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Note : Authors are sole responsible for the contents given in articles

IMMUNOMODULATION OF FERTILITY

ARUNBEER SINGH, PRATEEK JINDAL, M. HONPARKHE, SUMIT SINGHAL

The dairy industry in Punjab is dominated by a large population of cross bred cattle. One of the prime factors affecting productivity of these animals is their reproductive status. Uterine infections are a major cause of poor reproduction in dairy animals.Treatment with antibiotics involveshigh cost, inconsistent results, antibiotic residues and inhibition of natural defence. Immunomodulation therapy is an effective way of reducing bacterial count, clearing infections and treating endometritis

Natural Barriers and Uterine Defence Mechanism

A number of bacterial agents are known to cause endometritis in dairy animals- Streptococcus, Staphylococcus, E. coli, Micrococci and Pseudomonas. These microbes may be transferred to the reproductive tract at the time of A.I, mating, post-partum or during wallowing. The defence against the invasion of reproductive tract by environmental organisms is maintained in several ways. The vulva, vagina and cervix form an anatomical barrier against the ascending microbial movement. Other physical barriers include the stratified squamous epithelium of the vagina and columnar epithelium of the endometrium along with the presence of mucus. Mucins in mucus trap bacteria aiding their expulsion or act as antimicrobial. Apart from mucus, anti-microbial peptides and glycoproteins cover the mucosa and prevent microbes from reaching the epithelium. Acute phase proteins act to repair any cellular damage. Immunologically, protection is provided through the action of polymorphonuclear (PMN) cells and humoral antibodies.

The endometrium contains a set of receptors called the Toll Like Receptors (TLR) which are able to recognise specific Pathogen Associated Molecular Patterns (PAMP) associated with bacteria such as DNA,bacterial lipids and cell wall LPS. Activation of TLRs results in the secretion of cytokines into the lumen of uterus. Cytokines initiate an inflammatory response and recruit PMN cells and monocytes to the site of infection. PMN cells phagocytise the invading microbial pathogens through their interaction with complement system and antibodies or alone.

Immunomodulation

Normally the animals are able to initiate an immune response against the invading bacteria. But occasionally, bacteria overcome the defence and establish infection. Hence efforts have been made to use natural substances as a means of activating the natural uterine defence against bacterial endometritis. A number of agents have been tried as immunomodulators for their therapeutic value against bacterial infections. Some of the popular immunomodulators in research include:

E. coli Lipopolysaccharide

Intrauterine infusion ofE. coli LPS at estrus in repeat breeder cows results in a multifold increase in total leucocyte count (TLC), with majority of these cells being neutrophils. These neutrophils phagocytose the bacteria in uterine lumen and the cervico-vaginal mucus becomes clear in the subsequent estrus. Treatment with 100 microgram LPS in 30 ml phosphate buffer saline, infused intrauterine has been reported to have a success rate of

75% in endometritis. A single intrauterine infusion of E. coli LPS in cows with bacterial endometritis can stimulate uterine defence mechanism and clear infection within one estrous cycle.

A combination of LPS and autologous serum can further improve conception rate to 91% in repeat breeding cows as against the use of LPS alone (Singh et al 2011). Saini et al (2012) compared the effect of autologous plasma, levamisole, LPS and gentamycin in the uterine defence modulation and reported that intrauterine E.coli LPS infusion was effective in improving the stimulation of non-specific immunity and elimination of endometritis. Similarly, Bhuyan et al (2015) reported superiority of E.coli LPS as an immunomodulator over oyster glycogen for the treatment of metritis in cows.

Oyster Glycogen

Oyster glycogen is a branched polymer of glucose synthesized by animal cells. Oyster glycogen increases the migration of PMN cells into the uterine. The peak concentration of these cells in uterine lumen occurs 12 hours after intrauterine administration. The increase may be due to the chemotactic action of oyster glycogen.These PMN cells help to combat infection in uterine lumen by phagocytosis.Oyster glycogen increases the movement of neutrophils into uterine lumen, clears bacterial infections and improves conception rate. 500 mg of oyster glycogen used as intrauterine infusion improved the conception rate in cattle to 60 %(Biswal et al 2013)

Research has indicated that E. coli LPS and oyster glycogen may show better therapeutic efficacy as compared to intrauterine antibiotics in the treatment of endometritis in crossbred cattle and it stimulates the defence mechanismsof the uterus.

LLeucotriene B_4(LTB_4)

LTB_4, an arachidonic acid metabolite is a chemo-attractant. It stimulates the preferential migration of PMNs into the lumen of uterus. 50 ml of 30 nmol/L LTB4and 500 mg oyster glycogen can be used for the treatment of subclinical endometritis in crossbred cows(Krishnan et al 2015).

Levamisole, an anti-nematodal drug is reported to have immune-potentiating effect in cows. Weekly injections during dry period have been shown to decrease the incidence of mastitis, prevent foetal death and endometritis. Here injections of Levamisole (2.5 mg/kg) injected subcutaneously can improve(Kswain et al 2011).A popular approach is to use a combination of injectable levamisole (s/c) and oral immulite (20 ml for 10 days) in the treatment of endometritis. Levamisole causes a rise in serum immunoglobulins, reduction in bacterial load in uterus and a better conception rate.

HHerbal Drugs

Garlic is one of the important agents to have been tried in research studies for the treatment of bacterial endometritis over the past decade. Garlic extract has been found to be therapeutically effective in endometritic cows. Garlic extract has antimicrobial property against gram positive and gram negative bacteria which may be responsible for the significant reduction of bacterial load in the treated animals. The treatment with garlic extract has also been shown to stimulate the release of cytokines and increase the phagocytic activity of

peritoneal macrophages.The results obtained by iintrauterine application of garlic and ashwagandha have shown that garlic-ashwagandha with similar efficacy as intra-uterine antibiotics. The antibacterial, antifungal, antiviral, anti-protozoal and anti-tumour properties of garlic are believed to be caused by an organic sulphur compound 'Ajoene'.

Neem has been used for its immunomodulatory and therapeutic activity against endometritis (Kumar et al 2013). 30 ml extracts of hydro-alcoholic Neem bark and hydro-acetonic Neem bark were given intra-uterine for seven days beginning on the day of estrus. Although clinical recovery and improved conception were reported from both groups, it was concluded that hydro-alcoholic extract of Neem had better therapeutic value.

Conclusion

Uterine infections are a major cause of production loss in dairy animals. Antibiotic therapy is the most common intervention for the treatment of uterine infections. However, antibiotic therapy has proved to be expensive and inconsistent. As such there is an increased focus on stimulating the immunity of the animal against the invading pathogens in the uterus. Thus immunomodulation therapy as an alternative mode of treatment is being researched with encouraging results for the treatment of endometritis in dairy cattle.

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DIAGNOSIS OF REPRODUCTIVE LOSS IN DAIRY ANIMALS

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Diseases of reproductive organs in cattle usually develop so gradually that they go unrecognized until the disease is well established in the herd. To prevent reproductive diseases, farmers must always be on guard and practice good management techniques such as isolating newly acquired cattle and vaccinating them when needed. They should also maintain good contact with veterinarians to keep their cattle healthy.

Most of the dairy farmers probably do not realise the extent of economic loss that can occur due to reproductive failure in their cattle. There are many infectious and non-infectious factors that contribute to low calving rate causing great economic loss to farmers. Calving percentage also depends on the access of animals to adequate nutrition. More than 90 or 95 per cent live calves should be achievable with good management and nutrition and thus reducing the rate of abortions. Abortions can be caused by a number of factors, including hormonal abnormalities, toxic chemicals, nutritional deficiency during pregnancy, dystocia and genetic diseases. However, most of the abortions are due to infectious causes, which can be avoided. The infectious causes of abortions include trichomoniasis, vibriosis, brucellosis, leptospirosis, neosporiosis etc.

To effectively control reproductive losses, the precise cause of the problem must be determined. Several diseases can cause similar signs and a thorough veterinary investigation is required to pinpoint the cause. Sometimes more than one disease may be present in the herd at the same time.

Calving Pattern

To find out a problem it is essential to keep a record of herd's reproductive performance. Using a restricted mating season, then analysis of the calving pattern can help narrow down the possible causes. If herd fertility is normal, the majority of calves (65 to 70 per cent) should be born within the first 6 weeks of the start of calving. If this calving peak does not occur and births are spread over a much longer period, a venereal disease such as vibriosis or trichomoniasis is a likely cause.

Pattern of reproductive losses

Earlier losses (often recognised only when cows are pregnancy-tested as empty) may be more likely to be due to trichomonas, vibriosis or pestivirus. Late abortions are more likely to be seen with brucellosis, neosporosis or leptospirosis. Sporadic abortions may indicate that the herd is partly immune to the disease, and that the disease has been present for some time. An 'abortion storm' is more likely to indicate brucellosis or the recent introduction of neosporiosis to a previously unexposed herd. None of these observations is diagnostic, but they form an essential part of any effective investigation.

