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SOME ANATOMICAL DIFFERENCES IN STIFLE JOINT OF BUFFALO AND CATTLE

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The stifle joint is the largest and most complex and modified hinge joint. It consists of paired femorotibial and single femoropatellar articulations. The femur, tibia and patella contribute to the stability of the stifle joint, along with static and dynamic restraints of the ligaments, capsule and musculature of the joint (Simon *et al*. 2000). The structure of patella and trochlea of femur are of prime importance in providing a stable and smooth platform for patella motion along the trochlea.

Upward fixation of patella is characterized by temporary or permanent dislocation of the patella from its regular position. It causes extension of the limb and flexion of phalanges so that the animal drags the tip of the hoof. Although, there are various signs of upward fixation of patella, but the lameness immediately after the rest is most typical sign (Mondal *et al* 2013). Hereditary, nutritional deficiency, over exploitation, breed, external traumas, intense contraction of the crural triceps muscle and morphological changes in stifle joint are the major potential factors for this condition (Kofler, 1999). Cattle and buffalo both are predisposed to upward fixation of the patella but incidence is more common in buffalo than in cattle. This may be due to some differences in the anatomical structures of the stifle joint. The present study was conducted on stifle joint of cattle and buffalo to find out possible anatomical differences that can be responsible for more incidence of upward fixation of the patella in buffalo.

The distal extremity of femur, proximal extremity of tibia and patella of six buffaloes and cattle were observed. The biometrical observations were recorded on the trochlear ridges (medial and lateral) of femur, width and depth of trochlear groove, patella and tibial condyles. Two buffalo and cattle hind limbs were collected from post-mortem hall and their stifle joints were dissected. Different ligaments of joints were dissected. The length, width and thickness of patellar ligaments were measured. Patellar ligaments consisted of medial patellar, middle patellar and lateral patellar ligaments.

The biometrical observations on trochlea of femur, trochlear groove and patella of buffalo and cattle have been summarized in following table.

The medial ridge of buffalo was larger, higher and more massive than the lateral one and also than that of cattle. The trochlear surface comprised of two areas: Gliding and Resting. Resting part was larger in buffalo than cattle. In case of overextension, the patella rests on the resting part of the trochlea. The trochlear groove was shallow in buffalo than in cattle which might allow the patella to displace. Thus this shallow groove may be a predisposing factor to femoropatellar joint instability. Width of trochlear groove was narrow in buffalo than in cattle so the patella in buffalo may not follow the groove exactly and this can be another reason of femoropatellar joint instability. The length of three patellar ligaments in buffalo was more than that of cattle. It has been reported by Blackburne and Peel (1977) that if the patellar ligaments are longer than the length of the articular surface of the patella, it leads to instability of the patella in the trochlea and thus its dislocation. The space between medial and middle patellar ligament was wider in buffalo as compared to cattle. The patellar ligaments

were slightly thicker in the cattle than buffalo.

The cruciate ligaments were also longer and wider in cattle than buffalo which can be factor of more stability of joint in cattle. Cruciate ligaments along with collateral ligaments oppose rotation as well as medial and lateral deviation of the leg. The cranial cruciate ligament is at highest risk when strained in overextension of the joint, its rupture allows abnormally free forward displacement of the tibia in relation to the femur (the cranial drawer sign). The caudal cruciate ligament is at greatest risk in the flexed position of the joint and its rupture allows excessive caudal displacement of the tibia (the caudal drawer sign) (Dyce *et al*. 1996).

So from above observations it was concluded that there exits some anatomical differences in the stifle joint of cattle and buffalo. Although these are minor differences but may be predisposed to more incidence of upward fixation of patella in buffalo than cattle.

Distal extremity of femur of buffalo and cattle (Anterior and posterior side)

Tibia of buffalo

Tibia of cattle

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BUSINESS OPPORTUNITIES FOR VETERINARIANS IN INDIA

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Livestock sector was, is and shall continue to be an important sub sector of Punjab agriculture. This is evident from the large contribution of livestock sector to agriculture and allied GDP which increased from Rs 7698 crore (29 %) during 2000-01 to Rs 16676 crore (31.05 %) during 2008-09. Livestock sector in addition to regular income, provides house hold nutritional security and employment to small and marginal rural households. Till date, crops, livestock and fisheries were considered the drivers of rural Indian economy, which contributes around 32 % of the national income and provides employment to 70% of Indian working force. Declining agricultural land day by day under the various quoted pressures coupled with increase in labour cost and farm inputs, brings the animal husbandry at forefront.

India is going to usher another revolution in this millennium in the livestock sector. The sector is growing at an average annual growth rate of 4% for milk, and 6% for eggs. With per capita income growth of around 6%, the requirements by 2020 are going to be 176 million ton of milk, 4.3 million ton of eggs and 7.4 million ton for total meat. Production in 2009 was 112 million ton milk, 3.2 million ton eggs and 4.4 million ton meat. The market value of all the domesticated species in India is of the order of Rs. 45000 crores.(Patel, 2011) On the average livestock production contribution to the agricultural Gross Domestic Product (GDP) is about 25% and engages about 9% of agricultural labour force.(GOI,2012)

India's agricultural foreign trade rests heavily on livestock products. This in turn presents employment opportunities for veterinarians in the private sector to partner with livestock and livestock products businesses. Dairying in India comprises about one third of the rural incomes. Further, livestock is a security asset to be sold in times of crisis. Needless to say Livestock is the key to inclusive growth.

The role now the veterinarians have to play as **'job givers'** not as **'job seekers'**. They in turn should influence the farmers to make a transition from the former 'isolated' environment of being 'livestock producer' to 'livestock entrepreneur' doing business in a market-led outreach environment. With 70% Indians still living below global poverty standards and 8-9 per cent economic growth for last 5-6 years seems to have no relevance to the lives of these poor people. These people may get a sustainable livability through dairying indeed.

The spectacular growth of the dairy industry post-operation flood era has created tremendous demand for indigenous production of dairy equipment, increased quality standards and production of variety of dairy products. It has also given impetus to research and training professionals. Such notable expansion of the dairy industry and allied professions has opened up a big and bright career opportunity for veterinarians and other allied professionals.

The participation of private sector in veterinary profession is essential on two counts. First, India has an agrarian economy and animal husbandry contributes to more than 9% to its GDP and nearly a quarter of Agriculture GDP, whereas trained manpower in veterinary science constitutes less than 1% of the total science and technology manpower. Therefore, the economy has a higher absorption rate than the present veterinary student's growth rate. Second, the state sector needs to conserve its resources and the entry of the private sector can be allowed to fill the gap and to provide healthy competition. Also, because of heavy government interference and weak democracy at the village level co-operatives have achieved limited success in various states. To fill up the lacunae in various levels and to ensure the inclusive growth it is immediate need to privatize the veterinary profession and start privatization of livestock extension services in India. Following areas may be the choice for veterinary graduates:

Consultancy

In the global market there is greater demand of new products and improved technologies. This has created a huge gap between demand and supply of milk and milk products. Also, the market has become competitive due to expansion of dairy processing industry. To meet the growing need there is increasing demand of technical consultants to setup new dairy plants, milk procurement unit, processing units, animal health & disease control and vocational training institutes etc. it is need of the hour the consultant must be competent enough in cost estimation, project planning and communication skills. There has been very little effort to create a cadre of veterinary professionals to provide technical and professional services to farmers on a commercial scale. This holds good promise for budding vets.

Cattle and Buffalo Breeding Farm

India is a repository of a large segment of bio-diversity in domestic animals. India has 61 breeds of cattle, 19 of buffaloes, 29 of goats, 59 of sheep, 9 of horse, 3 of donkey and pig each and 18 of poultry. Although, India has the largest cattle and buffalo population in the world, the average production of Indian cattle is among the lowest in the world. Efforts have been undertaken to enhance breeding facilities through the National Cattle and Buffalo Breeding Program. However, the performance is far for satisfactory. Only a small percent (15-20%) is covered by Artificial Insemination (A.I.), rest is dependent on natural breeding; Performance of A.I. is not up to the mark. This may be the greatest opportunity to choose a breeding farm as an occupation to breed the selected Indian breeds (Preferably Sahiwal, Red Sindhi & Gir breeds of cow and Murrah, Nilli Ravi & Bhadavari breeds of buffalo).

Artificial Insemination (A. I.) sexed semen and ETT Services

Door to door delivery of AI services to the breeders with an information network may prove bigger challenges along with greater returns. The Import & marketing of frozen sexed bovine semen and embryo from high producing herds would be a profitable business indeed. Over a period of thirty years, commercial bovine embryo transfer has become a large international business and more than 500,000 embryos are produced annually worldwide. The Embryo Transfer Technology (ETT) would be useful in the production of

bulls and semen consequently in the absence of progeny testing. In AI field trials of 1,000 heifers, pregnancy rates following insemination with one million sexed, frozen sperm were reported to be 70% to 90% the rate of unsexed controls inseminated with 20 to 40 million sperm.

