 2.5 pg/ml) as has been reported by Vikash Chandra (2004). In Black Bengal goats, a peculiar character observed was that when females were kept open along with males separated by fences, the signs of estrus are augmented and the animals in heat come closer to the males. Peculiar sign of wagging of tail and vocalization were good characters to diagnose animal in heat. It was observed that among goats, Black Bengal goats show most intense signs of estrus. In this study animals showed an estrous cycle length of 20.6 days (18-23 days).

In the present study, rectal temperature was found to be increased on the day of estrus(103.4± 0.47^{0}C) in comparison to normal temperature (102.0^{0}C). It is not known if the rise in rectal temperature at estrus is a consequence of central regulation of body temperature influenced by factors that regulate gonadotropin releasing hormone or a consequence of increased activity as suggested by Walton and King (1986). In organized farms, this acute increase in rectal temperature can be measured by radiotelemetric method and can be employed for prediction of estrus (Kyle et al., 1998).

References :

Kyle. B. L.; Kennedy,A.D.; and Small,S. A. (1998). Measurement of vaginal temperature by radiotelemetry for the prediction of estrus in beef cows. Theriogenology, **49**: 1437-1449.

Mahmood,S.; and Koul,G.L.; (1990). Synchronization of oestrus in pashmina goats by prostaglandin analogue. Indian Vet.J., **67**(4): 326-328.

Mane, K. S.; Pargaonkar,D. R.; Bakshi, S. A.; Markandeya,N.M.; Tandle,M.K.; and Deshpande,W.S.; (1992). Efficacy of prostaglandin F_2 alpha alanogue (Dinofertin) for synchronization of oestrus in suboestrus cows. Indian J. Anim. Reprod., **13**(2): 187-188.

Ogunbiyi,P.O.; Molokwa,E.C.I.; and Sooryamoothy,T.(1980). Estrus synchronization and controlled breeding in goats using PGF2 . Theriogenology, **13**(5): 341-345.

Perera, B.M.A.; Bongso, T. A.; and Abeynaike, P.; (1978). Oestrus synchronization in goats using cloprostenol. Vet. Rec., **102**: 314.

Rao,V. H.; and Bhattacharya,N.K.; (1980). Ovulation in Black Bengal nany goats. J. Reprod. Fertil., **58**: 67-69

Shiv Kumar and Thomas (1994). Synchronization of oestrus in goats: effect of reproductive performance and man-hour requirement. Indian J Anim. Prod. Manag., **10**(3): 74-80.

Vikash Chandra (2004). Effect of heat stress on follicular dynamics of goat.M.V. Sc. Thesis, Deemed University, IVRI, Izatnagar, India.

Walton, J.S.; and King, G. J. (1986). Indicators of estrus in Holstein cows housed in the stalls. J. Dairy Sci., **69**: 2966-2973.

Indian Livestock Scenario - 3

ICMR Recommendations and Actual Consumption of Livestock Products in India (2007-08)

Livestock Product	ICMR Recommendation	Actual consumption
Milk (ml/day)	280	245
Eggs (Number/year)	183	50
Chicken Meat (gm/year)	1500	500
Meat in general (gm/day)	35	15
(kg/year)	12.5	5.1
There is a tremendous scope for improvement in production and productivity of present livestock considering the present needs and future demands.		

Reference : Dairy India 2007, 6th Edition

There is no one best method of oestrus ('heat') control; the choice will vary for each animal.
Whilst effective, spaying is irreversible and therefore not an option for animals intended for breeding.

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Efficacy of Receptal® (GnRH - analogue) in the treatment of repeat breeding cows

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Abstract

A total of 70 cows were taken in the present investigation and divided into five groups. Group T_1, Group T_2 and Group T_3 contained 20, 10 and 10 repeat breeding cows, respectively. Group C_1 and Group C_2 contained 20 normal breeding and 10 repeat cows, respectively. Mineral mixture, Receptal and both mineral mixture and receptal were given to the Group T_1 ,Group T_2 & Group T_3 animals, respectively. The 50 % conception was recorded both in group T_1 and group T_2 and 60 % in group T_3 animals.

Introduction

Repeat breeding in cattle is an important constraint for profitable dairy industry it is a worldwide problem for dairymen with an overall incidence rate of 10 to 25 % (Boyd and Reed; 1961., Hewett, 1968, Mayer et al. 1978 and Bartlett et al. 1986). Repeat breeding causes economic losses as it prolongs the age at 1st calving in heifers and extends the inter calving interval in cows leading to lowering of calf crop. Conception failure or repeat breeding is result of either fertilization failure or early embryonic death due to various reasons. Inadequate endocrine support to the uterus may result in fertilization failure and early embryonic death.

Material and Methods

The present study was carried out at the Department of Animal Reproduction, Gynaecology & Obstetrics of BVC, Patna and Organized Khatal in and around Patna. Seventy animals divided into 5 different groups. Group T_1 had 20 repeat breeding cows and treated with mineral mixture (Kalmin- L) 35 gm orally daily for 60 days ,10 repeat breeding cows were taken in group T_2 and treated with Inj. Receptal* 2.5 ml intravenous at the time of insemination Similarly, group T_3 had 10 repeat breeding cows and treated with

* Inj. Receptal : Buserelin acetate 0.0042 mg/ml (Intervet/Schering-Plough Animal Health, Pune)

both by mineral mixture and receptal. C_1 and C_2 were two control groups ,C_1 had 20 normal breeding and C_2 had 10 repeat breeding cows . No treatment was given to control groups. The efficacy was judged on the basis of conception rate.

Result and Discussion

Table-I shows that the conceptions in repeat breeder cows were found to be higher than the untreated controls. A total of 21 (52.50%) repeat breeder cows were found to be pregnant among 40 repeat breeder cows of different treatment groups. Whereas, 9 (45%) of 20 normal cycling cows and 2 (20%) of 10 repeat breeding cows kept in control groups were found to be pregnant. Among treatment groups maximum conception was recorded in T_3(60%) group, The conception rate in mineral mixture treated cows i.e. in treatment group T_1 are similar with Ranjan et al. (1991) after feeding of 5 gm iodized salt for one month and by Kumar (2000) after feeding of Supplevite-M and both found 50% conception rate in repeat breeding cows. The conception rate in GnRH treated cows i.e. in treatment group T_2 are in close agreement with Stevenson el al. (1988) and Sentil Kumar, and Rajasekar(1998) who reported 54% and 53.35% conception,

Table I : Effects of treatments of conception rate in repeat breeding cows

Treatments	Drug used	No. of cows treated	No. of cows conceived	Conception (%)
Mineral Mixture (Gr-T_1)	Mineral mixture feed supplement KALMIN- L	20	10	50
GnRH-analogue (Gr-T_2)	Buserelin acetate inj. 0.0042 mg RECEPTAL Vet.	10	5	50
GnRH-analogue & Mineral mixture (Gr-T_3)	Mineral mixture feed supplement KALMIN- L & GnRH-analogue RECEPTAL Vet.	10	6	60
Control, Normal breeding (Gr-C_1)	No treatment	20	9	45
Control, Repeat breeding (Gr-C_2)	No treatment	10	2	20

respectively. The conception rates higher than the present result were reported by Lee (1983), Majumdar(1989), Roy et al. (1995), Sonwane et al.(2001) and Rangnekar et al. (2002) who reported conception rate of 72.97 %,60 % ,73.60 % , 65 % and 70 %, respectively .

Conclusion

On the basis of the observation of the present study, it may be concluded that the treatment with GnRH is more effective with mineral mixture supplementation. It is essential to maintain the basic requirement of body system for maximum action of hormone.

Acknowledgement

The authors are thankful to Intervet India Ltd. and Karnatka Antibiotics and Pharmaceutical Ltd. for providing RECEPTAL and KALMIN-L as gift samples for conducting the present investigation.

References

Arthur, G.H.(1975) Veterinary Reproduction and Obstetrics. Fourth edn. *Bailliere Tindall, London.*

Bartlett, P. C., Kirk, J.H. and Mather, E.C.(1986). Theriogenology **26**:309.

Boyd,H.and Reed, C.B. (1961). *British Vet. J.* **117**:18.

Hewette, C.D.(1968).*British Vet. J.* **129**:342.

Kumar, P.(2000).Prevalence and blood biochemical profile of repeat breeding cows and its treatments. M. V.Sc. Thesis, RAU, Bihar.

Lee, C.N., Maurice,E.,Ax., L.R. Pennington, J.A., Hoffman, W.F. and Brown, M.D.(1983). Efficiency of Gonadotropin Releasing Hormone in repeat breeder dairy cows. *Am.J. Vet. Res.***44**(11):2160-2163.

Majumdar, K.A.(1989). Efficacy of Receptal (GnRH) treatment for various ovarian disorders in bovines. *Indian.J.Anim.Reprod.***10**(2):183-184.

Mayer, E., Francos, G. and Davidson, M.(1978).Theriogenology.**9**:393.

Moddie,E. W.(1965).Hypocalcaemia and hypomagnecaemia/.*Brit.Vet.J.121*.pp 338(cited from Dabas *et al.*(1987). *Indian J.Anim.Reprod.***9**(2) - 98-101.