Trichomonas foetus causes uterine infection and abortions, which may be accompanied by discharge of pus. This is a venereal disease, with bulls maintaining the infection in the folds of the prepuce, and transmitting it to cows at mating. Trichomoniasis is diagnosed by culturing samples from the infected bull's prepuce or from the uterine discharge of infected cows. The disease can be eradicated by culling infected bulls and ensuring that cows have at least 3 months sexual rest.

Vibriosis (Bovine campylobacteriosis) is a venereal disease that causes abortion and infertility in cattle. In most infected herds, the abortions reoccur sporadically. Vibriosis in females causes endometritis, resulting in failure to conceive or death of the embryo. Bulls also may be infected by breeding infected cows. Although semen from reputable bull studs is usually clean because of proper health examinations of the bulls and treatment of semen, this disease can be transmitted through artificial insemination if these precautions are not taken. Vibriosis can be diagnosed by examination of an aborted foetus, or by testing samples from the vaginal mucus of cows and heifers for the presence of antibodies against the disease. Scrapings or washings from the prepuce of a bull can also be cultured to detect the presence of the organism.

Brucellosis is the most common cause of abortion in cattle which accounts for great loss to farmers. It is important to understand that not all brucellosis-infected cows abort, produce weak calves, retain placenta or have trouble breeding back. A brucellosis reactor cow may be normal in every observable aspect. However, each time she calves or produces a genital discharge, millions of brucella organisms may be present on the surface of the placenta, calf or discharge. The discharges then contaminate the pasture and other feeds, such as hay, threatening other cattle. If susceptible animals ingest these bacteria, they are likely to become infected. Although infection usually occurs via the digestive tract, a susceptible animal may also pick up bacteria through the skin or eye. Contaminated feed, bedding, water or the premises may remain infective for a few days up to a few weeks, depending on environmental conditions. Brucellosis can be diagnosed by rose bengal Plate test, plate agglutination test, milk ring test, indirect ELISA or compliment fixation test (CFT).

Leptospirosis is a highly infectious bacterial disease of cattle that can also cause debilitating effects in humans. It causes repeat breeders, low-grade uterine infections, abortions, mastitis and occasionally systemic infection. Two different serotypes are common: Leptospira pomona and Leptospira hardjo bovis. Leptospirosis can be diagnosed by microscopic agglutination test.

Infectious bovine rhinotracheitis (IBR) and bovine viral diarrhoea (BVD) complexes are virus-caused diseases responsible for many abortions and possibly respiratory infections, pinkeye-type lesions and foot lesions. Temporary infertility may follow IBR because of vaginitis and/or a mild uterine infection.

A protozoan parasite known as Neospora caninum has only recently become recognised as an important cause of foetal death, mummification and abortion in cattle. Antibodies to this parasite appear to be widespread in dairy herds. The disease is difficult to diagnose unless an aborted foetus is available for examination.

Akabane, Aino and Palyam viruses are examples of arboviruses, meaning that they are spread by insects. These viruses can cause birth deformities such as 'dummy' calves

(from damage to the brain; known as **hydranencephaly**) and 'curly' calves (from damage to the spinal cord causing twisted limbs; known as **arthrogryposis**). However, this occurs only if animals with no immunity are exposed to the virus when they are pregnant.

Blood Tests

Blood tests can be very useful to indicate whether a herd has been exposed to a particular disease. However, although a positive result confirms previous exposure to the disease, it does not necessarily mean that particular agent is responsible for the problems seen. It is important to have the results of any blood tests interpreted by your veterinary officer in the context of other information available. Good records will be an asset in this situation.

For example, a cow may test positive for pestivirus, but if she was exposed before becoming pregnant she is likely to be immune to the disease, and it is unlikely to be the agent responsible for her abortion. A comparison of test results from cows that have calved normally with results of those that have aborted is more likely to yield meaningful results than looking at the test results of the affected animal only. If the affected cows have high levels of antibody and the normal pregnant cows are negative for antibodies, then it is the likely causative agent. If all cows are positive, and only some have aborted, then there is need to look for the other cause.

Submission of foetus and placenta

Post-mortem examination of dead or aborted calves is the only means of identifying with certainty the cause of herd's reproductive problem. It is important to recognise the importance of submitting aborted foetuses and placentas for laboratory examination. About two-third cases of abortion in cattle can be diagnosed if the foetus and placenta are submitted to a laboratory. Farmers should always wear protective gloves when picking up a foetus or placenta and place it in plastic bags and refrigerate it. Then contact veterinarian for further investigation and help.

Protecting herd in future

- Obtaining a differential diagnosis from a veterinarian.
- Adopting vaccination programs.
- Monitoring reproductive performance of the herd.
- Maintain records to monitor herd's progress towards more calves.
- Control measures adopted to increase reproductive performance.

EFFECTS OF GLOBAL WARMING ON ANIMAL HEALTH

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Some 200-300 years back (before 17th century) people used to travel by feet, using horses, bullock carts etc as there were no vehicles, trains or aeroplanes. There were no industries and factories at that time, people used to make their necessary items of their own i.e. hand production methods. But in 17th century, industrial revolution lead to the formation of industries, factories, automobiles and other types of technologies that use energy and emit heat and some gases into the atmosphere. These gases include CO_2, chlorofluro-carbons, nitrous oxide, methane, water vapours and some other gases. These gases which form the atmosphere of the earth are essential for survivability of living organisms because it is these gases that make the earth warm and sustain life on it. However, if there is an increase in the concentration of these gases it causes a rise in temperature on earth's surface. This gradual increase in the overall temperature of earth's atmosphere generally attributable to the green 'house effect is known as global warming.

Green house effect mechanism

All the radiations coming from the sun, that is the only source of energy to the earth, are not reflected back into the space but some part of it are trapped by the atmospheric gases which keep the earth warm. Among these gases CO_2 plays the major role in the warming of earth's atmosphere and hence this gas along with other gasses is essential for sustenance of life on the earth. Imagine, if there would have been no gases in the earth's atmosphere, there would have been no warming of earth and hence the temperature of the earth would have been below "Zero" i.e. freezing temperature where it is difficult for living organisms to live on. But an increase in the level of these green house gases (GHGs) in the atmosphere leads to an overall increase in atmospheric temperature which causes deleterious effects on all ecosystems and makes survivability of living organisms difficult on the earth.

From the above discussion we came to the conclusion that all human activities that increase the level of CO_2 or other green house gasses on the earth's atmosphere are causes of global warming. Being a veterinarian I am concerned more about animals and my question here is, are animals responsible for global warming?? Yes, because 18% of green house gases are emitted by these animals which add to the atmosphere and hence are the cause of global warming. But that does not mean we should start killing the innocent animals, rather we should take measures to reduce the green house gas emission from the animals such as reducing the number of the non productive animals that will reduce the production of these GHG, we can utilize the methane gas produced by animals using gobar gas plants to produce biogas that is used for cooking and other purposes. We should encourage pasture grazing by animals because researches have proven that pasture grazing of animal has lower GHG emission as compared to indoor housing.

Effect of global warming on animal health and diseases

Global warming has deleterious effect on all living organism on the earth be it small microscopic bacteria or largest blue whales. From various seminars, debates, magazines or news papers we have heard about the side effects of global warming on humans and their surroundings. Very less we know about the harmful effects of global warming on animal health which can be minimised and thus we can increase the production by animals. Both wild and domestic animals are affected by global warming and among domestic animals dairy cattle are particularly more susceptible to increased ambient temperature than other animals because of their high metabolic rate and poor water retention. Neonatal, postpubertal and lactating cattle are also prone to climate warming. Effect of global warming varies among individual animals according to breed, production level, prior exposure etc. as an example Bos indicus (Zebu cattle) are more thermo tolerate than Bos taurus (exotic cattle) due to possession of thermo tolerant gene by zebu cattle. Below are mentioned some major effects of global warming on animal health and hence a cause of diseases in them.

1. Due to climate warming there is reduction in the feed intake of animals. Why feed intake is reduced during hot weather?? It is actually thermoregulatory and physiological attempt of animals to decrease the metabolic rate and hence the metabolic heat production. Thermal stress has also a direct effect on appetite centre of hypothalamus to inhibit feed intake.

2. Global warming causes an increase in rectal temperature and respiration rate of animals. Why there is increase in respiration rate during hot weather?? The increase in respiration rate is an attempt to maintain the body temperature through evaporation cooling. i.e why you see animals and dogs panting during hot weather. But increased respiration rate leads to hyperventilation and exhalation of CO_2 resulting in lower levels of bicarbonate in blood. So there is decrease in the buffering action of carbonic acid and thus cause metabolic/respiratory acidosis/alkalosis.

3. Similarly, there is an increase in heart rate of animals due to climate warming to ensure more blood flow towards peripheral tissue to dissipate heat from the body core to the skin and then to the atmosphere.

4. Global warming has direct effects on animal's body as it causes alteration in the level of hormones (thyroxine, adrenaline, nor adrenaline, prolactin, somatotrophin, melanin, cortisol etc.) in the body which causes various types of metabolic disorders in the animals.