Information Network and Online Data Transfer

The connectivity of villages through internet and allied services have substantial potential for increasing the pace of rural development, spread of knowledge in dairy, price know-how, online training, packaging art and quality product manufacturing. Technologies and use of computers has helped the Gujarat Cooperative Milk Marketing Federation (GCMMF) –Amul- changes its rural face. Today, computers are comprehensively integrating all functions, operations and interrelationships of the organization. They have become a commercial force in influencing the market and help change management of national and international market.

Cattle Feed Plant

With the emergence of dairy farming as a commercial enterprise, the demand for cattle feed has been increasing day-by-day. This growing requirement is encouraging enterprise for educated young veterinarians to set up cattle feed unit as an economically viable venture. There is ample scope for compounded feed manufacturers as the new technology in cattle feed production viz. by-pass protein and by-pass fat is increasing milk yields and fat percentage, thus giving more benefits to animal breeders. A small feed unit of 20 tones per day production capacity on one-shift basis calls for investment of Rs. 30-35 lacs giving yearly turnover of Rs. 40-45 lacs (net profit of Rs. 20-25 lacs) .

Pharmaceuticals and Herbal Medicines

The Indian veterinary pharmaceutical industry has a potential to meet the domestic demand of drugs as the dairy and poultry are in booming state. The industry has also an added geographical advantage to export low cost veterinary formulations in developing nations like African and Asian. Indian companies may get bonanza in anthelmintics and antibiotics segments because these products enjoy maximum market share. At the same time, the interest of the western countries in this product range is shrinking due to increasing cost of input and competition there.

The market for herbal medicines is estimated to be expanding at 20% annually. Sales of medicinal plants have grown by nearly 25% in India in past ten years (1987-96), the highest rate of growth in the world but the per capita expenditure in India on medicines per annum is amongst the lowest in the world. According to Export Import Bank, the international market for medicinal plant has a growth rate of 7% per annum. India's share is only $1 billion. The annual export of medicinal plants from India is valued at Rs. 1200 million.

Nutraceuticals or Functional Food and Organics

The foods that contain biologically active components that impart health benefits beyond basic nutrition are generally referred to as nutraceuticals or functional food. The dairy industry offers food with established health-related benefits and therefore constitutes a family of natural functional food. Many lethal diseases like bovine spongiform encephalitis

(BSE) and Foot and Mouth disease (FMD) turn consumers toward organic products of meat as well as milk. Now people around the world want natural taste of food including milk and milk products and meat without any kind of adulteration or excessive processing. Organic dairy farmers are enjoying explosive growth in demand for their products. Consumers have been willing to pay premium prices in the market for certified organic dairy products. This industry now exceeds $15 billion annual revenues earning in USA.

Vocational Training and Research & Development

In India around 200 million children enter primary schools yearly but only 20 million finish class twelfth. These youths are not employable as they have neither skills nor education. To make them employable there may be a good chance to train them in dairy farm and dairy animal management particularly in villages. The vocational training institute for dairy management may be a good source of income for a veterinarian along with other allied sectors. Only 5% of the young people between 20 and 24 years old in developing nations are given vocational training as compared to 60-80% in developed countries. National Dairy Development Board is imparting training on Artificial Insemination to thousands of youth. They work in villages and earn their livelihoods.

Milk Processing Industry

Milk processing is a sunrise industry. About 35% of milk produced in India is processed. The market size of processed products in the organized (large scale dairy plants) and unorganized sector (Halwais and vendors) is estimated at Rs 255 billion and Rs 906 billion respectively. Milk processing capacity has been growing at the rate of 4% for the last 6 years. There is huge potential for processing and value addition, particularly in ethnic Indian products, which are largely sold in unbranded form in the market.

Milk and Milk Products

The Indian milk products provide a platform to the industry to take a quantum leap into an exciting future through diversifying into the production of hygienic and quality traditional milk products. The health conscious consumers are tending to avoid products with high sugar content. There is high demand of probiotic food –the food containing live microorganisms believed to actively enhance health by improving the balance of micro flora in the gut. The demand for traditional milk products peaks during the winter months that coincide with India's major festivals like Dushera-Diwali, as well as weddings. These are celebrated with exchange of sweets. A dairy plant to manufacture traditional milk products can be established at a suitable location with a capacity to handle 20,000 liters milk per day. It may require investment of 5 crores, depending upon the nature of the product mix. Biotechnological innovations towards improved starter culture for fermented dairy products, raw milk preservation, production of food grade preservatives, biomass lipid and protein products and dairy waste processing have a long lasting impact on dairy processing activities. Application of various enzymes in dairy processing is another area of special interest.

Milk Products Packaging Materials

Packaging industry is one of the fastest growing industries in India which has its influence on other industries directly or indirectly. It needs up gradation of technologies for

traditional dairy products packaging as demand for packaged dairy products of assured quality and shelf half life will have expanding market. The packaging industry continued to grow @15-20%. However, India's per capita packaging consumption is less than world wide average. This shows the kind of potential the industry offers. There is a lot of scope of innovation in the area of eco-friendly food packaging materials to store liquid food and the other perishable items under room temperature for months.

Poultry Industry: It is estimated that, at present, Indian Poultry Industry contribution to the GDP is about Rs 80 billion which is likely to reach Rs. 350 billion by the Year 2010. Poultry provides employment to about 1.5 million people. Poultry has a potential for producing many value added products like Whole egg powder, albumen flakes, yolk powder and natural yellow pigment from yolk, lecithin and avidin from eggs used in pharmaceutical industry. Lysozyme, chicken soup, chicken essence, nuggets, kababs, hot-dogs, frankfurters etc. The National Committee on Human Nutrition in India has recommended per capita of 180 eggs (about one egg every two days) and 10.8 kg meat. To meet this target, it is estimated that by year 2010, the requirements will be 180 billion eggs and 9.1 billion kg poultry meat while the estimated production may only be around 46.2 billion eggs and 3.04 billion kg poultry meat. This shows that there is a tremendous scope for growth. With rapid urbanization, and increasing demand from the present 250 million economically strong, consumer market base (which is likely to go up to 350 million by year 2010), there is bright future for this industry in India.

Poultry Meat: The annual growth rate is 12-15% in the broiler industry in India. It also produces 530 million broilers per year. The annual per capita consumption of poultry meat in India is 630 grams which is far from below the world average of 5.9 kg meat. Chicken is the most widely accepted meat in India. Unlike beef or pork, it does not have a religious taboo. The prices of chicken meat are lower than those of mutton and chevon. The demand in Gulf (West Asia) is 60,000 tons of frozen chicken per month. In Kuwait, the firm sells 1000 metric tons per month. One of the challenging problems faced by the Indian exporters so far is that the export demands are in huge quantities while the quantity available for export per lot from India is very small due to fragmented small sized farms with little or no facility for processing, refrigeration and marketing with infrastructure for maintaining a cold chain during the transportation of products.

Eggs: The annual growth rate is 8-10% in egg. With the annual production of 33 billion eggs, India is the fifth world's largest egg producing country. The annual per capita consumption in India is only 33 eggs. This is much lower as compared to the world average of 124 eggs. Eggs come to Gulf market from India, Holland and USA. In Dubai, our major sales are in the institutional market i.e. hotels, restaurants and caterers. Retail stores prefer eggs from Europe and USA. Indian eggs are perceived as of lower quality and are quoted for USD 2 to 3 less per carton (360 eggs) than the eggs from Europe and USA. We need to improve skills in getting higher productivity per bird and reduce cost of production of egg, develop "quality", grading, branding, packaging, preservation and transportation of exported table eggs. There is a scope to invest for creating this facility.

Pet Business: It's not hard to figure out why pets are so pampered and integral to people's lives. They bring us joy, they love us unconditionally, and they even lower our blood pressure and give us a sense of well-being. They also fill the aching void left when children leave the

nest or a spouse dies; for childless couples, a pet is "someone" on whom to lavish affection and gifts. Many people consider their pets their "kids," and even relate to them better than they do to people.

There are different types of pet-products and pet-service businesses that are in demand today: pet sitting/dog walking, dog breeding and training, pet grooming pet-food and dog accessories. Each of these businesses can be started as home based enterprises with a fairly low financial investment. Two can be started as strictly internet businesses to really keep costs low. And all of them can be launched and run successfully by the owner, without any assistance from employees.

Conclusion

Animal husbandry sector is almost untouched by the professionals in respect of its adoption as business. The time has come to think seriously on the development of livestock sector in India. In the era of globalization the professionals especially veterinary graduates and post graduates must think and take initiative in the new domain. They should play an active role as job givers not job seekers. One aspect of this phenomenon would be that we will get the opportunity to utilize our wider skills and knowledge in the area. The other aspect of this exercise will be dissemination of knowledge to human society either directly or indirectly for their better health, better utilization of resources and the most important is reduced per unit cost of production and increased productivity and employment generation.