Rangnekar M.N.,Dhoble R.L. Sawale A.G., Gacche M.G.,Ingawale,M.V. and Jadhav J.M.(2002). Effect of fertagyl, Gonadotropin on conception rate in repeat Breeding cows. *The blue cross book* **18.**

Ranjan A., Sreekumaran T., Abraham M.J, and Vijay Kumar V.(1991). Efficacy of iodine supplementation in cows with anestrum and repeat breeding. *J.Vet.Anim.Sci,***22**(1)**:** 119-121.

Roy G.P., Akhtar M.H. and Singh , A.P.(1995). Effect of Receptal to improve fertility in bovines. *Indian J,Anim.Reprod.***l6**(2) : 131.

Sentil kumar P. and Rajasekar, P.(1998). Pregnancy rate in GnRH and HcG treated breeding cows with ovulatory disturbances. *Indian Vet. Med.J.* **22**(6) :93-94.

Sonwane N.S., Dhoble R.L., Sawale A.G., Suryawanshi S.T., Dherange N.P and Wale V.R.(2001). The efficacy of receptal (GnRH-analogue) on improvement of conception rate in crossbred cows. *The Blue Cross Book* **-16.**

Stevenson J.S., Frantz K.D. and Call, E.P. (1988). Conception rates in repeat breeders and dairy cattle with unobserved estrus after prostaglandin F_{2a} and gonadotropin releasing hormone. *Theriogenolog*.**29**(2):451-460.

Comparative efficacy of different treatment protocols on the induction of oestrus in anoestrus Frieswal heifers.

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Abstract

Oestrus may be successfully induced in anoestrus Frieswal heifers by the use of oral feeding of progesterone + oestrogens / GnRH / Phosphorus +vitamin-A administration. However, oral feeding with combination of progesterone & oestrogen emerged as most viable and economical method for treatment of anoestrus in crossbred heifers.

Introduction

Reproduction in crossbred heifers is hampered due to delayed sexual maturity and prolonged anoestrus. The problem is mainly observed in crossbred cattle & buffaloes reared under field conditions. This condition occurs due to temporary suppression of optimum endocrine secretion needed for induction of oestrus and ovulation. Oestrus may be induced in such anoestrus animals with normal genitalia by various treatment. Accordingly, this experiment was conducted on Frieswal heifers which remained anoestrus after attaining sexual maturity even after the 20 months of age.

Material and Methods

Fourty two Frieswal heifers (HF X Sahiwal) showing true anoestrus (smooth and inactive ovaries) were selected after examination of genetalia per rectum twice at an interval of 11 days from Military Dairy Farm, Meerut. These animals were divided into four groups.

Group 1: Twelve heifers with mean age 20.83±1.86 month and body weight 334.15±8.54 kg were fed Norgestrel @1.2mg and 0.12mg Ethinylestradiol per day for 6 days.

Group 2: Ten animals with mean age 24.6±1.47 months and body weight 319.7±10.91 kg were administered with GnRH (Receptal, intervet) single injection of 0.02 mg.

Group 3: Ten animals with mean age 27.5±0.57 months and body weight 241.0± 5.62 kg were administered with two injections of vitamin-A (Glaxosmithkline) 6 lac I.U. per animal at weekly interval along with five injections of Tonophosphan (Intervet @ 2.0 g per animal at alternate days.

Group 4: Ten animals with mean age 22.2±1.12 months and body weight 308.0 ± 8.07 kg were injected with normal saline and were considered as control.

Oestrus was observed in all the animals at 12h interval (morning and evening) with the help of vasectomized teaser bull. Animals detected in oestrus were inseminated with frozen-thawed semen twice (morning and evening). Pregnancy was diagnosed by per rectal examination after 90 days of AI. Data was analysed using Chai square test as mentioned by Snedecor and Cochran (1967).

Result and Discussion

In treatment group I, II & III oestrus response was observed in 67, 80 and 80% heifers after 23.7, 19.4 and 10.2 days post treatment respectively. This response was significantly higher ($p<0.01$) in treatment groups as compared to control, where only 20% animals exhibited oestrus after 47.5 days. (Table -1)

`The ovarian activity in post-partum cows had also been induced by progesterone treatment associated with oestrogen (Foote & Hunter, 1964; Kumar et al 2000). In this study treatment with progesterone along with oestrogen resulted in exhibition of oestrus in 67% anoestrus heifers and conception in 87% heifers exhibited oestrus. Similar results were reported earlier by the use of combined preparation of progesterone & oestrogen given parentally (Faure et al, 1981; Srivastava et al, 1999). Perusal of available literature did not reveal any report on the oral feeding of combined preparation of progesterone & oestrogen, however reports of oral feeding of progesterone along with injection of oestrogen/PGF_2 alpha to induce oestrus are available (Shanker et al 1996; Yelich et al, 1995; Mehta & Mehta 1999). Our study indicate that oral feeding of Norgestrel in combination with Ethinylestradiol is very effective and comparatively economical than parentiral administration of progesterone & oestrogen preparation.

In group II oestrus response was significantly ($p<0.01$) higher (80%) followed by higher conception rate (75%) after GnRH treatment as compared to control group. These findings are in agreement with those of Dantre, et al (1998) and Thakur & Bhatt, (1999) in cross bred animals.

It was observed that in group III, 80% heifers exhibited oestrus after 10.25 days of treatment. The oestrus response and conception rate in this group was significantly ($p<0.01$) higher as compared to other two treatment groups. It has also been reported that deficiency of phosphorus is frequently associated with delayed onset of puberty, lowered conception rate, irregular estrus and depressed fertility in cows (Maynard et al,

1979; Morrow, 1980). Onset of puberty in females is also delayed in animals fed all corn silage. It has also been reported that vitamin-A and phosphorus plays a vital role to over come the problem of anoestrus and delayed sexual maturity in cattle (Blood et al, 1989). These results indicate that the problem of anoestrus in Frieswal heifers may be over come by the use of any of the three treatments given. Higher response in group III heifers may be due to administration of minerals and vitamins at optimum levels which have enhanced the functioning of genital tract and ovary. The deficiency of vitamin-A in farm animals may be attributed to feeding of corn silage at farm, which might have caused deficiency of vitamin-A in stall fed animals.

Conclusions

On the basis of these observations in the present study it may be concluded that oestrus may be induced in anoestrus heifers by any of three treatment schedule successfully. Oral feeding of combined progesterone and oestrogen emerged as most viable and economical/method for the treatment of anoestrus in crossbred heifers.

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References

Blood,B.C., Radostits,O.M. Arundel,J.H. and Gay,G.C. (1989).*Veterinary medicine* **9thEdn.)** Oxford:ELBS.

Dantre U.K.,Thakaur M.S., and Pandit R.K. (1998). *Indian Journal of Animal Reproduction.* **19**(2), 90-92.

Faure R.,Tur.,Alonso J.C. and Gonzalez F. (1981). Memoria Association Latinoamericana de production Animal 16, 28 (cited from *Animal Breeding* Abstract, **57** (7)506).

Foote W.D. and Hunter J.E. (1964). *Journal of Animal science*, **23**, 517-520.

Gerloft B.J. and Morrow D.A. (1986),*In D.A. Morrow (Ed.) Current therapy in theriogenology (pp. 310-320). Philadephia: W.B. Saunders Co.*

Kumar, N., Mahmood, S., Singh, L.P. and Puberty, L.N. (2000). *Indian Journal of Animal Reproduction.* **21** (1)53-54.

Maynard L. A.,Loosli J.K.,Hintz H.F. and Warner R.G.. (1979). *Reproduction. In Animal Nutrition (p 472).* **7th Ed**. *New Yord: Mchra Hill.*

Mehta M., and Mehta J.S. (1999). *In Proceedings XV Annual Convention and national symposium on biotechniques in optimizing fertility in farm animals. Feb 10-12.* PAU: Ludhiana

Morrow, D.A. (1980). *In D.A. Morrow (Ed). Current therapy in theriogenology (P.49)* . Philadephia: W.B. Saunder Co.

Shanker U., Singh G.D., Upadhyay M.P. & Pant H.C. (1996). *Indian Journal of Animal Reproduction.* **17**(1), 1-5.

Snedecor, W.A. and Cochran, W.G. (1967). *Statistical methods* **6th Ed**. *Calcutta, India:* Oxfore and IBH Publication Co.

Srivastava P. O., Pandit R.K. and Agarwal R.G.(1999) *Proceeding of national Symposium on biotechniques in optimizing fertility in farm animals.* Feb 10-12,: PAU : Ludhiana

Thakur, M.S. and Bhatt, V.K. (1999). *In Proceedings XV Annual Convention and national symposium on biotechnologies in optimizing fertility in farm animals.* Feb, 10-12PAU : Ludhiana.

Yelich J.V.; Mauch H.S.; Holland M.D. and Odde K.G. (1995). Theriogenology. **43**:389-400.

Table I : Effect of different treatments on induction of oestrus and fertility in heifers

Group	Treatment	No. of heifers	Oestrus exhibiton No. (%)	Post treatment Oestrus exhibition (days±SE)	Heifers pregnant at 90 days No.(%)
1	Progesterone oestrogen combination	12	8* (66.66)	23.7 ^{B}± 2.84	7 (87.5)
2	GnRH	10	8* (80.00)	19.4 ^{B}± 4.02	6 (75.00)
3	Tonophosphone + vitamin -A	10	8* (80.00)	10.25^{A}±3.95	8 (100.00)
4	Control	10	2 (20.00)	47.5^{C}±4.48	1 (50.00)

*Significant at P<0.01; different superscript shows significant difference at P<(0.05)

Effect of administration of Buserelin Acetate on different days of estrous cycle on conception in repeat breeder dairy cows

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Introduction

Decreased reproductive efficiency in cows can be attributed to many factors including inefficiency and inaccuracy of estrus detection, improper timing of insemination, delayed ovulation and anovulation, negative energy balance and nutrition, selection for higher milk production and inbreeding (Lucy 2001).