5. Cimate warming has been found to increase potassium loss through skin due to increased sweating which causes electrolyte imbalance inside the body leading to cardiovascular disturbances.

6. Climate warming causes reduction in the absorption of nutrients from gastrointestinal tract (GIT). For more dissipation of heat from the body, the main blood supply goes to the peripheral tissue and blood supply to the GIT is reduced which causes reduction in the absorption of nutrients.

7. Global warming leads to an increase in the number of vectors that are responsible

for causing various kinds of diseases in animals.

8. Last but not the least effect of global warming on animals is on their reproduction. High ambient temperature has been reported to increase the incidence of ovarian cysts. It reduces the fertility and conception rate of animals. Global warming also has deleterious effects on bulls it cause reduction in rate of spermatogenesis. It causes lower sperm concentration and motility. Global warming increases defects in spermatozoa (dag defect, diadem defect, knobbed spermatozoa, corkscrew defect etc).

Protection of animals from global warming

As explained above global warming has deleterious effects on all ecosystems on the earth and on all living creatures including animals. So there is a need to take necessary steps to reduce the levels of green house gases in the atmosphere and at the same time we should take measures to protect our animals from climatic warming. Below I have mentioned some steps to be taken to protect animals from climate warming.

1. Humans for their own benefits use intensified housing of animals for economic purpose, which reduces reproductive life of animals due to poor fertility and physical exhaustion and also increases the emission of green house gases. So we should adopt free range farming/pasture based farming which is more natural and reduces emission of GHGs.
2. Feed more concentrate to the animals during hot weather because feeding of roughages produces more heat inside the body and hence increases the body temperature.
3. Adopt the breeding techniques to produce animals that possess thermo-tolerant genes. Zebu cattle are more thermo-tolerant than exotic cattle.
4. Modification or alteration of methanogenic bacteria to reduce the production of methane produced by the animals.
5. Encourage afforestation and increase in grass land areas to store more carbon.
6. Match animal to environment or environment to animal. Provide animals with fans, sprinkle water cold water on them and provide shady areas.

COMPARATIVE ANATOMY OF MAJOR LYMPH NODES IN DOMESTIC ANIMALS

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Lymph nodes are vital organs of the defense mechanism of the body against the invasion of foreign bodies. Moreover, these lymph nodes, particularly the superficial lymph nodes that can be palpated easily and are significant indications of certain diseases processes in animals, thus helping in ante mortem and postmortem diagnosis of these diseases mostly during clinical practice and meat inspection. The detection of changes in size, color, and consistency of lymph nodes plays an important role in the evaluation of health and disease of animal. The knowledge of comparative anatomical features of these lymph glands will play important role in enhancing the clinical efficiency of veterinarians.

Name of Lymph Gland	Anatomical Features	Species in which normally palpable
Parotid lymph gland	Located at the base of the ear close to temporomandibular joint under cranial edge of parotid gland. Drains dorsal part of head, orbit, masticatory muscles and parotid gland.	Ox and dog
Mandibular lymph gland	Located between two halves of mandible, ventral to angle of jaw. Drains oral cavity including tongue and teeth.	Ox, horse and dog
Retropharyngeal lymph gland	Divided into medial and lateral retropharyngeal lymph glands.	Normally not palpable in any species.
Superficial cervical lymph gland (Prescapular)	**Medial retropharyngeal lymph gland** is the largest lymph gland of head and neck and is present in all species. Located between larynx and wing of atlas. Drains deep parts of head including pharynx, larynx and cranial part of trachea and oesophagus. Lymph coming from head region including including parotid and mandibular lymph gland passes through medial retropharyngeal lymph node before it drains into jugular trunk. **Lateral retropharyngeal lymph node** is usually absent in dog and drains guttural pouch in horse. Located cranial to shoulder joint covered by superficial neck muscles (Brachiocephalicus and Omotransversarius muscles). Drains skin and underlying structures of cervical region, dorsal thorax and proximal thoracic limb.	Palpable in ox and also in dog if present.

Axillary lymph gland	Located within axilla medial to shoulder joint. Present in all species. Drains forelimb and thoracic wall including first three pair of mammary glands in dog, so important during surgical removal of mammary tumors.	Dog
Cubital lymph gland	Accessory axillary lymph node is present in cat and inconstant in ox and dog. Located caudal to axillary lymph node .	Dog
Subiliac lymph gland (Prefemoral)	Located medial to elbow joint in horse and sheep	Horse
Superficial Inguinal lymph gland	Located in front of cranial border of tensor fascia lata muscle in middle of line connecting tuber coxae to patella. Absent in dog.	Ox and horse
	Located in inguinal region. Present in all species and are also called **mammary or scrotal lymph nodes** as these lymph nodes drain male reproductive organs or the udder (Caudal mammary glands in dog) and groin.	Ox, horse and dog
Superficial popliteal lymph gland	Located in popliteal fossa caudal to stifle joint. Superficial popliteal lymph nodes are absent, however deep popliteal lymph nodes are present	Dog

TREATMENT OF ANOESTRUS BUFFALO HEIFERS IN SOLAN DISTRICT IN HIMACHAL PRADESH

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Buffalo is the mainstay of dairy industry in India (Mishra *et al* 1990). Anoestrus in buffaloes is a common reproductive problem (Agrawal 2003). Also, ovarian inactivity is a big hindrance to make the dairy business more lucrative. However, anoestrus has been treated with variety of preparations having variable results in buffaloes. The problem becomes menace in field conditions due poor management practices of dairy animals at farmers' level. Therefore, this study was conducted to evaluate the efficacy of various methods of treatment on anoestrus buffalo heifers.

Selection of Experiment Animals: Fourty eight Murrah buffalo heifers aged between 36-40 months; weighted 300-350 Kg and having complaint of anoestrus from different farmers in Solan district were selected through health camps organized under Milch Livestock Improvement Society, District Rural Development Agency Solan. The selected buffalo heifers were however, clinically normal and free from any genital diseases. The ovaries of animals were smooth (confirmed by per rectal examination twice in a 10 days interval).

Matereological Data: Solan district is situated in the south-western side of Himachal Pradesh in the Shivalik range of Himalayas having semi-temperate climatic condition. The altitude of the district varies from 300-3000 meters. The annual normal rainfall is of 1420.20 mm. The minimum temperature goes down below 0°C in higher reaches during winter and highest one is 40°C in lower reaches during summer season.

Management of Experimental animals: All buffalo heifers were provided daily with 3.0 kg self prepared concentrate (containing maize-16 kg, oat-16 kg, rice bran-33 kg, mustard cake-27 kg, roasted soyabean-5 kg, mineral mix-3 kg and salt-2 kg), 15 kg green fodder, 4 kg wheat straw and 40 gram mineral mixture with adlib clean drinking water daily. After the treatment animals were regularly observed for external signs of estrus for three consecutive estrus cycle and pregnancy was confirmed 90 days after last AI done by per-rectal palpation.

Experimental Design: The animals were randomly divided into four groups. Animals in Group-I (n=12) were given single intra-uterine infusion of 30 ml of lugol's iodine (1:50), animals in Group-II (n=12) received 2-3 minutes of uterine and ovarian massage in alternate day, Animals in Group-III (n=12) were treated with single intramuscular injection of GnRH analogue, busereline, (Receptal, Intervet[R]) 20 ìg, 5ml im per animal. Group-IV (n=12) served as Control with no treatment. All animals were cleaned and were Injected Ivermectin before study.

Result and Discussion

A total seven animals (58.3%) became pregnant in Gp-II in this study (Table-1). Edwell et al., (2004) reported 77.1% of total pregnancy rate in cattle. In Indian condition

most of the farmers are poor and utero-ovarian massage may be a viable choice to treat their animals in anoestrus. It is not well understood how this method cause to get the animals in cyclicity. However, utero-ovarian massage may facilitate enhancement of blood circulation to the uterus and ovary (Romaniuk, 1973) and might cause activation of intrinsic ovarian factors (Lobb and Dorington 1992; Monget and Monniaux 1995).

In the present study the first service pregnancy rate was low (16.66%) in Gp-I (Table-1). However, total pregnancy rate recorded was 41.6%. Gupta et al., (2011); recorded 53.33% (8/15) total conception rate in post partum anoestrus buffaloes. Varied response reported with lugol's iodine infusion by Agarwal and Pandit, 1991; Reddy et al., 1994; Megahed et al., 1995; Kendre and Bhosker, 1996; Tapas et al., 2000; and Tomar 2004; However, our results were in close agreement with the findings of Porwal et al., 1976; and Reddy et al., 1994 (each 50%).