OBITUARY

Dr. Harpal Singh Sandhu, former Dean, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana passed away on the night of 16, Nov. 2016, Wednesday. Born in 1959 at Bilaspur (Chattisgarh) he did his B.V.Sc. & A.H., M.V.Sc. and Ph.D. from Punjab Agricultural University, Ludhiana. His field of specialization was Veterinary Pharmacology & Toxicology. An academician par excellence, he served about 32 years in teaching, research and extension. Dr Sandhu also served as Head, Department of Veterinary Pharmacology and Toxicology. He was decorated with several National Awards. He was an excellent teacher and his book on Pharmacology is the most popular and liked book by the students of veterinary profession. Veterinary fraternity of the India is under totally shock due to untimely demise of Dr. Sandhu.

CLASSICAL SWINE FEVER-DREADLY DISEASE IN PIGS

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Classical swine fever (CSF), also known as hog cholera is a highly contagious viral disease of swine characterized by hemorrhages in internal organs in acute form and button ulcer in intestine in chronic form. It is the most important devastating disease responsible for very high morbidity, mortality, mummification of fetuses and abortions, thus leading to huge economic losses to pig owners. The disease is worldwide in distribution and has been reported frequently from various parts of India.

Etiology

Classical swine fever is caused by RNA virus belonging to the genus *Pestivirus* of the family Flaviviridae. Currently only one serotype of CSF virus is recognized, although antigenic variation has been reported. Virus is closely related to the ruminant pestiviruses causing bovine viral diarrhoea and border disease in sheep.

The virus is partially resistant to heat, readily killed by cooking, inactivated by most disinfectants (most suitable are 1-2% sodium hydroxide and 4% anhydrous sodium carbonate), pH less than 3.0 or more than 11.0 and susceptible to organic solvents (ether, chloroform).Virus is quite stable in protein-rich environment, and is capable of surviving for months in refrigerated meat, for years in frozen meat and for as long as two weeks in contaminated pens or on fomites.

Transmission

The virus is present in all the body tissues, secretions and excretions of the affected pigs. The main route of infection is by direct or indirect contact with infected pig. Animals can also be infected through the mucous membranes, conjunctiva and skin abrasions. Transplacental infection also occurs and results in congenitally infected piglets that have a persistent viraemia and shed the virus for several months. Disease transmission via semen of infected boar may also occur. Transmission to new farms can occur via feed, bedding, boots of human beings or vehicle and equipment.

Pathogenesis

The target cells for the CSF virus are endothelial cells, lymphoreticular cells, macrophages and some specific epithelial cells. Virus causes severe leucopenia, followed by leucocytosis and immunosuppression, which in turn leads to secondary enteric or respiratory infections. Megakaryocyte damage caused by CSF virus is responsible for the thrombocytopenia detected in early stages of this disease. Prenatally, the virus affects organ differentiation causing malformations. In postnatal infections, lesions are related to endothelial damage and thrombosis.

Clinical findings

The incubation period ranges from 2 to 14 days depending on strain, route and dose. The mortality in young pigs is about 90-100% and in adult pigs is about 40-50%. Common clinical signs in young pigs include fever (105^{o}F), constipation followed by diarrhea, tendency to huddle, conjunctivitis, gummed-up eyes and blotchy discoloration of the skin especially of extremities (ears, limbs, tail, and snout). Neurological sign such as staggering gait with weakness of hind legs, incordination and convulsion are also seen within 2-3 week of infection.

Infection in sows is subclinical but virus crosses placenta of pregnant sows and infect fetus during all stages of pregnancy. In-utero infection with moderate or low virulence strains can result in the 'carrier sow' syndrome. The infection during early pregnancy results in stillbirth, mummification and malformations, however, infection between 50-70 days of pregnancy lead to birth of persistently viraemic piglets which are clinically normal at birth and survive for several months but they show poor growth, wasting or occasionally congenital tremor, this form of disease is called 'Late onset CSF'. These piglets constantly shed the virus and serve as reservoir spreading the disease and maintaining the infection within the population.

Pathology

Hematological examination revealed severe leucopenia. Postmortem lesions include swollen and hemorrhagic lymph nodes, petechial to echymotic hemorrhages on kidney; splenic infarcts. Button ulcers in cecum and colon, are pathognomic lesions which are formed mainly due to secondary bacterial infection. In congenitally infected piglets, common lesions include cerebellar hypoplasia, thymic atrophy, ascites, and deformities of the head and legs.

Diagnosis

The tentative diagnosis of the disease is based on history, clinical signs and postmortem lesions (lymph node swollen and hemorrhagic, petechial to echymotic hemorrhages on kidney, splenic infarcts, button ulcer in cecum and colon). Laboratory diagnostic techniques include Agar gel immunodiffusion test (AGID) and ELISA for detection of classical swine fever antigen in tissue and antibody in serum, virus isolation and RT-PCR. Suitable organs required for testing are tonsils, parotid glands, lymph nodes, spleen and kidneys. Samples should be submitted in 50% PBG or glycerine saline for confirmation of disease.

Treatment and control

There is no specific treatment for disease. The symptomatic treatment include antibiotics to check secondary bacterial infection, anti-inflammatory and antipyretic drugs. The number of susceptible pigs in the population can be decreased by implementing mass vaccination programs. Vaccinate the animals at 3 month of age with commercially available live virus vaccine (lapinized strain) and then repeat vaccine after every six months for prevention of the disease.

Cutaneous lesion of hyperemia

Intestine showing button ulcers on mucosal surface

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CRYSTALLOID PLUS COLLOID BASED FLUID THERAPY FOR DYSTOCIA AFFECTED BUFFALO

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The occurrence of dystocia has a significant negative impact on efficient reproduction causing heavy losses to dairy farmers. The development of post-operative toxemia is a major reason for the death of dam or impaired infertility in survivors that necessitates a better assessment of dystocia affected buffalo. In fact, a delay in obstetrical treatment leads to an increase in blood glucose, blood urea nitrogen, plasma creatinine and decrease in total plasma proteins and blood / plasma volume followed by dam mortality up to 70%. The condition of dehydrated and toxemic buffalo becomes protracted if heavy blood loss occurs at the time of fetal delivery. Therefore, intravascular volume expansion using appropriate fluid therapy is the fundamental goal in the clinical management of toxemic and hypovolemic dystocia affected buffalo.

In dystocia affected buffalo, the presence of variable degree of dehydration warrants immediate fluid therapy, hence, plasma volume expansion is necessary to maintain adequate tissue perfusion. Intravascular volume expansion using appropriate fluid therapy is a fundamental goal in the clinical management of toxemic and hypovolemic animals. Traditionally, intravenous isotonic saline therapy (crystalloid therapy) is used for the blood volume expansion in dystocia suffering buffalo. However, there are conspicuous disadvantages with the use of isotonic saline solution. Firstly, in bovines, suffering from mild to severe dehydration (8-12%), around 50-120 ml isotonic saline solution per kg b wt is recommended. This amounts to 20 to 48 L for a 400 kg animal, however, in a dystocia case, usually a meager amount (5-10 L) of isotonic saline solution is administered through intravenous route. Secondly, repeated administration of large volumes of isotonic saline through intravenous route is not possible in routine clinical practice. Thirdly, toxemia-induced increase in vascular permeability leads to loss of plasma into interstitial space and development of pulmonary edema.

Furthermore, crystalloid (hypertonic saline) based fluid therapies can be replaced with colloidal based fluid therapy regimes such as dextran - 40, due to longer half life of colloids and ability to increase blood oncotic pressure to a greater extent. Another gelatine based colloid, polygeline was also developed that offers an advantage of better fluid resuscitation and non-interference with normal blood hemostasis as compared to other colloid solutions. Thus, to counter the disadvantages of using isotonic saline through intravenous route, the possible way out appears to be the use of small volumes of intravenous hypertonic saline (crystalloid, 4 ml/kg b wt) and dextran (colloid, 20 ml/kg b wt) solution along with large volume of freshwater through stomach tube (40 ml/kg b wt). Hypertonic saline solution potentially limits the total volume of fluid infused and decreases morbidity related to pulmonary edema. Following administration of hypertonic saline along with dextran, plasma expansion persists for longer duration with greater efficiency.

The basic principle behind the use of hypertonic saline through intravenous route

and normal water through oral route is based upon the movement of water across the rumen wall due to osmolality difference between ruminal fluid and blood perfusing ruminal epithelium. Hypertonic saline results in an increase in plasma osmolality and orally administered water leads to decrease in the ruminal fluid osmolality. When plasma osmolality exceeds rumen osmolality by 20 mOsm/Kg, the osmolality gradient induces a net water flow from rumen to plasma @ 33 ml/min/L of rumen volume. Thus, hypertonic saline produces its resuscitative effects by rapidly increasing plasma volume by moving water from rumen and also by borrowing free water from intracellular space.