Another factor contributing to low pregnancy rates is embryonic loss (Diskin and Morrison, 2008). Although fertilization rates in cattle are reported to be greater than 90% (Diskin and Sreenam 1980), the majority of embryonic mortality (70-80% of total loss) occurs between days 8 and 16 after insemination (Santos et al. 2004).

Gonadotropin-releasing hormone (GnRH) or its synthetic analogues are important components of routine management programs in dairy cattle (Yaniz et al. 2004) The administration of GnRH during the estrous cycle results in LH release (Chenault et al. 1990) and can cause ovulation or luteinization of the large follicles present in the ovary and synchronize the recruitment of a new follicular wave (Thatcher et al. 1989). These benefits explain the extensive use of GnRH for both ovulation synchronization protocols and the treatment of ovarian disorders (Yaniz et al. 2004). The scientific rationale has been to induce ovulation at the appropriate time relative to insemination and to stimulate luteinization, thereby improving the chances of successful fertilization and embryo survival.

The present experiment was planned with the hypothesis that the treatment with GnRH in early luteal phase induces ovulation of the dominant follicle of first follicular wave and helps formation of accessory CL, thereby increasing the concentration of progesterone during the luteal phase The use of GnRH injection at mid luteal stage after AI may enhance embryo survival rates by delaying the luteolytic mechanism that may occur due to failed maternal recognition of pregnancy.

Material And Methods

The work was conducted at the Veterinary clinical complex of College of Veterinary and Animal Sciences, Palampur. In all 75 repeat breeder cows were taken for this study. Overall, 33, 17 and 12 cows received 0.021 mg Buserelin acetate* on Day 0, 5 and 12 post-AI, respectively. Another 13 cows inseminated without any treatment acted as control. Pregnancy diagnosis was carried out 60 days post AI by rectal palpation method in cows that did not return to estrus within this duration.

Results And Discussion

Effect of administration of Buserelin acetate on different days of estrous cycle on conception in repeat breeder dairy cows has been shown in Table I.

Out of 33 repeat breeder cows inseminated along with 0.021 mg Buserelin acetate administered simultaneous to AI, 16 (48.48%) were found pregnant. Among 17 cows injected Buserelin acetate fifth day post AI, 7 (41.17%) conceived and out of 12 cows inseminated following administration of hormone twelfth day post AI, 5 (41.66%) were pregnant, whereas in control group only 3 out of 13 (23.08%) cows conceived.

This study is in agreement with the observation of other researchers (Stevenson et al. 1990; Mee et al. 1993; Quadri et al. 2008) who reported increase in the conception rate of repeat breeder cows which were administered with GnRH at different days of estrous cycle. It has been shown that postpartum reproductive disorders are associated with increased risk for abnormal cyclicity (Opsomer et al. 2000).

Since it is speculated that abnormal cyclicity is associated with low preovulatory LH secretion after estrus, GnRH administered at observed estrus may improve endocrine responses that had been impaired by previous uterine disorders (Kaim et al. 2003).

Table I : Effect of administration of Buserelin acetate on different days of estrous cycle on conception in repeat breeder dairy cows.

Treatment groups	Day of administration (post AI)	Inseminated	Pregnant	CR (%)
Buserelin acetate 0.021 mg (5ml) (n=62)	0	33	16	48.48
	5	17	7	41.17
	12	12	5	41.66
Control (n=13)		13	3	23.08

* Inj. Receptal : Buserelin acetate 0.0042 mg/ml (Intervet/Schering-Plough Animal Health, Pune)

Two of the most consistent causes of repeat breeding are reduced rates of fertilization and embryonic survival (Tanabe et al. 1985). Gustafsson et al. (1986) showed that amount of LH released in the preovulatory LH surge was less and its timing relative to onset of estrus was delayed in the repeat breeding heifers compared with the normal heifers suggesting a delay in ovulation. The higher pregnancy rates observed following GnRH analogue treatment in repeat breeders could be because of the changes in the cellular composition caused by GnRH induced LH release (Alila and Hansel 1984) or better CL development due to better growth and development of ovulatory follicles (Matton et al. 1981). Furthermore, an increase in the spontaneous LH surge that results from the administration of GnRH at observed estrus (Kaim et al. 2003) and GnRH induced increase in blood progesterone levels (Mee et al. 1993; Ullah et al. 1996) might be the causes of increased conception rates in repeat breeder cows.

References

Alila HW and Hansel W. 1984. Origin of different cell types in the bovine corpus luteum as characterized by specific monoclonal antibodies. *Biology of Reproduction* **31**:1015-1025

Chennault JR, Kratzer DD, Rzepkowski RA and Goodwin MC. 1990. LH and FSH response of Holstein heifers to fertirelin acetate, gonadoreline and buserelin. *Theriogenology* **34**:81–98

Diskin MG and Morrison DG. 2008. Embryonic and early foetal losses in cattle and other ruminants. *Reproduction in Domestic Animals* **43**:260-267

Diskin MG and Sreenan JM. 1980. Fertilization and embryonic mortality rates in beef heifers after AI. *Journal of Reproduction and Fertility* **59**:463-468

Gustafsson H, Larsson K, Kindhal H and Madej A. 1986. Sequential endocrine changes and behaviour during estrus and metoestrus in repeat breeder and virgin estrus and metoestrus heifers. *Animal Reproduction Science* **10**:261-273

Kaim M, Bloch A, Wolfenson D, Braw-Tal R, Rosenberg M, Voet H and Folman Y. 2003. Effects of gonadotrophin releasing hormone administered to cows at the onset of estrus on timing of ovulation, endocrine responses and conception. *Journal of Dairy Science* **86**:2012-2021

Lucy MC. 2001. Reproductive loss in high producing dairy cattle: where will it end? *Journal of Dairy Science* **84**:1277-1293

Matton M, Adelakoun V, Couture Y and Dufour JJ. 1981. Growth and Replacement of

the Bovine Ovarian Follicles during the Estrous Cycle. *Journal of Animal Science* **52**:813-820

Mee MO, Stevenson JS, Alexender BM and Sasser RG. 1993. Administration of GnRH at estrus influences pregnancy rates, serum concentrations of LH, FSH, Estradiol-17B, Pregnancy specific Protein B, and Progesterone, Proportion of luteal cell types, and in vitro production of progesterone in dairy cows. *Journal of Animal Sciences* **71**:185-198

Opsomer G, Grohn YT, Hertel J, Coyn N, Delingker H and A. de Kriuf. 2000. Risk factors for postpartum ovarian dysfunction in high production in dairy cows in Belgium: A field study. *Theriogenology* **53**:841-857

Quadri SMA, Rao KS and Raju KGS. 2008. Hormonal Therapy for enhancement of fertility in repeat breeder crossbred cows. *In*: *Proceedings, National Symposium on "Recent Trends and future Strategies for improved Reproduction of Livestock, Companion and wild Animals" Bangalore, India 11-13 December*, 2008 pp 55

Santos JE, Thatcher WW, Chebel RC, Cerri RL and Galvao KN. 2004. The effect of embryonic death rates in cattle on the efficacy of estrus synchronization programmes.*Animal Reproduction Science* **82/83**:513-535

Stevenson JS, Call EP, Scoby RK and Phatak AP. 1990. Double insemination and Gonadotrophin Releasing hormone treatment of repeat breeding dairy cattle. *Journal of Dairy Science* **73:**1766-1772

Tanabe TY, Hawk HW and Hasler JF. 1985. Comparative fertility of normal and repeat-breeding cows as embryo recipients. Theriogenology **23**:687-696

Thatcher WW, Macmillan KL, Hansen PJ and Drost M. 1989. Concepts for regulation of CL function by the conceptus and ovarian follicles to improve fertility. *Theriogenology* **31**:149-164

Ullah G, Fuquay JW, Keawkhong T, Clark BL, Pogue DE and Murphey EJ. 1996. Effect of Gonadotrophin-Releasing Hormone at estrus on subsequent luteal function and fertility in lactating Holsteins during heat stress. *Journal of Dairy Science* **79**:1950-1953

Yaniz JL, Murugavel K and Lopez-Gatius F. 2004. Recent developments in oestrous synchronization of postpartum dairy cows with and without ovarian disorders. *Reproduction in Domestic Animals* **39**:86–93

Questions

Q1, At what stage of pregnancy the majority of embryonic mortality is observed?

Q2. Why the use of GnRH at mid luteal stage is indicated to prevent early embryonic mortality?

Clinical management of metritis in buffaloes

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Introduction :

Though number of factors such as unsanitary calving conditions, bacterial infections, endocrine insufficiency, nutritional im-balance, excessive physical manipulation etc. contribute to metritis. Retention of placenta and subsequent microbial infection is a major etiological factor for postpartum metritis. The microbial infection stimulates the uterus to secrete higher level of prostaglandin, which delays the onset of ovarian cyclicity and follicular activity during early purperium. It is, therefore, essential that animal suffering from metritis needs to be provided immediate treatment to avoid further loss in milk production and reproductive activity.