Table -1. Summary of response and pregnancy results in treated and control buffalo heifers

Group and no. of Animals	Animals responded in % and No.	Animals be came Pregnant in First Service % and No.	Total Pregnancy (%) and No. of animals
1. Intra -uterine Lugol's Solution (n=12)	58.3 (7/12)	16.66 (2/12)	41.66 (5/12)
2. Utero -Ovarian Massage (n=12)	83.3 (10/12)	33.3 (4/12)	58.3 (7/12)
3. GnRH (n=12)	41.6 (5/ 12)	16.66 (2/12)	25 (3/12)
4. Control (n=12)	50 (6/12)	33.3 (4/12)	50 (6/12)

The intrauterine infusion of lugol's solution may possibly stimulate uterine tone and motility (Roberts, 1971). It enhances blood circulation in uterus and cause hyperemia of utero-mucosa. That consequently leads to high degree of drug absorption. The absorbed iodine may stimulate production of thyroid hormones which cause increased metabolic rate of body (Sanchez, 1995) and that could be a triggering factor of ovarian function since one of the main causes of anoestrus is energy utilization imbalance (Short et al., 1990).

Single injection of synthetic analogue of GnRH, Buserelin administered was not effective to induce cyclicity in buffaloes in the present study and in dairy cows (Gupta et al; 2010) in earlier study. The pregnancy rates were also not encouraging. However, Edwell et al., (2004) reported 66.7% total pregnancy rate in a similar experiment in cattle. However, a total pregnancy rate recorded in control group was 50%.

Conclusion: The present study reveals that the GnRH injection may not be effective to treat the anoestrus buffaloes. However, utero-ovarian massage and infusion of lugol's solution in uterus were more effective means of to treat anestrous buffaloes. So, these two alternative methods can be tried in remote and countryside for disadvantaged farmers.

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Agency & Milch Livestock Improvement Society, Solan H.P. for providing facility to conduct the experiment.

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NUTRITIONAL MANAGEMENT OF FATTY LIVER DISEASE IN RUMINANTS

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The disease, which is also known as fat cow syndrome or hepatic lipidosis, is a metabolic disorder that can affect up to 50% of the high producing cows during the transition period. Fatty liver develops when plasma non-esterified fatty acid (NEFA) concentrations are high due to depressed feed intake and altered endocrine status associated with initiation of parturition and lactation. Almost all high-producing dairy cows are in negative energy balance in early lactation, as energy requirements exceed feed consumption capacity. Therefore, fatty liver mainly occurs in the first 4 weeks after calving, when the hepatic uptake of lipids exceeds the oxidation and secretion of lipids by the liver. As compared with other species, the bovine liver is inefficient at exporting triglyceride in very low-density lipoprotein (VLDL). This state leads to triglyceride accumulation in the liver, resulting in impaired hepatic metabolism and liver becomes fatty. Fatty liver is associated with lower milk yields, depressed appetite, increased incidences of milk fever, ketosis, mastitis, retained fetal membranes etc. and reduced fertility. Cows that are over-conditioned at calving are most likely to develop fatty liver. Cows that develop fatty liver at calving are more susceptible to ketosis.

Nutrition Therapy: Repeated intravenous administration of 500ml of 50% glucose/ dextrose is commonly used in dairy practice and it can be combined with oral administration of 250 ml propylene glycol twice a day. The sodium propionate can provide propionic acid which is the chief source of energy. Administer orally 12 g of niacin daily for one to two weeks and parentally 1 to 6 mg of Vitamin B_{12}.

Nutritional prevention: Reducing severity and duration of negative energy balance is crucial in the prevention of fatty liver. This can be achieved by avoiding over-conditioning cattle, rapid diet changes, unpalatable feeds, periparturient diseases and environmental stress. Feed balanced ration with respect to energy, protein, minerals and vitamins to the dairy animals. Cows should not be starved or overfed at calving. Oral administration of 400-700ml of propylene glycol per day during the final week prepartum has been effective in reducing plasma NEFA and the severity of fatty liver at calving. Propylene glycol can be fed, but feeding may not be as effective if the full dose is not consumed in a short period of time. Glycerin may be a less expensive alternative to propylene glycol. The supply of sodium propionate (100g daily for 6 weeks) at calving may be included in problematic herds. Sodium propionate is also a glucose precursor, but feeding can cause a depression in feed intake and reduce efficacy. Slow-release insulin compound (single 100 IU IM dose) immediately after calving may be used as prophylactic as it decreases lipid mobilization from adipose tissue. Feed 6-8g/cow/day niacin orally starting 20 days prior to expected calving and continuing for 3 months postpartum.

Minimizing stress is important for prevention of fatty liver. Sudden changes in environment i.e. changes in ration, housing, temperature, herd mates, etc. should be avoided. Because it may cause a reduction in feed intake and trigger catecholamine-mediated increases in fat mobilization.

HEAVY METALS IN FOOD OF ANIMAL ORIGIN

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A heavy metal is any metal or metalloid of environmental concern. Commonly encountered heavy metals are chromium, cobalt, nickel, copper, zinc, arsenic, selenium, silver, cadmium, antimony, mercury, thallium and lead. Out of them Lead (Pb), cadmium (Cd), mercury (Hg), and arsenic (As) are widely dispersed in the environment.

Contamination sources

- Accidental mixing of food with metallic compounds such as arsenic oxides, Barium carbonate, Lead arsenate and others.
- Dissolution of metallic food container while cooking or storage.
- Treatment of the food with metallic pesticides or excess food additives to prevent infection and spoilage as well as to secure special effects.
- The presence of some metals naturally in the food. Eg: Marine food
- High ambient air concentrations near emission sources.

Entry routes

Heavy metals enter plant, animal and human tissues via air inhalation, diet and manual handling. Motor vehicle emissions are a major source of airborne contaminants including arsenic, cadmium, cobalt, nickel, lead, antimony, vanadium, zinc, platinum, palladium and rhodium. Water sources (groundwater, lakes, streams and rivers) can be polluted by heavy metals leaching from industrial and consumer waste; acid rain can exacerbate this process by releasing heavy metals trapped in soils. Plants are exposed to heavy metals through the uptake of water; animals eat these plants; ingestion of plant- and animal-based foods are the largest sources of heavy metals in humans. Absorption through skin contact, for example from contact with soil, is another potential source of heavy metal contamination. Heavy metals can accumulate in organisms as they are hard to metabolize (process and eliminate).

Detrimental effects

Heavy metals can bind to vital cellular components, such as structural proteins, enzymes, and nucleic acids, and interfere with their functioning. Symptoms and effects can vary according to the metal or metal compound, and the dose involved. Broadly, long-term exposure to heavy metals can have carcinogenic, central and peripheral nervous system and circulatory effects. For humans, typical presentations associated with exposure to any of the “classical” heavy metals, or chromium (another heavy metal) or arsenic (a metalloid), are shown in the table.

Important heavy metals in food of animal origin

1. Lead: Food is one of the major sources of lead exposure; the others are air (mainly lead dust originating from petrol) and drinking water. Plant food may be contaminated with lead through its uptake from ambient air and soil; animals may then ingest the lead contaminated vegetation. In humans, lead ingestion may arise from eating lead contaminated vegetation or animal foods. Another source of ingestion is through the use of lead-containing vessels or lead-based pottery glazes. In humans, about 20 to 50% of inhaled, and 5 to 15% of ingested inorganic lead is absorbed. In contrast, about 80% of inhaled organic lead is absorbed, and ingested organic Pb is absorbed readily. Once in the bloodstream, lead is primarily distributed among blood, soft tissue, and mineralizing tissue. The bones and teeth of adults contain more than 95% of the total body burden of lead. Children are particularly sensitive to this metal because of their more rapid growth rate and metabolism, with critical effects in the developing nervous system.

2. **Cadmium:** The use of cadmium by man is relatively recent and it is only with its increasing technological use in the last few decades that serious consideration has been given to cadmium as a possible contaminant. Cadmium is naturally present in the environment: in air, soils, sediments and even in unpolluted seawater. Cadmium is emitted to air by mines, metal smelters and industries using cadmium compounds for alloys, batteries, pigments and in plastics, although many countries have stringent controls in place on such emissions.

Tobacco smoke is one of the largest single sources of cadmium exposure in humans. Tobacco in all of its forms contains appreciable amounts of the metal. Because the absorption of cadmium from the lungs is much greater than from the gastrointestinal tract, smoking contributes significantly to the total body burden.

In general, for non-smokers and non-occupationally exposed workers, food products account for most of the human exposure burden to cadmium. In food, only inorganic cadmium salts are present. Organic cadmium compounds are very unstable. In contrast to lead and mercury ions, cadmium ions are readily absorbed by plants. They are equally distributed over the plant. Cadmium is taken up through the roots of plants to edible leaves, fruits and seeds. During the growth of grains such as wheat and rice, cadmium taken from the soil is concentrated in the core of the kernel. Cadmium also accumulates in animal milk and fatty tissues. Therefore, people are exposed to cadmium when consuming plant- and animal-based foods. Seafood, such as molluscs and crustaceans, can be also a source of cadmium.

Cadmium accumulates in the human body affecting negatively several organs: liver, kidney, lung, bones, placenta, brain and the central nervous system. Other damages that have been observed include reproductive, and development toxicity, hepatic, hematological and immunological effects.