In a recently conducted study in buffalo, it was observed that intravenous normal saline and hypertonic saline along with oral fluid exhibited a less persistent increase for 6 h and 12 h, respectively, before returning to pre-treatment values, however, the increase in plasma and blood volume observed immediately after the end of colloid (dextran - 40 or polygeline) based fluid therapy persisted till 24 h. Thus, the additional use of colloid in the crystalloid fluid therapies will serve as better alternative to only crystalloid based fluid therapies for the dystocia affected buffalo subjected to obstetrical manoeuvering. This fact is corroborated by the findings of our recent study which suggested that use of colloids in the fluid therapies result in, 1) early return to normal rehydration status, 2) better restoration of haemato-biochemical parameters to normal, 3) better fluid resuscitation, as indicated by plasma and blood volume, 4) maintenance of proper electrolyte balance and 5) better dam survival.

It is advocated that the administration of crystalloid (7.2% hypertonic saline @ 4 ml/kg b wt) with or without colloid (Dextran-40 or Polygeline @ 20 ml/kg b wt) through intravenous route combined with freshwater through oral route (40 ml/kg b wt) could be a quicker, practical, easy and effective method for resuscitating the dystocia affected buffalo suffering from variable degree of toxemia and hypervolemia

HOW TO PREPARE YOUR DOG FOR A DOG SHOW

KIRTI DUA

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Showing dogs, is a popular and enjoyable activity for dog owners, but, before that you need to train your dog for the show. It is always easy if you start preparing your dog from the very young age.

Make sure your dog is eligible to participate

First of all you need to know the type of dog show you are participating and you need to make certain your dog will be allowed to take part in dog shows. There are different types of shows out of which some purebred type whereas others are of mixed breed. Other important thing is get your dog checked from a veterinarian to rule out any serious congenital abnormality or anomaly in the dog otherwise your whole effort may go waste. After doing all sorts of verification, you need to work on the training of the dogs

Training your dog for the show

In the training, gaiting of your dog is very important. Gaiting is moving your dog in a way that allows the judge to see their movement and structure. The correct gait is usually a trot, with the dogs head up. For this you also require a right lead. When your dog walks out into the ring, you'll need to have it on the right kind of leash or "lead." The sooner you get one of these, the sooner your dog can get comfortable with being on it.

To start, use treats to lure your dog to follow you around without a lead. The dog should remain at your left side. A trotting dog's right front leg and left back leg move forward at the same time, then the left front with the right back. Trotting is the correct pace because it shows the dog's true structure the best. Stack her for examination (on the table or on the ground, according to her size): It is generally of two types, Hand stack and free stack.

"Hand stack." In hand stacking, you manually place each leg in position while standing or kneeling close to the dog. All dogs should learn to "stack," or stand squarely and still. Dogs will have to stack several times during a show. Adjust the dog's front legs first, moving them at the elbow. Then, keeping your left hand on the dog at all times, move to the back legs and adjust them at the hock. Never stack by touching the dog's feet, as this may cause it to shift its whole body. Repeat this until your dog is comfortable with the process. Finally, teach the dog to maintain that position. Pull the food away for a second and tell the dog to stay. If it holds the position, say "yes!" and give the dog a nibble of the food. If it doesn't, restack the dog and try again.

Free stack." Free stacking is when your dog assumes the proper position on command, rather than with manual adjustment. This is most easily done with some training treats. Many people let dogs "free stack" most of the time, but hand stack right before the judge's examination. This ensures the best possible stance for the dog. You want your dog to look alert and happy when stacked. Most breeds should have their attention on the handler and the judge, and have their ears perked and their eyes on you.

Teach the dog tolerate examination

In a dog show, judges will physically examine a dog, touching its body and mouth. A successful show dog will need to tolerate this without complaint. A good first step in getting your dog accustomed to this is to touch the dog all over its body daily, including inside its mouth. If you start this at a young age, your dog will quickly grow accustomed to it. Next, begin giving your dog regular inspections that approximate those of a judge. Closely examine the dog's teeth.

For males, touch the testicles. Do this on both a table and the floor, if your dog is smaller in size. Finally, when the dog is comfortable with your inspections, bring in a second person and ask them to do the same. This way, your dog will get comfortable with inspection by strangers.

Dog should be clean

Judges want only clean dogs to be presented. Preferably breeds should be given a bath the day before the show weekend and then brushed as needed to keep him in the top condition. Reduce the stains on the white fur because staining around eyes, muzzle and urine staining on the hind limbs may give an impression that animals are not kept properly.

Start showing for local dog shows

Before you try taking your dog to a major club show, try showing your dog with a small, local club. These can a good way to determine if your dog is ready for the big shows.

ULTRASONOGRAPHY: A ROBUST TOOL TO IDENTIFY SUB-FERTILITY IN BREEDING BULLS

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Bull fertility is very important as it regulates herd conception rates and ultimately the financial profitability of dairy farmers. Introduction of subfertile or infertile bulls in herd for natural breeding and artificial breeding leads to lower pregnancy rates. It is a major problem among breeding bulls which poses problem at the time of semen collection as well as natural breeding. Bull fertility is indicated by several parameters such as libido, semen quality, freezability and conception rates. High libido bulls produce more ejaculates, have lesser reaction time and refractory period as compared to low libido bulls. So, high libido bulls are desired for better herd conception and financial profitability of the dairy farmers. Hence, identification of high fertility breeding bulls is imperative for the cost effective production of superior germplasm.

Various ultrasonographic approaches which can be used to demarcate subfertile breeding bulls are as follows:

1. Ultrasonography of external genitalia

Ultrasonography of external genitalia includes testes, epididymis and pampiniform plexus. Any abnormalities in the testicular parenchyma or testicular lesions can be diagnosed via ultrasonography. Epididymis can be checked for the normal presence of fluid and any kind of abnormalities like blockade. Ultrasonographic examinations are performed with a B-mode ultrasound scanner connected to 5.0 MHz linear array transducer.

1.1 Ultrasonography of testes

The transducer should be applied transversally on the external face of the testis halfway between the head and tail of the epididymis. Once both testes have been individually assessed, the transducer can then moved longitudinally on both testes. In the centre of ultrasonographic image of testis a hyperechoic area, rete testis is prominent. Hyperechoic images of testes are diagnosed as fibrosis (Fig. 1) and anechoic images are diagnosed as fluid accumulation in testes (Fig. 2). The infertile bulls shows abnormalities like abundance of hyperechoic areas scattered in the testicular parenchyma, acoustic shadowing, showing testicular degenerations with mineralization and many anechoic areas in the testicular parenchyma.

1.2 Ultrasonography of Epididymis

Epididymis is seen as fluid filled structure lateral to testicular parenchyma (Fig. 3). Any abnormality in the lumen and fluid consistency can be noticed via ultrasonography. Pampiniform plexus is seen as network of anechoic vessels and any change in echogenecity is diagnostic of abnormality.

2. Ultrasonography of the internal genitalia

Per rectal examination should be performed using 5 MHz linear probe to detect any abnormalities in the seminal vesicles and cowpers gland.

Fig. 1 Ultrasonographic view of fibrotic testis

Fig. 2 Ultrasonographic view of testis containing fluid.

Fig. 3 Ultrasonographic view of epididymis lateral to testis.

Fig. 4 Increased echogenecity of fluid present in seminal vesicle

Fig. 5 Pelvic urethra and cowpers gland

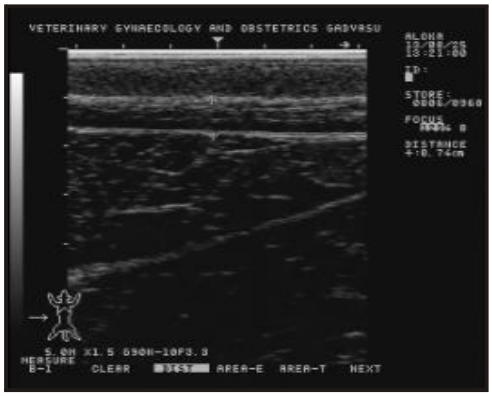

Fig. 6 Diameter of rump fat thickness measured (mm), including the thick fat layer and the two thin subcutaneous fascia layers

2.1 Seminal Vesicles

Pelvic urethra is the landmark for the examination of internal genital organs inside the pelvic cavity. Bilateral seminal vesicles can be found on the lateral sides of pelvic urethra. Seminal vesicles can be confirmed by its lobulated appearance. Diameter of seminal vesicles is measured and echogenicity of the fluids present in the accessory sex glands is examined for any abnormalities. Increased diameter and echogencity in the seminal vesicles may be an indicator of seminal vesiculitis in the infertile bulls (Fig. 4).

2.2 Cowpers gland

Pelvic urethra should be followed and cowpers gland is found as separate fluid filled cavity (Fig. 5). Diameter of cowpers gland can be measured and abnormal accumulation of fluid can be diagnosed.