Material and methods :

The present investigation was undertaken at Buffalo Farm Unit, Veterinary College, Parbhani. Sixteen buffaloes suffering from metritis were selected for the study. These buffaloes were divided into two groups, comprising of 8 buffaloes in each group. In Group - I (Treatment Group) , the buffaloes were treated with inj. Floxidin*, intramuscularly @ 5 mg/ kg body wt. for five consecutive days. The antibiotic treatment was also supplemented with analgesic and antihistaminic drugs by intramuscular route for five days. Group II was the Control group in which no treatment was given. In both the groups, blood samples were collected in citrated vials to study the hematological changes. Uterine discharge was collected in sterilized vials for isolation / identification of bacteria and to study the antibiotic sensitivity of the isolates.

Physical characteristics of the uterine discharge like color and consistency were noted. The days taken for recovery following the treatment and ovarian cyclicity were also studied and recorded.

* Inj. Floxidin 10% : Enrofloxacin 100 mg/ml (Intervet/Schering-Plough Animal Health, Pune)

Table -I Various bacterial isolates from uterine discharge of metritic buffaloes			
Sr.No.	**Organisum Isolated**	**No. Of Isolates from 16 samples**	**Percentage of isolates**
1	*Corynebacterium spp.*	13	81.25
2	*Escherichia coli*	12	75.00
3	*Pseudomonas spp*	10	62.50
4	*Staphylococcus spp.*	7	43.75
5	Unidentified gram positive rods	4	25.00
6	*Klebsiella spp.*	3	18.75
7	*Streptococcus spp.*	2	12.50

Results and Discussion :

The uterine discharge was collected before and after treatment. Cultural examination of uterine discharge revealed the presence of various bacterial isolates. (Table I) Among these isolates, Corynebacterium sp., *Escherichia coli*, *Pseudomonas sp.,* were predominant. The results obtained were comparable with those of David and Bonnier (1987) and Gatne and Ranade (1996).

Various authors have reported highly varying antibiotic sensitively pattern to uterine isolates (Bretzlaff et.al.1982.) These differences might be due to resistance of the organisms involved in the infection.

The color of uterine discharge; consistency and recovery period with ovarian rebound was also studied during the investigation. In Treatment group, uterine discharge ceased on an average five days post treatment. The color was whitish to yellow with thin consistency, while in Control group the discharge was whitish to yellow with thick consistency. Ovarian activity was observed on an average fifty days after treatment in Treatment group while in Control group it was not observed till the end of experiment.

The haematological studies comprising of HB, PCV, TLC and DLC estimation did not show any significant differences in both the groups. The results of in-vitro antibiotic sensitivity against the various isolates indicated that Enrofloxacin was most effective among the antibiotics tested. (Table II)

Table II Drug sensitivity pattern of uterine isolates from metritic buffaloes

Sr. No.	Antibiotic	samples tested	samples sensitive	Percent sensitivity
1	Enrofloxacin	16	15	93.75
2	Ciprofloxacin	16	14	87.50
3	Gentamicin	16	13	81.25
4	Chloramphenicol	16	11	68.75
5	Ampicillin	16	06	37.50
6	Terramycin	16	04	25.00
7	Sulphamethaxol	16	02	12.50

Conclusions :

On the basis of the observation in the above investigation, it is concluded that Inj. Floxidin with its broad spectrum antimicrobial activity controls the uterine infection effectively, stimulates the uterine involution process and also helps in resumption of ovarian activity.

References :

Bretzlaff, K .N., Whitmore, H.C;, Saphr, S. C. and Ott, R.C. (1982) *Theriogenology,* **17** : 507-535.

David C. and Bonnier, M. (1987). *Vet. Bull.*, **57** : 59-69.

Gatne, M. M. and Ranade, V. V. (1996). *The Blue Cross Book,* **6** : 26-28.

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Trypanosomiasis in buffaloes

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Introduction

Trypanosomiasis (Trips fever) is caused by *Trypanosoma evansi*, a haemoprotozoan, belonging to the subgenus Trypanozoon (Soulsby, 1982). Flies belonging to the genus *Stomoxys* and *Tabanus* act as vectors for the spread of this disease from one animal to another. Main species of domestic animals affected with this disease include camels and horses, but cases of trypanosomiasis in cattle and buffaloes are also reported. Cases of trypanosomiasis are also reported in wild animals like tigers (Ramachandraiah et al., 1994). The disease is characterized by pyrexia, progressive emaciation, anaemia, nervous signs and finally death. (Radostitis et al., 2000).

Case history and observation

Two non descript she buffaloes, aged between 7-9 years were brought for treatment with a history of high temperature, circling movements, head pressing, weakness, reduced milk yield and profuse salivation, since last 10 days. The animals appeared emaciated but had good appetite. On rectal examination, both the animals were found to be non pregnant. The animals were closely examined for any mark of dog bite on the body.

Clinically, animals showed persisting pyrexia (105^{0}F) along with corneal opacity, circling movements, salivation and suspension of rumination. The chronic course of the disease and clinical signs indicated the possibility of trypanosomiasis. For confirmation of the clinical diagnosis, thick and thin blood smear techniques were used and confirmed on the basis of the typical characteristics of Tyrpanosoma evansi as described by Soulsby (1982).

Treatment

Inj. Triquin[1] (2.5gm) dissolved in 15 ml distilled water was given at the rate 2.5/100kg body subcutaneously in the neck region for 3 days. As a prophylactic measure against any anaphylactic reaction, 5ml Anistamin®[2], was injected intra muscularly (Singh et al., 1985).

The supportive therapy given to the animal for a period of three days included 500 ml Rintose®; I/V, 15ml, 3-D vet Plus®[3], administered intramuscularly and 10 ml of Tribivet®[4], administered intramascularly. The animals were given Rumicare[5] powder (125gm; PO, oid) as oral appetite stimulant. The animals were subjected to laboratory examination using blood smears again on the 4th day and were found to be free of the parasite. The other clinical symptoms like circling movement and head pressing, pyrexia, hypersalivation, ruminal stasis and dehydration also subsided with the treatment and animals showed complete recovery in 3 days following treatment. Similar results have been reported earlier by Suryanarayan et al. (2004).

Reference

Radostitis,O.M.; Blood,D.C. and Gray,C.C. (2000) *Veterinary Medicine*, 9th ed. W.B. Saunders Ltd., London.

Ramachandraiah,K.,; Mohan, A.R.,;Chari, R.P.V. and Padmavathi, G. (1994) Treatment of trypanosomiasis in a male tiger - a case report. *Livestock Advisor*. **19** (80) : 7-8.

Singh, Veer.; Raisinghani,P.M.; Lodha,K. R. and Manahor,G.S. (1985) Experimental *Trypanosoma evansi* infection in buffalo calves. Paper presented in Asian Pharmacology Congress, New Delhi, Jan. 15-19 1985.

Soulsby,E.J.L. (1982) *Helminths, Arthropods and Protozoa of domesticated animal.* 7th ed. ELBS and Bailliere and Tindall, London.

Suryanarayana,C.; Purnima narayana and Nageswaramma, A. (2004) Trypanosomiasis in a she buffalo. *Indian Veterinary Medical Journal*. **28** (2) : 195.

1. Inj. Triquin - Quinapyramine Sulphate - 1.5 gm - Wockhardt Ltd. Animal Health Division
   Quinapyramine Chloride - 1.0 gm
2. Inj. Anistamin - Chlorpheniramine maleate 10 mg / ml (Intas Pharmaceuticals Ltd. Ahamadabad)
3. Inj. 3 D Vet Plus - Diclophenac Sodium 300 mg and Paracetamol 1500 mg (Intas Pharmaceuticals Ltd. Ahamadabad)
4. Inj. Tribivet - Cynocobalamine 500 mg / ml, Thiamine hydrochloride 50 mg/ml, and Pyridoxine hydrochloride 50, mg/ml (Intas Pharmaceuticals Ltd. Ahamadabad)
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I*nfectious Bovine Rhinotracheitis - (IBR) - An Emerging Problem*

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Infectious Bovine Rhinotracheitis (IBR) is a disease, caused by Bovine Herpesvirus-1 (BHV-1), an *Alphaherpesvirinae* virus belonging to *Herpesviridae* family. The disease shows various clinical syndromes, namely, respiratory disease, (IBR), genital disorders - Infectious Pustular Vulvovaginitis (IPV) in heifers, cows, she-buffaloes and Infectious Pustular Balanoposthitis (IPB) in bulls; abortion and other infections of eyes, nervous system, digestive system, skin etc. In India, BHV-1 was first isolated from a case of keratoconjunctivitis in calf as early as 1976 and thereafter several workers have reported its widespread prevalence all over the country. The disease is mainly characterized by abortions, infertility and repeat breeding.

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Prevalence of Brucella antibodies in bulk milk samples in Vidarbha Region

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Brucellosis is a wide-spread and economically important infectious disease of variety of animals and humans, caused by members of genus *Brucella*. Its impact on social and economic life is well established. The disease is characterized by abortion in the last trimester of pregnancy, premature births followed by retention of placenta, metritis and reduction in milk production. Brucella organisms are usually found to be localized in the mammary gland and reticulo-endothelial system.