3. Mercury: Mercury is one of the most toxic heavy metals in the environment. Man released mercury into the environment by the actions of the agriculture industry (fungicides, seed preservatives), by pharmaceuticals, as pulp and paper preservatives, catalysts in organic syntheses, in thermometers and batteries, in amalgams and in chlorine and caustic soda production. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus.Higher levels are often found in marine

foods. Up to 90% of most organic mercury compounds are absorbed from food.

4. Arsenic: Arsenic is a metalloid. It is rarely found as a free element in the natural environment, but more commonly as a component of sulphur-containing ores in which it occurs as metal arsenides. Arsenic is quite widely distributed in natural waters and is often associated with geological sources, but in some locations anthropogenic inputs, such as the use of arsenical insecticides and the combustion of fossil fuels, can be extremely important additional sources.

Inorganic arsenic is considered carcinogenic and is related mainly to lung, kidney, bladder, and skin disorders. The toxicity of arsenic in its inorganic form has been known for decades under the following forms: acute toxicity, subchronic toxicity, genetic toxicity, developmental and reproductive toxicity, immunotoxicity, biochemical and cellular toxicity, and chronic toxicity.

Drinking water is one of the primary routes of exposure of inorganic arsenic. Ingestion of groundwater with elevated arsenic concentrations and the associated human health effects are prevalent in several regions across the world. Arsenic toxicity and chronic arsenicosis is of an alarming magnitude particularly in South Asia and is a major environmental health disaster. Chronic arsenic ingestion from drinking water has been found to cause carcinogenic and non-carcinogenic health effects in humans. The growing awareness of arsenic-related health problems has led to a rethinking of the acceptable concentration in drinking water.

In foods, the major source of arsenic is mainly fish and seafood. The organic arsenic in food and seafood appears to be much less toxic than the inorganic forms. The presence of arsenic in fish has been detected in several species such as; sardine, chub mackerel, horse mackerel, blue fish, carp, mullet tuna, and salmon.

ESTRUS SYNCHRONIZATION IS DEMAND OF TODAY'S DAIRY FARMERS IN PUNJAB

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Timely and perfect estrus detection is crucial for economic gains from animal husbandry particularly in cattle/ buffalo industry. Estrus synchronization is the best ever reproductive tool to bypass the critical problems of heat detection and curtail the expenses & shortcomings faced during detection of estrus in dairy animals.

The method is intended to allow the non-pregnant cyclic animals of a herd to come in heat together at a predetermined time through exogenous hormonal administration destined to fixed timed artificial insemination (FTAI).

Benefits of the estrus synchronization: Due to its many advantages, the technique is very much popular and is demanding among the dairy farmers. The benefits are listed as:

·Evade the necessity of heat detection. Moreover, animal in groups express better heat signs compared to single animal

·Allows large number of animals for AI at predetermined fixed time with higher reproductive efficiency and relatively at low cost.

- Reduce post-partum open days and inter calving interval
- Permits easy management of pregnant animals of same status
- Assistance during parturition can be called well in advance
- Rearing of calf crop produced at same time is easy
- Milk produced in bulk amount could fetch better prices
- Save labour cost to great extend in terms of easiness in rearing and managing animals of same reproductive status
- Semen of desired bull could be arranged in advance
- Record keeping is easy

Hormones commonly used in different heat synchronization protocols:

1. Prostaglandin (PGF2á) – Prostaglandin (PGF2á) is the foundation hormone for any synchronization protocol. Prostaglandin cause lysis of the functional corpus luteum (CL) reduces blood progesterone concentration and emerge new follicular wave so that animal come into heat within 2-4 days. Prostaglandin work in presence of CL that is why it is useful for synchronization only of cyclic animals.

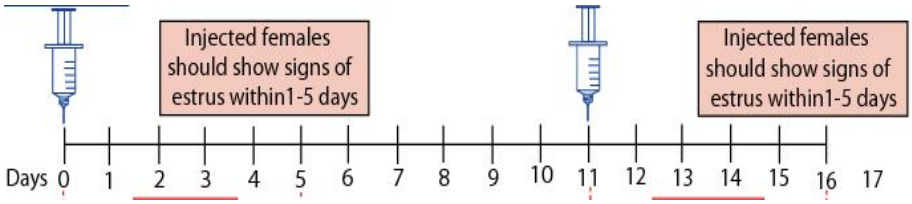
Note: Always rule out the pregnancy before administration of Prostaglandin (PGF2á).

2. Gonadotropic Releasing Hormone (GnRH) – It causes ovulation of responsive follicle and thereby help in follicular wave emergence in ovaries.

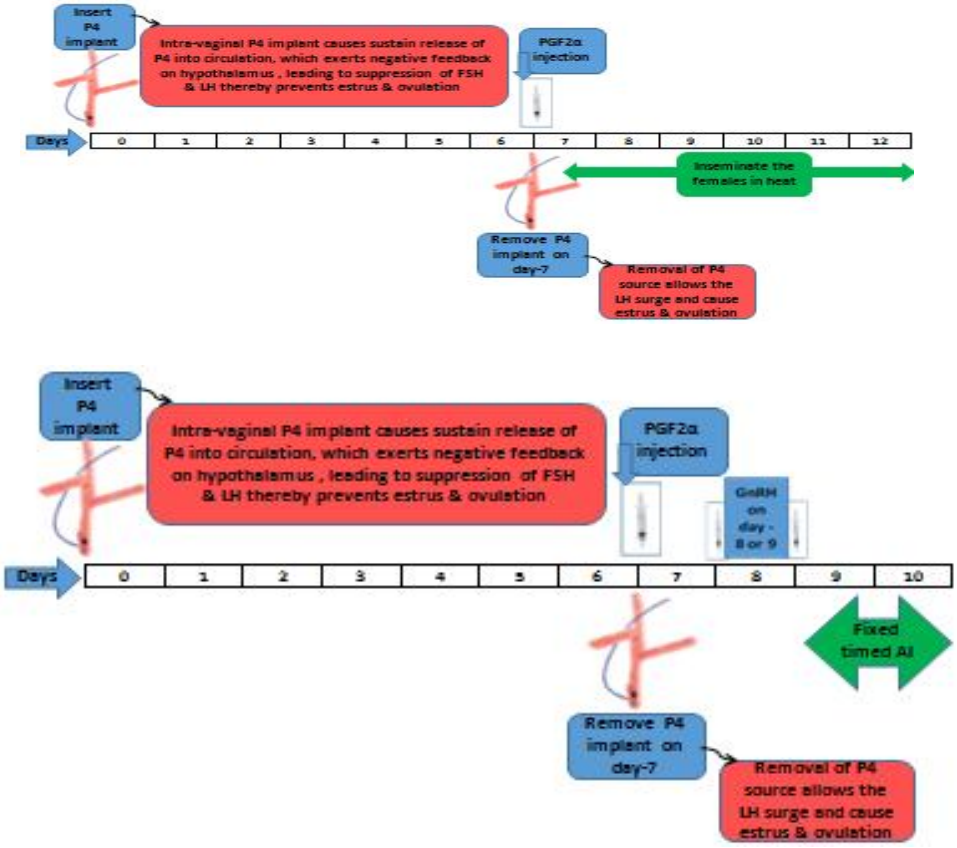
3. Progesterone/ progestins – progestins are available as intra-vaginal implant or in form of oral feeding. It mimic the CL and prevent the animal to come in heat in its presence. Soon after the removal of progesterone source the animal may come in heat within 4-6 days. If GnRH is administered along with the removal of progesterone, the animal come in heat at early stage and FTAI can be done. Progesterone based treatment have added advantage that the anestrus animal also come in heat.

Commonly used synchronization protocols under field: Lot many synchronization protocols are available in literature and the list is routinely expanding. From the never ending list, some of the protocols that can be easily implemented in fields are as:

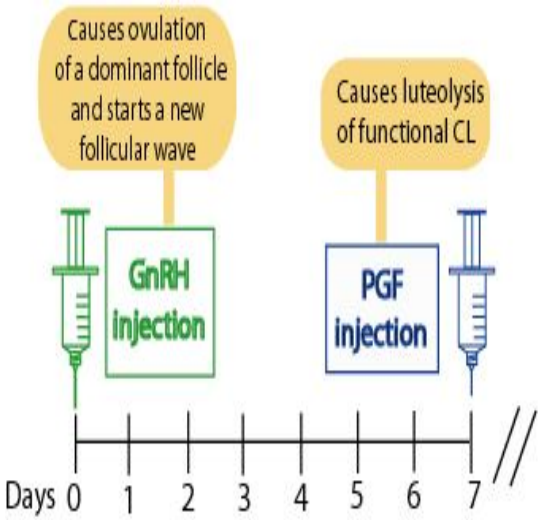
Double prostaglandin(PGF2á) protocol:



Progesterone (P4) based protocols:

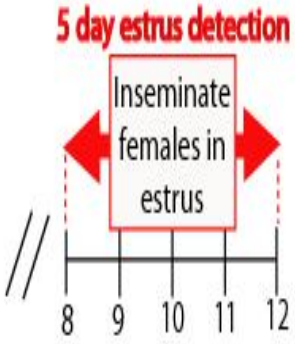


Gonadotropin (GnRH) synchronization protocols:

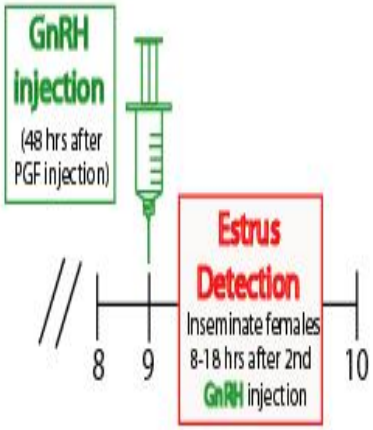


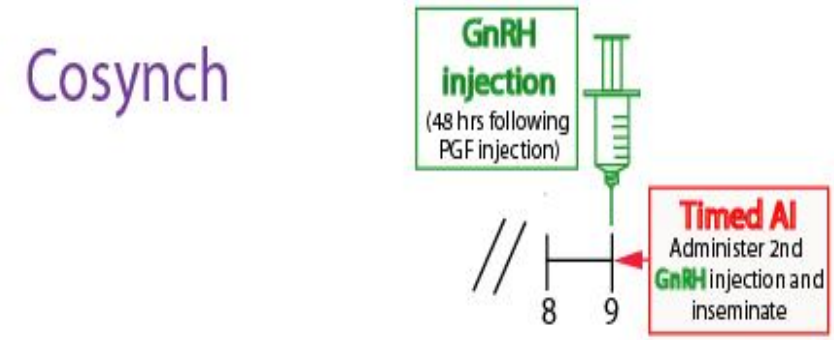
Basic GnRH synchronization protocols (Select Synch, Ovsynch, Cosynch) begin with the same format of an initial GnRH injection followed by a PGF injection 7 days later. Differences are derived from timing of insemination, estrus detection, parity, and hormone administration.

Select Synch



Ovsynch





Steps to execute estrus synchronization protocol

To achieve best out of any synchronization protocol, each of the following steps should be implemented with utmost care:

1. Selection of animal
2. Selection of synchronization protocol
3. Artificial insemination
4. Pregnancy diagnosis

1. Selection of animal

·Female should be in positive energy balance before subjected to any hormonal treatment. Deworming, *ad-libtum* water, adequate energy, protein, vitamins and mineral mixture should be supplemented as per required schedule.

- Pregnancy should be ruled out, and prefer animal with normal cyclicity, healthy genitalia
- Heifer if selected should be able to parturate normally without facing dystocia
- Body condition score (BCS) for parous animal should be above 3.0 and for heifer should be above 2.5 in scale of 1-5.
- Prior to breeding post-partum sexual rest of 60 days is must
- Irregular estrus, prolonged estrus, anestrus, silent estrus, cystic animal should be treated accordingly

2. Selection of synchronization protocol

- It mainly depends on economic status and expectations of owner
- For any protocol, it should be started such that AI must fall on working day and in cooler time of day

3. Artificial insemination (AI)

- Fixed timed AI is required in most of the synchronization protocols
- Inseminator should be expert to do AI in body of uterus
- Precaution are utmost during thawing, loading of AI gun and hygiene is mandate during AI

4. Pregnancy diagnosis (PD)

- At the earliest do pregnancy diagnosis and separate the non-pregnant animal so that they can be resynchronize to reduce the days open.

Precautions: For better implementation of any synchronization protocol and to achieve maximum out of them, following precautions should be taken:

- Avoid any synchronization protocol in summer months and AI during hot hours of day.
- Not necessary to inseminate each and every synchronized animal: animal with infected discharge should never be inseminated rather treat accordingly.
- Due precautions are mandate in thawing of semen and during AI.

RISK OF OCCUPATIONAL ZOONOSES IN VETERINARIANS AND INFECTION CONTROL PRACTICES

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Zoonoses are the diseases and infections that are naturally transmitted between vertebrate, animals and man. Most of the zoonoses diagnosed are transmitted by close contact of man with these animals and are, more often, occupational diseases that principally affect breeders, veterinarians and/or slaughterhouse workers. Zoonotic disease risks and infection control practices in public and private research, public health, clinical and diagnostic laboratories, and in animal care facilities has expanded all over the world. For all the zoonotic diseases, veterinarians played a key role and so the laboratory training is an essential tool and competency to meet the challenge of emerging zoonoses.

The fact that people working with animals or their products may contract some infections has been known for centuries, before the introduction of the concept of "zoonoses". *Anthrax* and glanders are the occupational zoonoses most cited in historical references. More than 200 diseases are known to be transmittable from animals to humans. These zoonoses are considered as a major occupational health risk among veterinarians and animal handlers. In order to prevent possible pathogen transmission, precaution measures for workers, veterinarians and animals are important, as well as institutional hygiene.

The essential role of animals in the transmission of infectious diseases has long been recognised. Not only were animals known to be responsible for the maintenance of infections in nature by harbouring and enabling pathogens to survive; animals were also found to be an active cause of pathogen spread in the environment and to other animals, including man.

Although the profession of veterinarians is exciting, it is also invariably challenging since it exposes them to numerous health-related risks in their day to day activities. A wide variety of health risks are usually encountered by veterinarians viz. animal bites, back injuries, infections, adverse exposure to anaesthetic gases, needle stick injuries and even mortalities in certain cases. The exposure to zoonotic diseases is one of the most important of such health risks for veterinarians by virtue of their occupation which demands a close association with animals. There are about 1415 infectious agents causing diseases in humans, out of which 868 (61%) are known to be zoonotic in nature. Animals act as reservoirs for several zoonotic diseases which could be bacterial, rickettsial, chlamydial, mycotic, viral and parasitic in their etiology (Table 1). It has been documented that more than 60% of the emerging human infectious diseases are zoonotic in nature.

In India, zoonotic diseases viz. leptospirosis, rabies, Japanese encephalitis, anthrax, brucellosis, bovine tuberculosis, cysticercosis, rickettsial infections and salmonellosis have been identified as 'priority zoonoses' which are to be targeted for their prevention and control.

Veterinarians and technical staff come in direct contact with animals during clinical examination, blood collection, biopsy procedure, surgery, hand rearing of new born animals and post-mortem examinations. These occupational interventions leave them exposed to the risk of contracting zoonotic diseases.

Table 1: Major zoonotic diseases

Agents	Zoonotic Diseases
Bacteria, Rickettsia and Chlamydia	Anthrax, Brucellosis, Tuberculosis, Melioidosis, Tetanus, Leptospirosis, Salmonellosis, Campylobacteriosis, Colibacillosis, Ehrlichiosis, Lyme disease, Pasteurellosis, Plague, Q fever, Tularemia, Typhus, Psittacosis, Murine typhus, Relapsing fever, Rocky mountain spotted fever etc.
Fungi	Aspergillosis, Coccidioidomycosis, Cryptococcosis, Dermatophytosis, Histoplasmosis etc.
Viruses	Colorado tick fever, Contagious ecthyma (Orf), Buffalo pox, Crimean-Congo haemorrhagic fever, Equine encephalomyelitis, Foot-and-mouth disease, Hantavirus pulmonary syndrome, Hendra virus infection, Hepatitis E, Influenza type A, Japanese encephalitis, Kyasanur forest disease, Louping ill, Lymphocytic choriomeningitis, Murray Valley encephalitis, Newcastle disease, Nipah virus infection, Rabies, Rift Valley fever, Russian spring-summer encephalitis, St. Louis encephalitis, Tanapox, Viral Haemorrhagic Fevers, West Nile fever, Yabapox, Yellow fever etc.
Parasites	Babesiosis, Balantidiasis, Coenuriasis, Cryptosporidiosis, Cutaneous larva migrans, Dirofilariasis, Giardiasis, Echinococcosis, Leishmaniasis, Malaria of nonhuman primates, Malayan filariasis, Taeniasis, Toxoplasmosis, Trichinellosis, Trypanosomiasis, Visceral larva migrans etc.

It is not uncommon for a veterinarian to get bitten by animals. Procedures like restraint and clinical examination involve inherent risk of scratches and bites. Such scratches and wounds inflicted by diseased animals may prove fatal, if neglected. Several mammals including animals are reservoirs for rabies. In India animal's viz. mongoose, jackals and monkeys act as reservoirs of rabies. Other major diseases which spread through animal bites are tularemia and simian B herpes virus.

Unlike humans, animals are not highly cooperative during clinical procedures. Thus, it is not surprising for a veterinarian to get accidental needle stick injuries. Needle stick injuries can lead to staphylococcus infection, herpesvirus simiae infection and blastomycosis.

Tuberculosis, an ancient disease, is the cause of death of several people in India annually. Many species of non-human primates and birds have been implicated as sources of tuberculosis infection to livestock professionals. Epidemiological reports which are suggestive of animal to human and human to animal transmission of tubercle bacilli are also

available indicating the potential risk to veterinarians and other staff.