3. Ultrasonography of Rump Fat Thickness

Linear ultrasonographic probe of 5 MHz is successful in demarcation of fat from the skin layers above and muscle layers below fat. Homogeneity of ultrasonographic measurement of rump fat is obtained in the area lying in the halfway between the hook bone and the pin bone. Centre point between hook and pin bone is suitable for placing of ultrasonographic probe. The rump fat layer obtained on ultrasonographic image is usually parallel in the bulls. The subcutaneous fasia is hyperechoic and appeared as thin white layer surrounding the fat from upper side as well as from the lower side. Fat was hypoechoic with low range of contrast. The diameter of rump fat should be measured including the thick fat layer and the two thin subcutaneous fascia layers (Fig. 6). Selection of sires with low back fat thickness have been found to possess good fertility. Bulls with high rump fat thickness are affected with poor libido and the reason behind poor libido is the increased peripheral aromatization of testosterone to estrogen in adipose tissue. In high fed bulls, there is increased rump fat accumulation which can lead to poor libido.

Ultrasonography of external genitalia can efficiently diagnose lesions affecting fertility in breeding bulls. Abnormal fluid accumulation in accessory sex glands can be successfully diagnosed which can cause partial as well as complete loss of fertilty in breeding bulls. Accumulation of rump fat has an adverse effect leading to poor libido in breeding bulls.

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LAMENESS IN YOUNG DOGS

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The large and giant breeds are most susceptible to musculoskeletal diseases. Genetics, environment and nutritional status of the animal play key roles in the skeletal health of an animal. When the growth rate in young growing puppies does not correlate to maximal adult size, it increases the risk of skeletal disease. There are basically 6 skeletal conditions, apart from fractures, which are required to be differentiated in young dogs, below 1 year of age. The diagnosis and treatment of such conditions is discussed below for use in clinical settings:

OsteochondrosisDessicans (OCD)

It indicates a focal area of disruption in the endochondral ossification and usually occurs in the physis and/ or epiphyseal regions of growth cartilage.

Age: less than one year. Large and giant breeds such as Great Danes, Labrador retrievers and Rottweiler's are commonly affected.

Etiology: Multi-factorial with risk factors associated with age, gender, breed, rapid growth and nutrient (primarily calcium) excess which leads to hypo-parathyroidism that manifests as retarded bone maturation, inhibition of osteoclastic activity and slowed cartilage maturation. Elbow dysplasia can also lead to OCD.

Clinical signs: Lameness which may be sudden or gradual and may involve one or more limbs. Pain on palpation of the affected limb, swelling in joints and wasting of muscles may be seen.

Radiography: Most commonly affected is the condyles of humerus (marked with green arrow and a chip marked with white arrow).Anterio-posterior, lateral and flexed lateral views of the elbow are required to diagnose the condition.

Treatment: Arthroscopy may be required to remove the free cartilaginous piece in the joint. Conservative treatment includes pain killers and stabilization.

Prognosis: depends on the location and extent of the problem.

Rickets:

Rickets is a disease of young, growing animals that affects the bony growth plate. The most common causes are dietary insufficiencies of phosphorous or vitamin D.

Age: 2 -6 months

Clinical signs: bone pain, stiff gait, swelling in the area of the metaphyses, difficulty in rising, bowed limbs and pathological fractures.

Pathology: Failure of both vascular invasion and mineralization in the area of provisional calcification of the physis which is most obvious in the metaphyses of the long bones.

Radiograph: Increased width of the physes, non-physeal area is distorted and the affected bone may show decreased radio-opacity. In advanced cases, angular limb deformity can

also be seen due to asynchronous bone growth.

Treatment: Correction of the diet. Oral or injectable supplements of vitamin D3 may be given in prescribed doses.Exposure to UV-radiation (sunlight) can be increasedfor the production of vitamin D_3 precursors.

Prognosis: good in early cases, otherwise permanent deformity may remain.

Panosteitis———episodic condition

Age: 5-12 months. In German shepherd breeds may be 2 months to 5 years.

Etiology: Unknown. Stress can aggravate.

Clinical signs: Acute onset of lameness in a healthy dog without any history of trauma. It is episodic with an episode of 2-14days in one leg and then may shift to complimentary limb so is also called "shifting leg lameness".

Physical examination: pain upon firm palpation of the diaphysis of the affected long bones.

Bones affected: long bones, femur, humerus, tibia, radius and ulna.

Radiography: Classical increased intra-medullary radio-opacity is seen in patches.

Differentials: HOD, Un-united anconeal process, OCD, Hip dysplasia and trauma.

Treatment: Painkillers like phenybutazone in mild cases can be prescribed.

Prognosis: Good.

Legg-Calve Perthes Disease/ Avascular necrosis of Femur head

Prognosis: Fairafter surgery.

Hypertrophic Osteodystrophy (HOD) ———episodic condition

Age and breed of dogs commonly affected: 3-4 months

Etiology: Unknown. Young rapidly growing large and giant breeds like Great Dane, St. Bernard, Dalmatian, German shepherd and Labrador are commonly affected.

Clinical signs: in less affected pups: slight limp, pain on deep digital palpation of affected metaphyses is seen. In Severely affected pups: anorexia, weight loss, fever, depression, swollen joints, painful long bone metaphyses, and refusal to bear weight on affected limbs is seen.

Pathology: When calcified cartilage fails to be penetrated by vessels from the bone marrow, the unvesiculated tissue dies. Fever and swelling in joints is due to fibrous thickening of the metaphyses in advance cases.

Bones affected: Radius and ulna and tibia commonly affected.

Radiography: confirmatory diagnosis can be made on radiography. Classical radiolucent line above the epiphysis of radius and ulna is seen on radiograph. It appears as if double epiphysis

is there. In severe cases significant periosteal reaction may also be present.

Treatment: Correct nutritional imbalance.Phenybutazone in mild cases can be prescribed.

Prognosis: Gaurded. Sometimes sudden death may occur. Condition can also be associated with history of diarrohea or respiratory infections.

Hip dysplasia

Canine hip dysplasia is a complex biomechanical developmental, not congenital, abnormality.Hip dysplasia is a common problem in veterinary practice, accounting for up to 30% of orthopedic cases.

Age: Upto 16 months. Labradors, St. Bernard, Rottweiler and Bull dogs are more affected.

Clinical signs: Variable. Some dogs are normal, while others are very lame. There is history of stilted or abnormal gait that worsens with exercise or causes difficulties in jumping or sitting or while climbing stairs. The dog may lift both hind legs together while walking so also known as “bunny hoppy” gait. In dogs younger than 1 y of age, pain may be caused by micro fractures and older than 12 to 16 months with chronic pain from degenerative joint disease.

Clinical examination: On hip joint manipulation there is pain, especially during extension or abduction and internal rotation. Pelvic muscle atrophy, restricted range of motion, sub-luxation, and crepitus may also be present.

Radiograph: Ventro-dorsal view of hip joints reveals that femoral head conforms poorly to the acetabulum, the joint space is increased or subluxation is present (as seen in the radiograph), structural abnormalities can be seen in the femoral head or acetabulum or osteophytes can be present.

Conservative treatment: weight control, use of joint supplements, antioxidants, NSAIDs, and omega 3 fatty acids along with soft or kaccha flooring. Marble flooring should be strictly avoided. Swimming can be the best physiotherapy for hip dysplasia.

Surgical treatment: Femur head ostectomy.

PHYSICAL OCCUPATIONAL HEALTH HAZARDS IN VETERINARY PRACTICE AND THEIR MANAGEMENT

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Veterinary medicine and animal husbandry workers provide medical, surgical, preventive health or animal care services for a variety of animal species in different work settings. These workers are exposed to biological, chemical, physical, and psychological hazards depending on their workplace environment, species of animals worked with, and type of tasks performed. The main physical risks for veterinary profession are injuries/ trauma/musculoskeletal disorders and ionizing radiations. Chemical risk can result mainly from the use of gaseous anaesthetics, drugs, detergents and disinfectants. Biological risk is present in all work activities where there is risk of exposure to biological agents that is any organism that may cause infection, allergy or poisoning.

The practice of Veterinary medicine sometimes puts the individuals in unpredictable situations that expose them to physical injury through contact with animals and equipment, and repetitive motion.

Types of Physical Hazards

Kicks/Bites/Physical injury: A Veterinarian or animal husbandry worker is always at risk of being bitten, scratched, kicked or even crushed while working with animals. Improper handling or restraining may put the animals in distress or pain, causing them to react defensively by jumping, kicking or biting. Personnel working with large domestic animals might sustain crushing injuries when the animals jump, kick, fall, or simply shift their body weight. Uneven surfaces and wet floors in animal rooms and cage wash areas increases the risk of injury from slipping, tripping, or falling. Animal bites and scratches, especially that inflict little tissue damage, are sometimes considered inconsequential. However, serious complications can result from wound contamination by the normal oral flora of the animals involved. Rabies, B-virus infection, Hantavirus infection, cat-scratch fever, tularemia, tetanus, rat-bite fever, and orf are among the specific diseases that can be transmitted by animal bites.