Isolation and identification of the causative agent have been considered to be the gold standards for the diagnosis of disease. However, because of lengthy isolation procedure and non-feasibility under field conditions, variety of serological tests are used for the diagnosis of Brucellosis, namely, Rose Bengal Plate Test (RBPT), Standard Tube Agglutination Test (STAT), Compliment Fixation Test (CFT) and Enzyme Linked Immuno sorbent Assay (ELISA). For detection of Brucella antibodies in milk, the Milk Ring test (MRT) is used, in which stained *B. abortus* cell antigen when added to the milk binds with the antibody and gets concentrated in the cream layer. The MRT is good screening test for cattle. However, milk samples taken shortly after parturition, near the end of lactation and from mastitis affected quarters may give false positive reactions. Detection of Brucella antibodies in milk employing ELISA has proved to be a highly sensitive and specific test.

Material and Methods

In the present investigation, the prevalence of brucella antibodies in bovines in Vidarbha region has been undertaken by employing Avidn-Biotn milk ELISA (A-B milk; ELISA) in bulk milk samples.

A total of 126 bulk milk samples were collected from Govt. Milk Scheme, Nagpur (31), Private

Milk Unions of Bhandara district (69) and milk vendors (26). The samples were collected in sterile vials and transferred to laboratory on ice and stored at 40°C. The bulk milk samples were screened for brucella antibodies by avidin- biotin milk based ELISA (A- B milk ELISA) test developed by Project Directorate on Animal Disease Monitoring and Surveillance (PD_ADMAS), Bangalore.

Results and Discussions :

Out of total 126 bulk milk samples screened, 6 (4.76%) were positive by A-B milk ELISA. The details of bulk milk samples collected and screened for brucella antibodies by A-B milk ELISA are given in Table I.

The reported prevalence in the present study is lower than that reported as 6.50% in organized farms in Madhya Pradesh (Mehra et al, 2000), 5% in Karnataka (Isloor et al 1998 a) and 8.7% in Uttar Pradesh (Sharma et al 1984) and 11.38% in Goa (Barbuddhe et al, 2003).

Crowding of animals in organized farms, inadequate floor space and poor sanitation may attribute to high prevalence of Brucellosis. Introduction of animals from infected herd may contribute for spread of disease.

ELISA has been described for the detection of brucella antibodies in milk from cows experimentally or naturally infected with *B. abortus*. IgG based ELISA using milk was found to be 22 times more sensitive than MRT and is more sensitive to bulk milk samples.

The use of milk ELISA could help in considerable cost savings in brucellosis control programme and can be conducted on milk samples not suitable for MRT.

Table I. Details of bulk milk samples collected and screened by Avidin-biotin milk ELISA (A-B milk ELISA).

Sr. No.	Source of bulk milk samples collected	No. of sample collected	No. of samples found positive	Percentage positively
1.	Govt. milk scheme, Nagpur	31	1	3.21
2.	Private milk unions of Bhandara district	69	2	2.89
3.	Milk vendors	26	3	11.53
	Total	**126**	**6**	**4.76%**

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References :

Barbuddhe,S.B.; Isloor.S.Chakurkar E.B.; Swain.B.K.;Burman.D. and Rajasekhar.M. (2003). Prevalence of brucella antibodies in bulk milk samples in Goa region. *J. Vet. Publ. Hlth.,* **1**(2) : 173-175.

Isloor.S., Renukaradhya,G.J. and Rajasekhar, M (1998). A serological survey of bovine brucellosis in India. *Rev. Sci. Tech. Off. Int. Epizoot.* **17** : 781:785.

Mehra.K.N.; Dhanesar.N.S. and Chaturvedi V. K. (2000). Sero-prevalence of brucellosis in bovines in Madhya Pradesh. *Indian Vet. J.* **77** : 571-573.

SharmaV. D., YadavM. P., SinghS. P. and Pratap V. K. (1994). Prevalence of agglutinins of *Coxiella burnetti* and *Brucella abortus* in man and animals in U.P. *Indian J. Comp. Microbiol Immunol Infect. Dis.,* **5** : 12-16

Indian Livestock Scenario - 4

Value of output of Indian Livestock / Milk (2000-01 to 2008-09)

Year	Value of output of Livestock (Rs. Crores)	Value of output of Milk (Rs. Crores)	% of Milk output
2000-01	139981	94491	67.5
2001-02	149580	100019	66.8
2002-03	156080	107540	67
2003-04	160507	107544	69
2004-05	173500	115970	67
2006-07	210629	144380	60.5
2007-08	218980	150000	68.5
2008-09	225000	176898	78

Source : Internet

Autosomal recessive genetic defects of cattle breeds

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Introduction

There are two sex chromosomes in normal somatic cells which determine the sex of an individual. The rest of the chromosomes are known as autosomes. The genetic diseases, which are linked with autosomes are known as autosomal genetic diseases which could be recessive or dominant. The autosomal recessive genetic diseases are mostly breed-specific. Some of the autosomal recessive genetic diseases in various cattle breeds are tabulated with their symptoms. Such recessive disorders have created concern in various countries as strong inbreeding in the bovine population has increased the risk of the occurrence of genetic diseases. In fact, the wide use of only a few elite sires has enhanced the probability of the accumulation of two mutated recessive genes in cattle population. These genetic diseases have already spread to large population as animal carrier of the disease looks normal. As a result many countries including India (Patel at el, 2006; 2007a; 2007b; 2008), have been regularly screening their AI bulls with the major objective to reduce the incidence of genetic disorders in cattle population and reduce the economic losses to the organized farms.

Table 1 : Autosomal Genetic Diseases in Important Breeds

S. No.	Name of Disease	Breeds affected	Symptoms
1.	Bilateral convergent strabismus with exophthalmos (BCSE)	Jersey, German, Holstein	BCSE shows a progressive course and defect can not be often noticed. Ends up in complete blindness. The onset prior to first breeding. Generally, no signs of the defect are present at birth.

S. No.	Name of Disease	Breeds affected	Symptoms
2.	Bovine Chondrodysplastic Dwarfism	Holstein	Short limbs, joint abnormality and ateliosis. Affected calves show insufficient endochondral ossification with irregularly arranged chondrocytes, abnormal formation of the cartilaginous matrix, and partial disappreance of the epiphysical growth plates
3.	Bovine Citrullinaemia	Holstein	It is urea cycle disorder in animals. Calves affected with the disease appear normal immediately after birth. However, by the second day of life they become depressed and feed poorly. By the third day, they are often seen aimlessly wandering about their enclosure or standing with their head pressed against a fence or wall. Between day 3 and 5 the disease progresses rapidly. The calves appear to be blind and then they collapse.
4.	Bovine Leukocyte Adhesion Deficiency (BLAD)	Holstein, Holstein CB	Recurrent pneumonia, ulcerative and granulomatous stomatitis, enteritis with bacterial overgrowth, periodontitis, loss of teeth, delayed wound healing, persistent neutrophilia and death at an early age
5.	Bovine Spinal dysmyelination (BSD)	American Brown Swiss (ABS) and in several European cattle breeds upgraded with ABS	Manifested at birth and include lateral recumbency with opisthotonos, body tremor, and spastic extention of the limbs. Attempt to rise and limb movements are absent.
6.	Bull dog or Achondrosplasia	Holstein	Calves are usually aborted before the seventh month of gestation, with extreme shortening of limbs and vertebral column, gross craniofacial defects
7.	Complex Vertebral Malformation (CVM)	Holstein	Shortened neck and forelimbs, bilateral, symmetrical, moderate traction of the carpal joints, severe contraction and slight lateral rotation of the fetlock joints, stillbirth.

S. No.	Name of Disease	Breeds affected	Symptoms
8.	Deficiency of Uridine Monophosphate Synthase (DUMPS)	Holstein	Embryos do not survive to birth rather die at early in gestation, as embryos appear to be aborted or reabsorbed approximately 40 days after conception, leading to repeat breeding problems
9.	Ehlers-Danlos syndrome (EDS) or Dermatosparaxix	Holstein	Connective tissue characterized by articular hypermobility, skin hyperextensibility, and tissue fragility affecting skin, ligaments, joints, blood vessels, and internal organs
10.	Factor XI Deficiency Syndrome	Holstein	Bleeding disorder, Prolonged oozing of blood following dehorning and castration, susceptible to diseases such as pneumonia, mastitis and mastritis
11.	Myopathy of the diaphragmatic muscles	Holstein	Muscular disease in which the muscle fibers do not function, resulting in muscular weakness. This also leads to degenerative changes in the diaphragmatic and other thoracic muscles.
12.	Pink tooth or congenital porphyria	Holstein	Defective hemoglobin formation. Usual symptoms are discoloured (pink to reddish brown) teeth and urine. Dermal lesions on unpigmented areas may be present when the animals are subjected to sunlight. Anemia and unthriftness also may be observed. Discoloured bones are also observed upon post mortem examination.
13.	Polydactyly (extra toes)	Simmental, Holstein etc	one or both front feet are usually affected, but all four may have the outer dew claw develop into an extra toe which often cause lameness
14.	Spinal muscular atrophy	Holstein, Brown Swiss	Exhibits locomotion difficulties started at the age of 15 days, and progressed to paraparesis and tetraparesis in 2 weeks.

S. No.	Name of Disease	Breeds affected	Symptoms
15.	Syndactyly or Mule foot	Holstein, Angus	Painful fusion of the hooves and reduced mobility
16.	Weaver Syndrome or Bovine Progressive Degenerative Myeloencephalopathy (PDME)	Brown Swiss	Clinical signs for the disease usually begin at 6 to 8 months of age and include weakness in hindquarters when getting up, uncoordinated movement of hind limbs, abnormal gait and staggering.