Infection control strategies for veterinarians and staff

Prevention of zoonotic diseases involves recognition and quarantine of infected animals, personal hygiene, and environmental disinfection. The management of occupational health risks in veterinary practices is an important issue and failing in active health risk management systems could be due to lack of training to ensure competence with responsibilities. An increase in awareness that some of these diseases may be associated with animals could provide a better plan for the prevention and treatment of common and uncommon zoonotic infections.

Because of the close proximity with animals, often time's vets and staff become the victims of the zoonotic pathogens. It is important to know that since past few decades many of the zoonotic pathogens have emerged resulting in grave consequences. Hence, veterinarians and handlers must have sound knowledge regarding zoonotic diseases, particularly with respect to reservoirs, transmission, clinical symptoms and their prevention and control measures. Proper physical and chemical restraint of animals is necessary to avoid fear, apprehension and bites. Mandatory use of personal protective equipment like gloves, mask, face shield, apron while performing veterinary procedures and during cleaning of animal enclosures should be strictly enforced. Veterinarians and other staff coming in contact with animals must receive prophylactic vaccination against infectious diseases like rabies, tetanus influenza, hepatitis A and B. Well trained personnel and establishment of a network of laboratories for rapid diagnosis of zoonotic diseases is necessary at regional and national levels.

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STRANGLES

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Strangles is one of the most common respiratory illnesses in horses .It is an upper respiratory disease of horses caused by the bacteria *Streptococcus equi subspecies equi* (S. equi). It causes a distinctive swelling under the jaw and around the neck, which lead to name the disease "strangles". Although strangles is not generally fatal, and most horses recover fully, there are the occasional complications that can lead to death.

Causes of Strangles

Strangles is caused by a transmissible bacterium called *Streptococcus equi.* The bacteria can easily be carried from horse to horse, by human hands and clothing, and persist on stable surfaces for weeks. Young horses are more susceptible to strangles than mature horses over five years of age, although horses can get infected with strangles at any age, especially if their immune system is weak.

Clinical SIgns

In typical cases, horses develop a high fever, are depressed, and develop a clear nasal discharge that becomes thick and white. The mandibular and retropharyngeal lymph nodes are initially firm but become fluctuant and swollen. The swelling under the throat may become so severe that the horse has difficulty swallowing or difficulty breathing. The lymph nodes rupture at 7 to 10 days after the onset of signs. Ruptured lymph nodes drain a white to yellow pus for several days. A soft moist cough may be heard in some horses. The average course of the syndrome is 23 days from exposure to resolution. The incubation period ranges from 2 to 6 days after exposure to the bacteria.

Some horses that develop the disease will resolve and the horse will be completely normal, some of the horses will develop serious complications, and some will become asymptomatic carriers. Possible resulting complications include internal abscessation of the abdomen or of other organs (often called Bastard Strangles).. The horse may have a history of intermittent colic, periodic fever, anorexia, depression, and weight loss.

Another symptom is Purpura hemorrhagica. This is the most devastating and the most dangerous potential complication. Purpura hemorrhagica causes severe inflammation to the blood vessels called vasculitis. Horses with purpura develop swelling of the limbs, head, and trunk. Death may occur as a result of pneumonia, cardiac arrhythmias, renal failure, or gastrointestinal disorders. Strangles also leads to guttural pouch empyema and chondroid formation. There is a large sac in the throat latch called the guttural pouch. This sac can become filled with pus. Sometimes the pus will develop into hard masses called chondroids. These horses can become asymptomatic carriers.

Epidemiology

The infection occurs primarily in horses 1 to 5 years old. In susceptible equine populations, morbidity is nearly100%. The mortality is low (up to 10%) if appropriate therapy is given.

The organism is transmitted

1.Via direct contact with nasal secretions or lymph node discharges from infected horses

2. Via exposure to fomites such as contaminated equipment, pails, halters, leads, brushes, clothing, horse vans, or stalls.

3.Via exposure to asymptomatic carriers.

Fortunately S. equi is easily killed with disinfectants such as bleach, povidone-iodine, chlorhexidine, and glutaraldehyde. Any one of these disinfectants will kill the organism in the environment within 90 minutes.

Treatment

For horses exposed to the organism but not yet showing swelling of the lymph nodes, antibiotic therapy can be used to prevent seeding of the pharyngeal lymph nodes. Antimicrobial therapy should continue for as long as the horse remains exposed to the organism. Horses should be treated symptomatically until an abscess forms.

Horses that are severely systemically ill or that develop complications such as difficulty in swallowing or respiratory distress require supportive care in addition to high levels of intravenous antibiotics. This therapy may entail intravenous fluid therapy, a tracheotomy, non-steroidal anti-inflammatory drugs, and feeding via a nasogastric tube.

Prevention

Prevent spread of infection to horses on other premises and to new arrivals by immediately stopping all movement of horses on and off the premises. Owners can identify symptomatic and asymptomatic carriers by sampling nasopharygneal or guttural pouch regions. Isolate infectious horses from those screened negative for S. equi. Disinfect stalls, aisles, and equipment.

Vaccination

Vaccines are available, but so far, their life span is very short so they effective only in the short term. Foals should be vaccinated with intranasal vaccines at five and six months of age. Adult horses with any risk of exposure to strangles should be vaccinated yearly with the intranasal vaccine.

If a horse is suspected to have strangles quarantine is necessary. Any new horse to a stable should be kept separate to make sure it has no diseases to pass along. Anything that comes in contact with a sick horse, equipment including feed and water buckets, brushes, blankets, human hands should be well cleaned. Care should be taken as it is said prevention is better than cure.

SIGNIFICANCE OF BYPASS PROTEIN IN ANIMAL NUTRITION

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Some of the crude protein fed to cows is degraded by rumen microbes to peptides, amino acids and ammonia. This degradable protein is channelized into microbial protein synthesis in the rumen, which flows to the small intestine, where it is digested and absorbed. The rest of the crude protein escapes microbial breakdown in the rumen. This undegradable intake protein is commonly called escape or bypass protein. Bypass proteins are defined as the portion of the protein from a feedstuff that escapes from being broken down in the rumen by microbes and passes into the small intestine intact where it is then digested by enzymes and utilized by the animal as a source of protein. All cows require adequate amounts of degradable protein for proper fiber and starch digestion in the rumen, and flow of microbial protein from the rumen. Hgh-producing cows require extra bypass protein, because the amount of protein supplied by microbial synthesis flowing into the small intestine does not meet their needs. Rations for high-producing, early lactation cows should contain at least 18% crude protein with 35% to 38% of the crude protein as bypass protein. The use of bypass proteins is only beneficial when the animal's requirement for protein (amino acids) is not being met i.e. fast growing animals, transition cows and high yielders.

Bypass protein is important because a large percentage of the rumen degradable protein is converted into ammonia, which if in high concentrations, can be lost through the urine as urea. In high-producing animals this represents an inefficient utilization of protein, so increasing the amount of bypass protein constitutes a more efficient utilization of protein for growing or lactating animals on high-quality pastures. In forages, roughly 20 to 30 percent of the protein taken in by the animal is bypassed to the intestines. Lactating or growing cattle generally require 32 to 38 percent of their total protein intake to be in the un-degradable form. The protein supplements could be categorized as high (60-80%), intermediate (30-60%) and low (10-30%) bypass sources. Roasted soybean meal, corn gluten meal, blood meal and meat meal are belongs to first category, cotton seed meal, lin seed meal and dehydrated alfalfa to second category whereas soybean meal, groundnut cake, mustard cake and sunflower cake to third category. The microbial degradation of protein is an energy-dependant process. Generally more microbial protein is synthesized from green forage diets than from hay or mature forage diets. When a ruminant animal grazes fresh forage on high-quality pasture, about 70 percent of the protein is degraded in the rumen by microorganisms, and about 30 percent escapes to the small intestine for absorption. Ruminant animals need approximately 65 to 68 percent of the protein to be rumen degradable for adequate rumen function and the development of microbial protein. But if more protein is degraded in the rumen, less is available to the animal for absorption in the small intestine. This is important because researchers believe that rumen un-degradable or bypass protein consists of certain essential amino acids that are missing or deficient in rumen degradable protein. Much of the rumen degraded protein is absorbed as ammonia and excreted out of the body via the urine, and is therefore a waste of protein. This is why bypass or undegradable protein is important, especially for high-producing livestock such

as dairy animals, even in protein-rich-pasture diets.

Methods of protein protection

The methods which are used to modify protein supplements like soybean meal, groundnut cake, mustard cake etc. to rumen undegradable proteins, are heat treatment, chemical treatment, encapsulation, use of amino acid analogues, selective manipulation of balances of rumen metabolic pathways and oesophegeal groove closure. The main methods used to protect the proteins are heat treatment and formaldehyde treatment. The roasting of soybean at 140°C for 30 minutes protected its protein from ruminal degradation. But over heating may decrease the availability of amino acids like lysine, arginine and cystine in animal body. So high pressure steam treatment is better way to protect proteins as it not only increases the bypass protein content of soyabean but also increases its digestibility. Extraction of oil from oil seed cakes at different temperatures may also lead to increase in bypass protein content. Formaldehyde treatment may also used to reduce the protein degradability of protein supplements in the rumen. The optimum level of formaldehyde (40%) recommended is different for different sources e.g. protein supplement (1-1.5%), for hay (1.5-2.0%) and for silage (3-5%). The protein supplement is sprayed with formalin solution, mixed and kept in plastic bags/silos for 3-5 days. The other aldehydes like acetaldehyde, glutaraldehyde or glyoxal are also effective in protecting proteins but are not as cost effective as formaldehyde.