In addition to acute injuries, Veterinarians suffer from Repetitive Strain injuries or Musculoskeletal disorders (MSD), known as “Work-Related Musculoskeletal Disorders of Upper Extremities” (WRMSDs-UE), which are inflammatory and degenerative disorders responsible for pain and functional impairment in tendons, muscles, joints, nerves or blood

vessels. Working with heavy animals and equipment can stress muscles and joints, leading to strains, sprains and back injuries. Cumulative trauma injuries including carpal-tunnel syndrome, tennis elbow, and bursitis are possible from repetitive motions associated with animal husbandry.

Sharp Objects: Needles, syringes, pipettes and scalpels are commonly used in animal facilities and laboratories. Sharp injuries can result in lacerations and traumatic injuries. Other equipment used in veterinary practice such as nose tongs for cattle, halters, metal cattle chutes, restraining equipment and even opthalmoscopes may cause injury especially to fingers, wrists and hands. Many cases of self-pricking while administering medicine to animals have been reported. Sometimes, self-pricking may result in introduction of infection as the case while vaccinating with live vaccines e.g. *Brucella abortus* cotton strain 19. Needle stick injuries may involve the risk of self-injecting drugs or other harmful substances, which can result in allergic reactions or other more severe sequelae. Occupational exposure to bloodborne pathogens from needle sticks and other sharps injuries is also a serious problem.

The primary method for decreasing needle stick injuries is to avoid recapping needles and disposing off them in designated puncture proof containers. When disposing of sharps, they should be segregated away from regular trash so that custodial staff is not exposed to cuts, puncture wounds, infectious agents, or hazardous chemicals. Moreover, the sharps' disposal containers should be located as near the point of use as possible.

Ionizing radiation: Risk of exposure during radiography increases with the physical restraint of animals, use of older or poorly maintained equipment and inadequate use of protective garments. The dose of radiation received by an individual depends on the number of X-rays taken, the machine type and settings, distance from the X-rays and positioning of animals for X-rays. However, film holders and the use of strings or other arm propping devices such as foam wedges can limit the need for individuals to stand close to or directly within the beam.

Electrical hazards: They are found throughout animal and laboratory facilities, especially in frequently wet areas. Equipment that has frayed or damaged cords should not be used. Electrical cord repairs made with electrical tape should be avoided, as the tape does not check current flow.

Compressed gas cylinders: They are found routinely in laboratories and animal facilities. These cylinders are under high pressure and contain enormous amounts of energy. An uncontrolled release of energy from a typical five-foot compressed gas cylinder can easily propel the cylinder through a concrete block wall. Such an uncontrolled release can occur when a cylinder is knocked over. All compressed gas cylinders should be properly secured by a wall chain, bracket, or base and the protective valve stem cap be replaced when the

cylinder is not in use.

Excessive Noise and hearing defects: Exposure to excessive noise in Veterinary workplaces may include barking dogs in kennels and other confined spaces and swine when being handled. These animals in particular are known for their persistent and loud vocalizations that can reach intense levels inside the confines of the holding facility. Other sources of excessive noise include loud machinery eequipments such as cage washers.

Heat stress: Exposure to extreme heat in hot environments can result in heat stroke, heat exhaustion, heat cramps, or heat rashes. Heat can also increase the risk of injuries in workers as it may result in sweaty palms, fogged-up safety glasses, and dizziness. Burns may also occur as a result of accidental contact with hot surfaces or steam. The workplace heat stress may be reduced by limiting time in the heat and with plenty of hydration.

Respiratory hazards: Different types of organic and inorganic dust and other airborne contaminants are present in animal facilities. The major sources of allergens are dust, animal bites, animal dander and excretions (e.g., urine, saliva) and cautery fumes. The dust is generated from feed, bedding, manure, and many other sources. The dust can be an irritant or an allergen, causing allergies/wheezing. Common clinical symptoms of laboratory animal allergies include inflammation of the skin, nose, eyes; and urticaria. Individuals who develop allergies to animal dander and excretions are at increased risk of developing asthma. Chloramine compounds generated in settings such as poultry plants from interactions between chlorinated water and nitrogenous materials are respiratory irritants. Cleaners and disinfectants have also been associated with asthma.

Motor vehicle hazards: The Veterinarians, especially in rural areas, often drive great distances to treat their patients. Commuting between farms, and facilities increases the risk of motor vehicle accidents.

Precautions and Management:

Risks are substantially minimized by using appropriate handling techniques when manipulating animals, wearing protective clothing/devices; and utilizing appropriate personal hygiene practices. Following points should be kept in mind while handling animals:

1. Do not handle animals unless you have been trained in the proper methods of handling and restraining the species you will work with.

2. Report all injuries (bites, scratches, even cuts on equipment), however small, to your instructor/supervisor and take medical advice.

3. Consult with a physician knowledgeable if you have any medical condition that may

make you more susceptible to certain animal-related diseases. Such medical conditions include but are not limited to splenectomy, alcoholism, immune system problems (e.g. AIDS, chemotherapy, systemic steroids such as cortisone, cancer), tuberculosis, pregnancy, or a history of heart disease or heart surgery.

4. Wear protective clothing like a lab coat or coveralls when working with animals and launder them in the animal facility.

5. Handle the animals in animal facilities when possible or transport them in a manner that protects other people.

6. Remove jewelry before working with animals. Jewelry can be caught in machinery or pulled by animals. Loose hair and clothing are also a danger. Remove earrings, finger rings, necklaces and bracelets when working with animals or machinery.

7. Do not introduce animals into research facilities without prior approval from Laboratory Animal Services. Laboratory personnel must wear laboratory coats when working with lab animals.

8. Exposure to allergens can be minimized by wearing protective clothing and gloves when handling animals, reducing exposure to airborne dusts, dander and cautery fumes (e.g. exhaust systems) and practicing good personal hygiene. HEPA filter respirators or masks may help prevent the development of allergies.

9. Prevention of bites and scratches: Proper restraining of dogs and cats before examination should be done using collars, harnesses, leash and muzzles. Chemical restraint is recommended before removing any nonhuman primate from its cage. Wear protective clothing and hand protection when in primate housing areas. Handlers should also wear a long sleeved garment and a face shield (or surgical mask and goggles or glasses) to prevent exposure of eyes and mucous membranes to primate secretions. A minimum of two personnel should be present when restraining a physically active macaque.

Management of Bites from animals

To reduce the risk of injury, it is important to be aware of animal behaviors and surroundings. Knowledge of how to restrain and handle animals correctly and being aware of their mannerisms and behavior is very important for safety. In case of bites/scratches, the animal should be should be identified as a rabies suspect and placed on observation. If death of a rabies suspect occurs, place the animal in refrigerated cold storage and sample should be sent to a rabies testing lab.

a. Skin wound

- Scrub (deliberately but gently) the area with chlorhexidine 2% scrub **immediately** for 15 minutes. In absence of the appropriate solution, hot, soapy water can be used.
- If the area becomes severely irritated due to scrubbing, discontinue scrubbing and soak the wound for the remainder of the 15 minute period.
- Universal precautions (gloves, eye protection, masks and lab coat or apron) should be used by persons aiding the bite victim in scrubbing.
- A clean dry dressing should be applied after cleansing the wound.
- Monitor for post-exposure symptoms.

b. Mucous Membrane (e.g., eye, nose, mouth) exposure

- Irrigate for a full 15 minutes with 0.9% sodium chloride (normal saline), if available, or tap water.
- Seek medical attention immediately after first aid treatment.
- Monitor for post-exposure symptoms. Development of any of the symptoms like numbness, tingling, burning, weakness, pain, blister like lesions, fever, chills, muscles aches, headaches lasting over 24 hours, unsteadiness when walking, double vision, intense itching, and shortness of breath should be reported immediately to medical practitioner.

Management of Bites received from rats and mice

- Bites from rodents should be immediately cleaned with warm, soapy water.
- Rats naturally carry bacteria in their mouth and can transmit them through bite wounds causing infection. Development of any of the symptoms of infection after exposure like inflammation around the bite wound, high prostrating fevers, rigors, headache and polyarthralgia should be taken seriously and immediately reported to a physician for medical management.

Physical Hazards and their management in Meat industry: Workers can be seriously injured by moving animals prior to stunning, and by stunning guns that may ---prematurely or inadvertently discharge while they try to still the animal. During the hoisting operation, it is possible for a 2,000-pound carcass to fall on workers and injure them if faulty chains break or slip off the carcass' hind leg. Workers can suffer from crippling arm, hand, and wrist injuries. For example, carpal tunnel syndrome, caused by repetitive motion, can literally

wear out the nerves running through one section of the wrist. Workers can be cut by their own knives and by other workers' knives during the butchering process. Back injuries can result from loading and unloading meat from trucks and from moving meat, meat racks, or meat trees along overhead rails. Workers can be severely burned by cleaning solvents and burned by heat sealant machines when they wrap meat. It is not uncommon for workers to sever fingers or hands on machines that are improperly locked-out or inadequately guarded.