Reference

Patel, R. K., Singh, K. M., Soni, K. J., Chauhan J. B. and Sambasiva Rao, K. R. S., (2006). Lack of carriers of Citrullinaemia and DUMPS in Indian Holstein cattle. *J of Applied Genetics.* **47**(3):239-242.

Patel, R. K., Singh, K. M., Soni, K. J., Chauhan, J. B. and Sambasiva Rao, K. S. R. (2007a). Low incidence of Bovine Leukocyte Adhesion Deficiency (BLAD) carriers in Indian dairy cattle and buffalo breeds. *Journal of applied genetics.* **48**(2): 153-155.

Patel, R. K., Soni, K. J., Chauhan, J. B., Singh, K. M. and Sambasiva Rao, K. S. R. (2007). Factor XI deficiency in Indian *Bos taurus, Bos indicus and Bubalus bubalis. Genetics and Molecular Biology.* **30** (3): 580-583.

Patel, R. K., Singh, K. M., Soni, K. J., Chauhan, J. B. and Sambasiva Rao, K. S. R. (2008). Screening of dairy bulls for weaver syndrome in India. *Current Trends in Biotechnology and Pharmacy,* **2** (1): 192-197.

A study on the occurrence of Tuberculosis in cattle and animal attendants in the city of Kolkata, West Bengal

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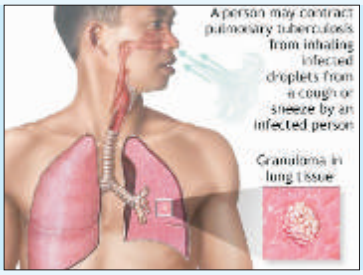

Introduction :

Tuberculosis (TB), is re-emerging as one of the major diseases of man and animals worldwide. Its resurgence is causing concern even in those countries which had eradicated this disease. It is estimated that about one third of total population of the world is infected with TB (Aranaz et al, 1996). According to WHO, India has 30% of world's TB patients. Everyday, more than two thousand people become infected with Tubercle Bacilli and about 1000 die from TB. In India, TB kills 14 times more people than all tropical diseases, 20 times more than malarial and 400 times more than leprosy. Every sputum positive patient can infect 10-15 individuals in a year (WHO).

Since time immemorial, animals were found to have a great impact on human health. In India, rural community often shares a single roof with their animals. In recent years, intensive animal husbandry practices gained importance in rural as well as urban population which has led to emergence of diseases like Bovine tuberculosis, Salmonellosis etc. and become public health hazards to animal attendants, Veterinarians and para-Veterinarians and also animal product consumers. In West Bengal, Sen et al (1987) reported isolation of *M. bovis* strain from sputum of man. *M. tuberculosis* strain has also been isolated from bovines in India (Verma et al 1987). Tuberculosis is the most common opportunistic infection amongst the HIV-AIDS patients. It is worth mentioning that the vast majority of people carrying this dual infection live in the developing countries and dual HIV and M. bovis infection has been reported in industrialized countries (Dankner et al 1993). Epedemic of HIV infection in developing countries like India, where *M. bovis* infection is prevailing in animals, favours zoonotic tuberculosis and poses a serious public health threat to persons at risk.

With this background information, a study was conducted to know the magnitude of

tuberculosis in cattle and animal attendants and to ascertain the comparative efficacy of diagnostic methods of tuberculosis.

Material and Methods :

- A total of 50 specimens of lungs having nodules and equal number of sera samples from cattle and buffaloes were collected from the CMC, slaughter house, Kolkata.
- A total of 50 sputum samples and 50 sera samples were collected systematically from the patients admitted to Mother Teresa T. B. Hospital, Kolkata having exposure (direct or indirect) to animals
- Standard Reference Culture of *Mycobacterium bovis* was procured from Division of Biological Products, Indian Veterinary Research Institute, Izatnagar. Bareilly - 243122 (U.P.). The reference strain was maintained by subculture on Stonebrink's media as well as stock preserved in Dorset's egg medium.

Collection of Samples :

a) A thorough necropsy of cattle and buffaloes slaughtered at Slaughter House, Kolkata Municipal Corporation was done. Pieces of Lung specimens having nodules suspected to be tuberculous were collected aseptically and transported to the laboratory on ice for further investigation.

b) Sputum samples from the patients / animal attendants suspected to be suffering from tuberculosis at TB Hospital were collected aseptically and transported on ice to the laboratory. Blood samples were collected directly from the heart of the slaughtered animals having nodules suspected for tuberculosis and serum was separated aseptically which was inactivated at 56^{0}C for 30 minutes and preserved at (-)20^{0}C for further laboratory use. Similarly, blood collected from animal attendants/patients suspected to be suffering from tuberculosis was collected from saphenous veins. Serum was separated and preserved for further use after inactivation. Sputum and lung samples were processed for microscopic smear examination using Ziehl-Neelsen staining procedure, cultured on standard Lowenstein Jensen (LJ) and Stonebrink's (SB) medium. The lung specimens were also subjected to histopathological examination following HE staining.

Bovine and human sera were also tested for detection of IgG antibodies to M. tuberculosis complex species by using the PATHOZYME TB COMPLEX plus reagents kit supplied by Omega Diagnostics Limited, Scotland (UK).

Results :

Direct smear examination of bovine specimens showed presence of acid-fast bacilli (AFB) in 12(24%) out of 50 lung specimens from cattle processed. In case of human samples, 18(36%) sputum samples were positive for AFB. Bovine specimens cultured on SB and LJ medium revealed growth of Mycobacterium species in 9(18%) and 5(10%) samples

respectively. The growth of Mycobacterium species in bovine lung samples following histopathological examination showed typical tubercular granuloma with giant cells in 14(28%) samples. Serodiagnosis based on Indirect ELISA in bovine serum samples showed 8(16%) O.D. values parallel or more than the values of positive controls. In human sera, the positivity was 21(42%) when tested by ELISA method.

The growth of Mycobacterium species when further characterized by standard biochemical tests revealed growth of 8 *Mycobacterium bovis* and 1 *M. tuberculosis* on SB medium while 5 strains of *M. tuberculosis* grew on LJ medium (Table-I). In case of human sputum, out of 3 strains of Mycobacterium species grown, 2 were *M. tuberculosis* and one *M. bovis* on SB medium while 6 strains of *M. tuberculosis* and 1 strain of *M. bovis* were isolated on LJ medium (Table - II).

Discussion :

The sputum samples collected from humans were proved to be culturally positive in Stonebrink's medium 3(6%) and Lowenstein-Jensen medium 7(14%) respectively. On species characterisation, out of 3 isolates in human sputa, 2 were detected to be *M. tuberculosis* and one as *M. bovis.* Similarly with isolates from L-J medium, 6 were identified as *M.tuberculosis* and one as *M. bovis*. Such species prevalence suggested the probability of transmission of mycobacteria from animal to man and vice-a-versa.

It was observed that Stonebrink's medium is more suitable than L.J medium for isolation of M. bovis from bovine specimens which corroborates with the findings of Grange (1984) who recorded that Stonbrink's medium is suitable preferable for growth of Mycobacteria of animal origin.

In the present study, bovine lung specimens were subjected to histopathological examination. The sections were stained by H-E method. Only 14 (28%) samples showed typical microscopical lesions which were very much pathognomonic.

In this study 50 bovine sera samples were screened for the antibody by indirect ELISA. Only 8(16%) were found to be positive based on OD values parallel to the positive control as provided by the manufacturer. The 50 human sera samples were also placed for sero-diagnosis and 21 (42%) recorded to be positive.

For detection of positive bovine tuberculosis after postmortem examination in slaughtered cattle, histopathology showed more sensitivity than smear examination alone. Moreover, indirect ELISA by using the kit as stated above is more sensitive than cultural isolation in L-J medium but less sensitive than smear examination as well as cultural isolation in stonebrink's medium and histopathological examination for detection of bovine tuberculosis.

But in case of human, L-J medium is more sensitive than Stonebrink's medium for cultural isolation from sputum and similarly microscopic smear examination also proved sensitive. But indirect ELISA is most suitable for

antemortem diagnosis than smear examination or cultural isolation. Therefore, for routine examination of bovine samples, specific bovine kit should be used for indirect ELISA. The serological observation was in support of the results obtained by Ritacco et al (1990) and Amadori et al (1998) who observed promising result by ELISA with the different groups of animals found positive for tuberculosis as well as culturally positive cases. From the above it may be concluded that for diagnosis of bovine or human TB, a battery of tests inclusive of indirect ELISA would be suitable.

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Table - I The cultural isolates of Mycobacterium Species on different media from bovine and human samples.

Total number of samples	Culture in Stonebrink's medium with antifungal agents and antibiotics.			Culture in Lowenstein-Jensen medium with antifungal agents and antibiotics		
	Positive pure growth of Mycobacteria	Positive growth of Mycobacteria with Moderate contamination	Negative samples	Positive pure growth of Mycobacteria	Positive growth of Mycobacteria with Moderate contamin action	Negative samples
a) Bovine Lung Specimens : 50	4(8%) (M. bovis-4)	5 (10%) (M. bovis-4 (M.tuberculosis-1)	41 (82%)	2(4%) (M. tuberculosis-2)	3(%) (M. tuberculosis-3)	45(90%)
b) Human sputa: 50	2(4%) (M. tuberculosis-2)	1(2%) (M.bovis-1)	47(97%)	5(10%) (M.tuberculosis-4) (M.bovis-1)	2(4%) (M.tuberculosis-2)	43(86%)

References :

Amadori,M.: tameni,S.; Scaccaglia,p.; Cavirani,S.; Archetti, I.L.; Giandomenico,R.Q. (1998). Antibody tests for identification of Mycobactgerium bovis infected bovine herds. *Journal of Clinical microbiology*.**36**:2, 566-568.