Benefits of bypass protein feeding

The main benefit of bypass protein is that the original amino acids in the protein meal are absorbed in the small intestine instead of converted to microbial protein in the rumen, thereby providing a different balance of essential amino acids for better animal nutrition hence, production. Another benefit of feeding meals with high bypass protein is that the portion of the protein that is rumen degradable breaks down in the rumen very slowly. This allows animals to source small amounts of protein over longer periods for microbial protein production, long after urea has been degraded and used in the rumen by the animals. Small quantities of bypass protein fed at strategic times, have an enormously beneficial effect on production. Bypass protein also provides an important protein source when the animal's requirements for protein exceed those provided by microbial protein.

Characteristics considered desirable for bypass protein supplements

a) High level of crude protein

b) Optimal essential amino acids profile

c) About 70-75% of the protein to be in rumen un-degradable form

d) Approximately 80% of the rumen un-degradable protein to be digestible in the small intestine

Reasons for variable production responses to bypass protein feeding

a) Protein requirements of target group may be met either from feed or from mobilizing body proteins or protein might not be the first limiting factor for milk production in that group.

b) Bypass protein supplementation may not lead to fulfill the first limiting amino acid required for milk production.

c) Improper amino acid ratios of metabolizable protein or less digestibility of bypass protein may also lead to variable production responses.

d) Use of bypass protein might cause a shortage of degradable proteins.

e) Overestimation of degradation of other supplemental proteins.

DIFFERENT METHODS TO DETECT ESTROUS FOR OPTIMUM FARM MANAGEMENT

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Estrous is fairly well defined period characterized by sexual desire and the period begins with the time of first acceptance and ends with the last acceptance of male by the female domestic animals. The estrous cycle (also oestrous cycle; derived from Latin oestrus and originally from Greek ï6óôñïò meaning sexual desire) comprises the recurring physiologic changes that are induced by reproductive hormones in most mammalian females. Estrous cycles start after puberty in sexually mature females and are interrupted by anestrous phases or pregnancies.

Efficient and profitable reproductive performance of dairy herd requires routine but conscientious heat detection and proper timing of AI. Failure to detect estrus (heat) is a major factor contributing to low fertility and prolongs the calving interval and additional expense of semen and other investment involved in management activities. For that exact estrus detection is very important to reduce the economic losses to farmer and farm owners. With the adoption of cross breeding programme and artificial insemination for improving productivity, estrus detection has become an important factor in enhancing reproductive efficiency. The accurate and efficient detection of estrus (heat) in dairy cattle is an important component of a good reproductive management program. Failure to observe cow in estrous or to detect estrous at an appropriate time results in significant losses to dairy producer and low fertility (Brit 1985). Thus poor estrous detection affects directly and indirectly the economy of farm. As individual dairy herds increase in size the problem of poor detection in estrous is amplified due to increased manpower input in dairy per cow. Thus along with visual observation and teaser parading, application of highly effective automated technique will help in enhancing the heat detection rate further.

Methods of Estrous Detection

A successful A.I. programme must incorporate efficient and accurate detection of estrous and timely artificial insemination relative to ovulation. Inefficient detection of estrous results in decreased number of calves born per animal during lifetime, excessive days open and increased culling on reproductive grounds.

A variety of methods can be used to improve the estrous detection rate:

Heat Expectancy Chart

Heat expectancy charts are special calendars used to record information. They are probably the least expensive and most valuable estrous detection aids available. The types of information recorded on the chart include signs of estrus and results from using other estrous detection aids. Information recorded on a heat expectancy chart also may be useful to a veterinarian diagnosing a cow that is a problem breeder.

Kamar Pressure-Sensitive Mount Detectors

Pressure sensitive mount detectors are probably the most commonly used estrous detection aid, other than heat expectancy chart. These devices are glued on the top line of

the rump forward toward the hooks according to the size of the cow. Sustained pressure for several seconds by the sternum of the mounting cow will expel red fluid from a small storage chamber into a larger visible plastic chamber. The detectors should be placed further forward on small cows to avoid false activation when large cows attempt to mount them. Partially triggered detectors may indicate a cow is coming into estrus.

Tail Chalk, Crayon, or Paint

These types of estrous detection aids are most commonly used in large herds. Markings 10 to 12 inches long and 2 to 3 inches wide are made across the tail head with a livestock marking crayon or heat detector paint. Tail head paint is less convenient to use than crayon but lasts longer (up to three weeks). Animal should be observed for evidence of smeared or rubbed-off markings, which indicate the animal was mounted. Markings can also be touched up at this time.

Electronic mount detectors

Mount detectors are being developed which detect and record legitimate mounts. Each detector is coded with the cow's identification number, and the information is transmitted to a computer to be stored. At regular intervals during the day, the herd manager can access the information to determine which cows were mounted at a particular time.

Chin ball marking device

Vasectomized bulls or cystic buffaloes can be used as heat detectors. If these animals are fitted with a "chin ball marker", they will mark the backs of those buffaloes which they have mounted. When the animal presses down with its chain on the back or rump region of mounted animals, a spring loaded valve in the device is opened and marking fluid is released.

Use of closed circuits television –24 hour surveliance

Television cameras, recorders and monitors are cheaper and reliable to be installed in sheds for recording mounting behaviour, time and duration of estrous to enhance reproductive efficiency. During night, there is adequate lighting and good animal identification, a continuous video recording can be made of the loofing areas of the yard. Herdsman can then rapidly scan the recording in the morning and identify cow that are in estrous.

Uses of dogs

Dogs can be trained to detect odours associated with estrous (pheromones) in cows (Kiddy et al 1978) as canine are equipped with strong olfactory system. Sources of odour are widespread throughout the genital tract, milk, urine.

Use of milk progesterone assay

Return to estrous in non pregnant cow and also the establishment of pregnancy can be anticipated by the measurement of progesterone concentration in milk samples collected during late cycle (16-21days) to assess the change/ decline in progesterone concentration.

Vaginal electrical resistance

The electrical resistance (ER) of vaginal fluids decreased during proestrus and through the estrous period. The challenge is to adapt this technology to the herd management situation. ER measurement varies among cows however monitoring relative changes within

cows during the estrous cycle can provide useful information. Once ER reading begins to decline, the cow should be probed frequently until the lowest reading is obtained. Theoretically this lowest reading coincides with the time of estrous. ER measurements have been useful to time insemination and improve conception rates, with detection efficiency ranging from 65% to 82% and accuracy between 57% and 82%.

Pedometry

It has been observed that cattle are more active during estrous and spend more time in walking and standing than resting. Electronic pedometers have been installed in commercial herds. Activity information usually obtained by an interrogation unit in the milk parlour and transmitted to a herd management program analysis. Pedometer devices are mounted on the neck or the leg of the cow. Activity is measured by mercury switch, which is activated by movement of cow. The most common method for determination of the onset of estrous is attainment of a certain threshold of relative activity compared with earlier measurements. Using a pedometer system that moniter step per hour, Arney showed a linear increase in activity during the 72 to 16 hours before estrous and during estrous. Following estrous activity decreases exponentially. Using pedometers attached to the inside of the cow's right hind leg, calculated the optimal time for insemination to be 11.8 hours after increased activity. To be most effective in determining proper timing of insemination, pedometry systems should incorporate real time data acquisition.

Types of teaser animals used for estrous detection

Use of estrous detector animals can improve estrous detection if this approach is conducted properly and used to supplement visual observations. Vasectomised or surgically altered bulls and hormonally treated animals vary in their sexual aggressiveness. Such animal have potential to increase the sexual activity in the herd. The more animals sexually active at one time, the more mounting will occur for each animal in estrous.

·Surgically altering the penis of bull in beef cattle can be used to stimulate arly postpartum estrous activity the "male effect" and then remain with the herd for enhanced estrous detection during an artificial insemination program.

·Testosterone causes increased sexual aggressiveness when injected or implanted into steers, cow or heifers. Non lactating cow or heifers, even freemartin heifers are preferred candidates for this treatment and tend to be more docile than surgically altered or vasectomised bulls.

Use of androgenised heifers, implanted with testosterone propionate and estradiol benzoate and equipped with chin ball marker for estrous detection during 30 minute period increases likelihood of detection of estrous.

To achieve goals of accurate estrous detection the management team should improve cow identification, maximize nutrition and health, provide good footing surface, maintain and use accurate records, establish employee responsibility, implement aggressive detection methods and develop estrous synchronisation programme.

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