A preferred way of controlling potential hazards is through the use of following engineering controls:

a. **Guardrails:** The use of guardrails can protect workers from accidental falls. Open surface dip tanks used for sterilizing shackling equipment, and elevated work platforms must have guardrails. Railings should be checked to see that they are securely attached to walls.

b. **Floors: A** non-skid flooring material or rubberized cushioned floor mats should be installed at all work stations for workers to stand on, especially in areas where hand knives and power tools are used.

c. **Wiring:** All electrical wiring should be checked periodically for cracking, fraying, or other defects, and all electrical equipment should be grounded.

d. **Equipment and Machine Guarding:** Equipment used to hold and move meat and items such as shackles, conveyors, and hooks should be checked frequently and repaired. All equipment that poses a hazard should be appropriately guarded.

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POLICY AND STRATEGY FOR GENETIC IMPROVEMENT OF DAIRY ANIMALS IN PUNJAB

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The breeding policy is a program document and is designed to bring planned genetic changes in dairy animals to improve their production and profitability in a sustained manner, while protecting the environment, preserving animal biodiversity, ensuring bio-security and farmers' livelihood. It mainly depends on the livestock wealth, their production level and utility, infrastructure and resources available. It should focus on judicious use of input per unit of output for attaining sustainable animal production and management. The genetic improvement programs should be based on perception and wishes and needs of farmers, which would enhance acceptability and facilitate easy implementation of the policies. In the normal course a breeding policy shall be part of the overall developmental objectives and livestock production system.

The breeding strategies should be different for the different species of livestock. Livestock is a state sector activity. Thus states had to evolve their own breeding policies; of course in tune with the overall guidelines prescribed by Govt. of India.

National Livestock Policy- 2013

The National Livestock Policy- 2013 has been developed by the Government of India, which also covers the breeding policy. As per this document the breeding policy for livestock should be as follows:

States would be encouraged to review their respective breeding policies for different livestock species. Species-wise breeding programs will be fine-tuned and implemented for faster growth in production.

Breeding Policy for cattle and buffalo

For increasing milk production in cattle and buffaloes and to increase their life time productivity, a broad framework of policy would include the following:-

- Selective breeding of defined indigenous breeds of cattle have high milk yield, and those with excellent draft abilities will be promoted to improve their production and reproduction potential. This will help their proliferation, conservation and genetic up-gradation. Efforts will be made to import/exchange semen of these breeds if necessary, to avoid/reduce inbreeding. Intrusions of crossbreeding in their defined breeding tracts will be avoided.
- Cross-breeding of non-descript and low producing cattle with high yielding exotic breeds suitable for respective agro-climatic conditions will be encouraged in selected areas having adequate facility for feed and fodder and marketing facilities etc. Up-gradation of non-descript and low producing cattle with defined indigenous breeds

in resource deficient areas and the breeding tracts of defined indigenous breeds would be encouraged.

- Buffalo development will aim at improving milk production and to hasten growth, maturity and proliferation. Selective breeding of established native breeds, and upgrading low producers through breeding with defined high milk yielding breeds will be undertaken. If required, semen may also be imported/ exchanged to reduce inbreeding. Cross-breeding of non-descript buffalo breeds with improved indigenous breeds will be considered, where appropriate.
- Production of breeding males having high genetic potential will be an essential element of the breeding policy for each species and breed. Formation of breed associations involving farmers for improvement of indigenous breeds of various species and identification/registration of animals having good genetic potential would be promoted by providing financial, technical and organizational assistance.
- There is a need to focus on the hitherto neglected natural mating system and to produce quality disease free high genetic merit bulls for natural service through implementation of massive pedigree selection program and progeny testing program.
- For the purpose of cross-breeding, semen of progeny tested bulls would be used as far as possible.

A number of studies have been carried out to analyze the performance of crossbreds. Studies have shown that age at first calving in crossbreds (26-42 months) is much lower than that in some of well-known indigenous breeds (36-52 months). Average lactation yield in crossbreds varied from 1139 to 4039 kg. Vs. 1438-2326 kg in breeds of Indian cattle having good potential for milk production like Sahiwal Cows.

This indicates that there exists genetic potential for high milk production in indigenous breeds but this needs to be exploited. The differences in milk production of crossbreds and indigenous milch breeds do not seem to be substantial considering the fact that not much selection has gone into the improvement of indigenous breeds for milk yield. Further the performance of crossbreds deteriorates in subsequent generations.

There is nothing wrong with crossbreeding as such but it needs to be implemented with caution. The need to utilize between-breed genetic differences via crossbreeding (where it is appropriate) is fully appreciated but there is an urgent need to give greater emphasis to the locally adapted animal genetic resources. Indigenous breeds survive, produce and reproduce in the environmental conditions under which they have developed. Crossbreds can produce more milk but they need more and better feed, and resources to exploit the potential. Under medium to low input conditions, locally adapted indigenous breeds should be favored. The between animal variability can be exploited for higher genetic gains through well planned and executed breeding programs.

To strategize production of milk from the existing bovine population pragmatic and revolutionary and not evolutionary approach is needed. This should include, reducing the number of unproductive animals, particularly male (both from descript breeds and nondescript animals), fast up scaling of productivity, ensuring grading up and conservation

of Sahiwal breed and fast replacing the nondescript population through grading up or crossbreeding depending upon the eco-regional, agro-climatic and socio-economic condition of the animal keepers.

Objectives of the Breeding Policy:

1. To undertake systematic genetic improvement of dairy cattle and buffaloes.
2. To undertake systematic bull production and evaluation program so as to improve the productivity of dairy cows and buffaloes.
3. To regulate the use of bulls/semen to improve productivity and to check transmission of diseases.
4. To motivate the farmers to rear high yielding animals and participate in breed improvement program.
5. Conservation and improvement of Nili Ravi buffalo and Sahiwal cattle breeds.
6. To develop regulation under The Punjab Livestock Improvement Act, 1953.

Status of milk production and productivity in Punjab

In the first 14 years of 21st century, the milk production in Punjab state has been increased with a compounded annual growth rate (CAGR) of 1.89% against the national CAGR in milk production of 4.12%. At the same period, per capita per day milk availability in Punjab was recorded to grow at CAGR of 0.45% against the national CAGR of 2.32%.(Table-1). It is important to mention here that CAGR for milk productivity of Indigenous cattle, exotic/crossbred cattle, buffalo and goat of Punjab was found to be 5.3%, 1.83%, 2.33% and 2.52% during the same period, which is well above to the corresponding national figures.(Table-2). Due to this fact, the milk production in Punjab has been increased in spite of the fact that number of animals in milk was reduced for all the dairy livestock species except crossbred cattle. Therefore, there is a need to make further increase in the milk production of Punjab state through genetic improvement of all the dairy species of livestock.

Cattle Breeding

The cattle population in the Punjab state has continuously declined during the last 20 years and was recorded as 17.77 lac in 2007 and showed upward trend with cattle population of 24.27 lac in Livestock Census 2012. . The state followed the crossbreeding program very extensively to improve the productivity of cows as a result of which more than 80 % indigenous cows have been replaced by crossbreds, which range from 64.15% in 1990 to 85.05% in 2012. The daily milk yield of lactating cows increased from 7.09 kg in 1990 to 11.04 kg in 2014. The average lactation milk yield of crossbred cows is 2819 kg in Punjab as compared to 1390 kg in India. The productivity of indigenous cows is recorded as highest in Punjab with milk yield of 6.59 kg/day as compared to national figure of 2.50kg/ day in 2014. Punjab is among the five top milk producing states with annual milk production of 10.01 MT. The per capita availability of milk in Punjab is much more (961 g/day) as compared to India (299g/day). Keeping in view the high milk production and better returns many farmers have established large dairy farms with high yielding crossbred cows, modern

dairy sheds, mechanized milking/fodder harvesting. The state is not only providing large quantity of milk to the national grid but is also the major source of high yielding crossbred cows. The state has the potential to be the major source of germplasm of Murrah/Nili Ravi buffaloes and Holstein Friesian/Jersey crossbreds, Sahiwal cattle in the form of semen and bulls to other states.

Breeding policy should be framed as

1. Recognized breeds of milch especially Sahiwal should be left out of crossbreeding program, which may be improved through selective breeding only. These breeds should be used to upgrade local cattle in areas having low availability of feed, fodder and other resources. The Sahiwal cows/bulls available with different institutions/ farmers shall be identified and registered in a Breed Book. Sahiwal cows shall be mated with the best available semen of Sahiwal bulls and the male calves from the elite cows shall be procured and used in the progeny testing program of Sahiwal breed.

2. Crossbreeding should be implemented only in potential areas having availability of quality feeds at relatively low prices, demand for cow milk, and accessibility to veterinary facilities. Only the non-descript or low producing animals should be bred through crossbreeding. The local/crossbred cows shall be mated with Holstein Friesian bulls to produce crossbreds up to 75% exotic inheritance. Crossbred bulls with 75% exotic inheritance will be produced from the elite crossbred cows and put to progeny testing. Progeny tested Crossbred bulls will be extensively used to stabilize and maintain the level of 75% exotic inheritance in crossbreds.