Aranaz.A.; Liebana,E.; Pickering,X.; Novoa,C.; Mateos,A.; Dominnguez,L. (1996). Use of polymerase chain reaction in the diagnosis of tuberculosis in cats and dogs. *Vet. Record* **138**: 272-280.

Dankner,W.M.;Waecker,N.J.;Essey,M.A.; Moser,k.;Thompson,M.;Davis,C.H.(1993). Mycobacterium bovis infections in Sam Diego:

a clinicoepidemiologic study of 73 patients and a historical review of a forgotten pathogen. *Medicine (Baltimore):* **72**:11-37.

Grange,J.M.(1984).The mycobacteria (chapter 24) in: Topley and Wilson's Principles of Bacteriology, Virology and immunity, *Seventh edition*. **Vol.2.** 61-93.

Ritacco,V.; Lopez,B.; Barrera,L; Noder,A.; Fliess, E.; Kantor, I.N. de.; Dekantor-IN. (1990). Further evaluation of an indirect enzyme-linked immonosorbent asay for the diagnosis of bovine tuberculosis. Journal of Veterinary Medicine. Series-B. **37**:1, 19-27.

Sen, G.P.; Biswas, Gita;.; Sanyal, R. and Ghosh, A.K. (1987). A report on M. bovis infection in man in West Bengal. Indian J. Animal. Health. **26**:177-78.

Verma,R.; Sharma,A.K.;Vanamaya,P.R., Khanna,P.N.; Siddique, I.H. and Gupta, B.R. (1987). Prevalence of tuberculosis at an Organised farm and its public health implications. Abstract-Annual conference India Association. Vety. Immunol. Inf. Dis., HAU, Hissar, 68.

World Health Organisation / pan American Health. Organization (1993). VIII Inter American meeting, Apr. 27-29. Washington, D.C. Washington:

Indian Livestock Scenario - 5

Export of Indian Livestock Products (1980-2005)
Value in Rs crores

Livestock products	1980-81	1990-91	2000-01	2004-05
Milk and dairy products	3.01	2.46	8.88	24.77
Buffalo meat	70	107	325	1537
Mutton/Chevon	18	32	68	110
Chicken	-	8	11	23
Eggs	-	176	182	225
Skins/Leather	-	1530	8946	9307
Total Export	91.01	1855.46	9540	11226

Source : Internet

Pioneer's Profile

Dr. Rishendra Verma

Dr. Rishendra Verma (B, 1953) graduated (BSc) from Bareilly College, Bareilly, completed his BVSc & AH and MVSc in Bacteriology in the year 1977 and 1979 respectively from Veterinary College, Mathura. He obtained MSc (Immunology) in 1990 from Birmingham University, U.K, PhD in 1995 in Bacteriology from IVRI, Izatnagar. and Diploma in Journalism from Mysore University. Registered for DSc at Rani Durgavati Vishwavidyalaya, Jabalpur and enrolled for Master of Veterinary Medicine (Biosecruity), Massey University, New Zealand.

Currently, Dr. Verma holds the position of Joint-Director, Centre for Animal Disease Research and Diagnosis (CADRAD), In-charge, Central Disease Diagnostic Laboratory (CDDL) recognized by Deptt. of Animal Husbandry, Dairying & Fisheries (DAHD & F), Ministry of Agriculture, Project Coordinator, All India Network Programmes of ICAR on Blue tongue and Haemorrhagic septicaemia, in addition to being Head, Division of Biological Standardization (since 28.6.2001), and Government of India **Analyst** with jurisdiction of entire country and regulating authority for the quality control of veterinary biologicals manufactured or imported in India. He is **Member of Drugs Consultative Committee,** Ministry of Health and Family Welfare. The Member Secretary, Indian Pharmacopoeia Commission nominated Coordinator for the revision of **Indian Pharmacopoeia (Veterinary) and Member Expert Committee on Vaccine and other Biological Products, Indian Pharmacopoeia Commission.** He has revolutionized the area of quality control of veterinary biological products by bringing tremendous changes in GMP/GLP functioning of both State Veterinary Biologicals and Private Manufacturers.

Dr. Verma has been appointed as Technical Consultant by the Maharashtra Government, for GMP renovation of IVBP, Pune; He is a Technical Member, Board of Directors, Globion Biotech Pt Ltd, Hyderabad, nominee as expert member by M.P. Govt., Punjab Govt. and IAH & VB, Bangalore, for restructuring of GMP of biological units. Dr. Verma has participated in more than two dozen times in joint-inspection of biological manufacturers with Drugs authorities (Central Licensing Authority).

Dr. Verma has been expert member for the Committee constituted for creation of National Veterinary Biological Quality Control centre, Baghpat and Chairman of its map designing. Dr. Verma was a member of Import/Export committee for 5 years at DAHD & F, Ministry of Agriculture.

His employment record shows that Dr. Verma has experience of many organizations viz: Sheep & Wool Extension

Officer (Officiated as District Sheep & Wool Officer, Barmer), Veterinary Officer, Sabar Dairy, Livestock Development Officer, U.P., Assistant Disease Investigation Officer (Poultry) HAU, Hisar. He joined the ICAR as Scientist S-1 in 1981 and joined CDRI Lucknow as Scientist "C" from 1987-89, repatriated to IVRI, Izatnagar, went to U.K from 1989-1990 and became Senior Scientist in 1995. Selected in absentia as Principal Scientist by the ASRB in 2000 and finally selected as Head, Division of Standardization, IVRI, Izatnagar in 2001.

Dr. Verma was deputed to **Asian Institute of Technology, Bangkok** (Thailand) for 3 months for training on Educational Technologies. He has received training in Medical Mycology at AIIMS, VP Chest Institute, Delhi, CDRI, Lucknow, Tuberculosis Research Centre, Chennai and National Institute of Tuberculosis, Bangalore. He received two **National Fellowships** viz: **INSA Visiting Scientist Fellowship** and **SERC Visiting Fellowship** by Ministry of Science & Tech, New Delhi for period of 3 months each for molecular work on Mycobacteria at Central JALMA Institute for Leprosy, Agra.

Dr. Verma received number of awards viz : **One Time ICAR Award of Rs. 1 lac** (jointly with Dr. T. N. Jaiswal) for development of Multiple Emulsion Haemorrhagic Septicaemia Vaccine, **K. D. M. Allergy Research Award, Kathmandu (Np. Rs. 1000,1), Bhartiya Shiksha Ratan Award, Pfizer Fellowship**, Merit Certificate by Veterinary College, Mathura, Certificate of Exemplary Courage by CDRI, **International Cultural Diploma of Honor, British TCTA Award**, Dr. C.M. Singh Award in Veterinary Microbiology, **FAO Fellowship, Major (Mrs) Malika Trivedi IAAVR Award**, Ahilya Mata Jeev Daya Mandal Trust Award, International Diploma of Honor (ABI,USA), Gold Medal and Scroll of Honour by Maharashtra Gazetted Vet Association, **Award of Merit** by IVRI, **Bharat Jyoti Award (2008)**, **Bharat Excellence Award & Gold Medal [2009]** Life Time achievement award, Life Time Ac First prize in Hindi Dictation etc.

Dr. Verma is endowed with many prestigious fellowships.

i) **Fellow,** The National Academy of Sciences, Allahabad

ii) **Fellow,** National Academy of Agricultural Sciences, New Delhi

ii) **Fellow,** National Academy of Veterinary Science, New Delhi

iii) **Fellow,** Indian Association for the Advancement of Veterinary Research

iv) **Fellow,** Indian Society of Veterinary Immunology & Biotechnology

v) **Fellow,** Association of Public Health Veterinarians

vi) **Fellow,** Indian Association of Veterinary Public Health Specialists

Dr. Verma is **Founder Secretary**, Indian Association for the Advancement of Veterinary Research, **President**, Agricultural Research Scientist Service Forum, President, Laboratory Animal Science Association of India (LASAI), **Member,** Academic Council, IVRI, **Co-opted Member,** Research Advisory Committee, Co-opted Member, Board of Management, IVRI, Research Advisory Committee (RAC), **Nodal Officer**, National Agricultural Technology Project, PME Cell Coordinator, NATP, Nodal Officer, Indian Agricultural Universities

Association, **General Secretary**, IVRI Alumni Association, Scientific Coordinator, Deemed University, IVRI, Izatnagar. He looks after duties of **Joint-Director** (Academic) as well as **Registrar**, Deemed University, IVRI as and when required, and is expert on many committee and task force of ICMR, DBT, Ministry of Agriculture.

He is a Expert member in SRC at ICAR Research Complex, Barapani, National Research Centre on Camel, Bikaner, DG's ICAR nominee of CARI Institute Management Committee, Expert Member in Screening/Selection Committee at Universities/Colleges/ASRB; Dr. Verma is member of editorial board of several periodicals:

- **Founder Editor, The Indian Journal of Veterinary Research**
- Guest Editor, Natural Product Radiance, NISCAIR, CSIR
- Member, Editorial Board, Poultry Guide
- Member, Editorial Board, Poultry Line
- Advisor (Ex), Indian Secular Voice
- Member, Editorial Board, Poultry World
- Co-editor (Ex), NLAC News Letter, CDRI, Lucknow
- Associate Editor, Veterinary World
- Editor (Ex)-Brij Sundree, Mathura
- Editor & Publisher, Souvenirs, Vet College, Mathura
- Member (Ex), Advisory Board, Pashudhan

Dr. Verma has guided 15 postgraduate students (9 MVSc and 6 PhD) and has been member of advisory committee of dozen students. He has 70 research papers to his credit, 11 Hindi articles, 2 monographs, 3 reviews, author of 1 book, chapter to books, edited number of books, 50 technical/popular articles. He has been invited by a number of National Platforms as Guest Speaker like at AIIMS, CDRI, Ranbaxy Sci. Foundation, IIT Kharagpur, Indian Sci. Congr., universities/ institutes. Dr. Verma has participated in number of National and International Seminars/ symposia. He is member of several professional societies. Delivered a number of Radio talks and TV talk.

Dr. Verma has been expert in Veterinary Mycology and Bacteriology. His specialized area of recent work include Haemorrhagic septicaemia and for the last more than 2 decades, he has been working on Mycobacteria. Some of his brief research findings include "A new serovar of Leptospira interrogans isolated from rat first time in India which was designated as SR 20 **(Satish-Rishendra, 20)** "Izatnagar", reported Gumboro disease in poultry first time in Haryana, reported first time serotypes of E.coli from poultry and turkeys viz: "O29", "O26" from yolk sac in baby chicks, "O1", "O37", "O36" from coryza in poultry, "O5" and "O6" from air saculitis in turkeys, *Haemophillus gallinaum* from coryza and Mortierella wolfii from the reproductive tract of mare. He did research on Ranikhet disease and Salmonellosis. Most of his work in Mycobacteria includes molecular techniques like PCR assays using species-specific targets, multiplex PCR, RFLP and RAPD, PCR-SCCP, gene cloning and expression of proteins.

Dr. Verma is an eloquent speaker, able teacher endowed with a strong writing flair. His students have received awards and passed ARS NET Examinations, some are placed in United States. He has visited **U.K., Thailand, Nepal and South Korea.**

News.... National....

A Second Prolific Sheep Breed of India

Almost all Sheep breeds of India produce a single lamb, except Garole sheep, which are reputed for multiple births. The Garole sheep inhabit Sunderban area of West Bengal and their hyperprolificacy is attributed to a single autosomal gene, which is known as Booroola Fecundity (FecB) gene.

Recently, FecB gene has been discovered in Kendrapada sheep, inhabiting Konark, Bhadrak and Puri districts of coastal Orissa. It is now a second breed of India which carries FecB gene. The distribution of twinning and triplet lambing is 35.1% and 2.3% respectively in Kendrapada sheep. Almost 75% of ewes produce multiple births.

NDRI, Karnal Scientists demonstrated anticarcinogenic properties in Cow Ghee

Conjugated Linoleic Acid (CLA) is a potent anti-mutagenic substance and is abundantly present in Cow Ghee produced by indigenous method. This substance confers protection against gastrointestinal and mammary carcinogenesis as demonstrated by NDRI scientists in an experiment in two groups of female rats fed diet containing Cow Ghee (Experimental Group) and Soyabean Oil (Control Group) for 44 days. Carcinogenesis was produced with 7 / 12 dimethyle benz(a)anthracene (DMBA), given through oral intubation. The results were as under,

Table - Effect of Cow Ghee and Soyabean Oil on Mammary and Gastrointestinal Carcinogenesis

Parameter	Cow Ghee Group		Soyabean Oil Group	
	Mammary Carcinogenesis	Gastrointestinal Carcinogenesis	Mammary Carcinogenesis	Gastrointestinal Carcinogenesis
Tumor Latency Period (Weeks)	27	-	23	-
Tumor Incidence (%)	26	55	65	73
Tumor Volume (mm^3)	1925	59	6285	677
Tumor Weight (gm)	1.67	1.73	6.18	3.64

Know the prestigious institutes

IVRI

(Indian Veterinary Research Institute)

Administrative block

Indian Veterinary Research Institute (IVRI) is one of the premier institutes of the country, engaged in Veterinary Research, Training and Education. Initially, it was started as Imperial Bacteriological Laboratory at Pune on December 9, 1889. It was then relocated at Mukteswar in the Kumaon hills in 1893; thereafter, the Izatnagar campus was established, in the year 1913.

It is perhaps one of the oldest and largest Veterinary institute in South-East Asia. IVRI has a glorious past of significant and landmark achievements in animal research and livestock development.

From a modest beginning in 1889; over the years, the Institute has expanded its horizon far and wide; IVRI today encompasses 3 campuses, viz. Izatnagar, Mukteswar and Bangalore, 4 regional stations located at Bhopal, Palampur (HR), Kolkata and Srinagar (J&K). The Institute was conferred the status of Deemed to be University in 1983 and offers doctoral & Masters degree programmes in 23 major disciplines of Veterinary and Animal Sciences. From its very inception, IVRI has the unique feature of providing training facilities to scholars and professionals from within the country and from abroad. Besides Masters and Doctoral programmes, National Diploma Courses and short term training programmes in various subjects are offered to the nominees of State Governments, army and candidates nominated by Foreign Governments and Universities.

In the pursuit of R&D, to meet new challenges and fulfill the national goals of augmenting livestock economy and in the areas, such as animal disease diagnosis and prophylactics, indigenous drugs arid efficacious immunobiotogicals, superior germ- plasm and crossbred strains of livestock, better and alternative animal nutrition, biotechnology and bio-engineering, efficient and eco-friendly management systems, livestock products and post harvest techniques for value addition etc. These efforts are well supported by a dynamic and committed extension system so that the benefits of research reach the ultimate users, industries, practitioners, entrepreneurs and the farmers.

The institute imparts quality post-graduate education to students, not only from various parts of the country, but also from overseas. Today, the institute with its deemed to be university status, contributes immensely to human resource development in the discipline of veterinary sciences with skills and knowledge necessary for the challenges of the new millennium.

The institute's research is currently addressed with clear benchmarking of deliverables through 157 research and 44 service projects. The institute undertakes basic, advanced and applied research through 85 externally funded projects. A number of national and international research projects on animal health and production systems are addressed by the institute. Presently 19 National Agricultural Innovation Projects, 3 All India Network Projects, 3 Outreach Program and 26 DBT funded projects are operational. Besides these extramural funded programmes, the institute is having 5 international collaborative projects with USA, UK, Australia, international organization, IAEA, etc.

The institute continues to play an important role in quality control and potency testing of immunobiologicals to various stakeholders with a good liaison with industry.

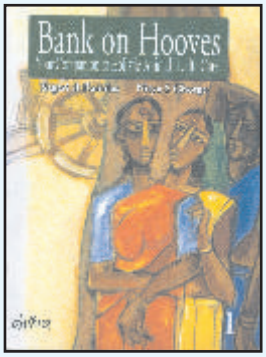
Biological products

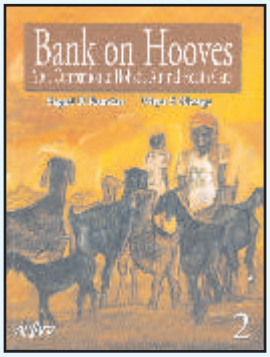
Department of Standardization

Veterinarian's Book Shelf

Bank on Hooves* ... vol. 1 and 2.

(Your Companion to Holistic Animal Health Care)





Aptly dedicated to Healers and Animal Health Workers, these two wonderful volumes present in meaningful words, the experience gained by Anthra (Women Veterinarians Organization) Veterinarians during their training programmes for village level Animal Health Workers.

Funding by "Swiss Agency for Development Co-operation" amply speaks about the importance and usefulness of the contents of these books, not only to village level professionals, but also for graduates and post graduates engaged in livestock health and productivity development.

The first volume of the book describes about the village resources and their micro planning for livestock development, nutritional requirement of livestock and its fulfillment through available resources, important anatomical and physiological features of different livestock species and their role in productivity performance etc. The second volume covers the health aspect of livestock production, describing various systems of Veterinary medicine including therapeutics and prevention. The most important aspect of these volumes is the information about alternate and economic system of livestock production through traditional means. No such information is readily available in any published literature on livestock health and management.

The books undoubtedly impress upon the readers that India is a land, full of natural resources of its own to improve livestock health and productivity. What is needed is the knowledge and the direction. Fortunately, these books provide the both through effective words and beautiful sketches. The dedication of Anthra workers in educating resource poor livestock owners and equally poor village health workers, flows through every chapter of these two books.

The books are must on the shelf of every Veterinarian.

* Publication of Anthra

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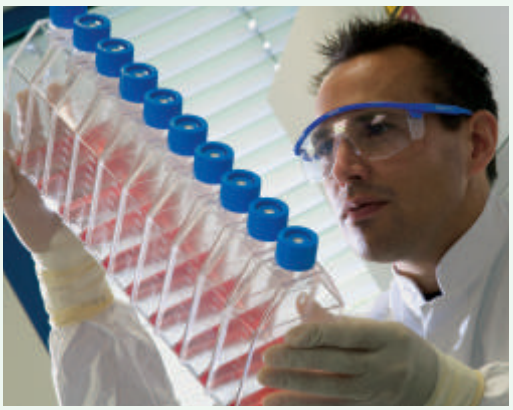

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