3. The progressive dairy farmers who have established high milk producing crossbred herds with exotic level of more than 75% and are adopting the high input technologies of dairy management and disease control can be allowed to use exotic bulls to have cows with high level of exotic inheritance. Such farmers will be required to follow regular herd testing for specified diseases, herd registration and performance recording and will be the major source of bull calves.

4. Institutional farms may produce pure bred exotic cattle for bull production.

5. The cows in the sub-mountainous/Kandi and other regions having limited fodder resources will be improved by using Jersey.

Buffalo Breeding

The buffalo is the premier dairy animal and accounts for 68.37% of the total milk production in the state. The buffalo population was following an increasing trend up to 1997 (61.71 lac), but subsequently declined to 50.11 lac with breedable population of 29.72 lac in 2007 and again increasing trend is recorded with buffalo population of 51.59 lac in 2012. The daily milk production of lactating buffaloes increased from 4.9 kg in 1990 to 8.72 kg in 2014. The average lactation milk yield of buffaloes in Punjab is comparatively very high i.e. about 1977 kg as compared to the national average of about 1016 kg. Buffalo is preferred over cow as a dairy animal because of its high fat (6.5-8.0%) and SNF (9.00-10.5%) content, adaptability to harsh climatic conditions, resistance to tropical bovine diseases, ability to utilize low grade roughages and easy disposal of unproductive buffaloes and

surplus male calves. But the rate of genetic improvement in buffaloes is very low. The major source of improvement in buffaloes is selection of bulls and their extensive use through the A.I. In the absence of large scale progeny testing programs, majority of bulls being used in the state are pedigree selected (that too on dam's peak yield estimates) mostly used through natural service. In order to bring substantial improvement in buffaloes it is necessary to develop an efficient system of bull calf production and progeny testing.

Buffalo Breeding Policy:

The state has Murrah (9.90 lac), Nili Ravi (3.84 lac), and a large population of graded buffaloes (32.04 lac) which represent crosses between Murrah and Nili Ravi breeds as well as non-descript buffaloes (4.84 lac) as per Livestock Census 2007, because breed wise figures are not available in Livestock Census 2012. In order to improve the productivity and to maintain the purity of the two breeds i.e. Murrah and Nili Ravi and also to reduce the population of graded buffaloes, the following breeding program shall be followed:-

1. The Murrah buffaloes shall be bred with high genetic merit Murrah bulls only.
2. The Nili Ravi buffaloes will be bred with high genetic merit Nili Ravi bulls only.
3. The graded buffaloes with predominantly Murrah characteristics shall be classified as Murrah graded and bred with Murrah bulls.
4. The graded buffaloes with predominantly Nili Ravi characteristics shall be classified as Nili Ravi graded and bred with Nili Ravi bulls.
5. The non-descript buffaloes will be bred with the bulls of either of the predominant breed of the area i.e. Murrah or Nili Ravi.

Registration of Elite Dairy Animals:

The elite dairy animals of the Institutional, rural dairy farms and peri-urban dairy units can be exploited as a major source of bull calves, which will require proper motivation, incentive, and constant rapport with such farmers. The field staff to be associated with this task would be given proper training, to have authentic records. A directory of elite dairy animals will be maintained by registering the animals available with the institutions as well as the farmers/ peri-urban dairy units which meet the following production standards and have the breed-characteristics:

Breed	Peak Milk Production (kg)/d	Approx. Std. Lactation Milk Yield (k
Murrah buffalo	15	3000
Nili Ravi buffalo	15	3000
HF Purebred	40	7000
HF Crossbred	30	5500
Jersey Purebred	25	4500
Jersey Crossbred	18	3500
Sahiwal	12	2200

I. Elite animals for registration will be identified by the concerned Veterinary Hospital/ Dispensary with due publicity in the media and field camps.

II. Sub Division level standing committees, constituted by DAH will record the peak milk yield of animals identified under para I. and shall arrange for disease testing. Elite animals can also be registered during milk yield competitions/ dairy shows.

III. After registration in the directory, the owner of elite animal will be given a certificate with detailed particulars of the animal.

IV. Such animals will be provided special dedicated veterinary services and inseminations with premium bulls.

V. Bull calves produced from elite animals will be purchased on approved rates depending upon the age of calf, milk yield of dam, sire index and other breed characteristics.

VI. Bull calves from elite animals will be purchased and reared at 3-4 locations and shifted to bull stations after thorough screening for diseases and genetic abnormalities.

VII. Preliminary evaluation of young bulls will be made on the basis of the pedigree records, semen profile and freezability etc. and the best 10% bulls will be shifted to the Sperm Stations and the remaining bulls will be supplied to the farmers for natural breeding. They must be exchanged after certain period of time to avoid inbreeding.

VIII. Adequate infrastructure of animal registration and data recording will be developed for effective implementation of progeny testing program with the active participation of the farmers and Cattle/Buffalo Breeders' Association.

IX. Cattle/Buffalo Breeders' Association will be adequately equipped to assist in the implementation of such programs with the technical support of the Veterinary University/DAH.

X. Incentives shall be given to owners of the elite animals depending upon the level of production to check the exodus of such animals from the state.

XI. Some incentive/honorarium shall also be given to Veterinary staff for the identification, registration and recording the elite animals and procurement of bull calves from the farmers.

Performance Recording and Progeny Testing of Bulls

Performance recording and progeny testing are the essential component of any breeding policy/program. The performance recording in rural areas is very limited and that too confined to recording the peak yield during milk yield competitions. The institutional farms of DAH/University with limited animals are undertaking performance recording and in some cases progeny testing on very small number of daughters. Similar is the case with field progeny testing programs. The state shall develop adequate infrastructure for performance recording and progeny testing of Murrah and Nili Ravi buffalo bulls, exotic cattle bulls (including the imported semen), crossbred cattle bulls and Sahiwal Cattle bulls.

It is proposed to evaluate the bulls on the basis of at least 30 daughters by undertaking the field progeny testing program in defined clusters having the animals of the specific breed and by involving the commercial milk producers. It is proposed to meet at least 25% requirement of frozen semen from the progeny tested bulls.

Registration of Bulls

The registration of all the bulls (as per the livestock Improvement Act, 1953) to be used in the state by any organization/individuals shall be mandatory. This will include the bulls used through artificial insemination or natural mating as well as semen procured from other states/countries. The registration authority will ensure that the bulls meet the minimum prescribed standards w.r.t. production, reproduction, health and semen profile. The registration shall be valid for one year only and for renewal of registration, testing for specified diseases shall be necessary. Any Bull Station having a single positive case of the specified diseases will be required to undertake six-monthly disease testing protocol and should destroy all the doses of frozen semen and shall withdraw all the doses of positive bulls supplied to AI centres or farmers. All the positive testing bulls at Bull Stations or used through natural mating shall be sterilized by the concerned organization/individual under intimation to the registering authority. Legal frame work will be developed to effectively implement this program.

All the agencies doing A.I. should have to submit follow up reports including calves born to department Animal Husbandry, Punjab in the specified format.

Some of the records are important for formulating any Livestock improvement Strategy:

These include:

Breeding Records: Animal number; Sire & Dam number; Date of Birth, first service, first calving and subsequent calving; Date of first ejaculation and service in males; information about AI, pregnancy, abnormal pregnancy, normal birth, sex and weight of calf etc.

Health records**:** information about sickness and treatment, Prophylaxis measures against diseases like vaccination, deworming etc. The diseases of mammary system and reproductive system need special mention.

Production records: Milk production in the lactation, lactation length, peak yield, and milk constituents like SNF, Fat, and Protein etc. should be recorded on monthly interval.

The records generated under field conditions should be compiled and analyzed by the organization involved in such work.

Recommendations

1. Accurate breed-wise census of all the cattle and buffalo breeds and lesser-known breeds should be carried out by the Department of Animal Husbandry.

2. The pedigree and performance recording of field animals along with breeding and health parameters recording may be planned with the involvement of Government and non-government agencies. The data and information collected from the farmers

must be accurate and properly documented for future use. Suitable Information technologies should be used in recording of data at field level.

3. Progeny Testing programs by involving farmer's cows and buffaloes may be formulated at a large scale depending upon requirement of bulls of different breeds of cattle and buffalo in state. This may also led to development of data on phenomics of cattle and buffaloes in the state, which may be utilized in whole Genome selection at molecular level in the later stages. Second and third generation Reproductive technologies like ET and Cloning may be used in selection of bulls/bull calves. Available IT tools should be well utilized for increasing accuracy and speed of such programs.

4. State must develop its livestock breeding policy, review and revise the same periodically. The livestock policies and programs to be adopted by State should be developed by a group of experts and thoroughly discussed with all stakeholders before its release as government order.

5. The genetic improvement and conservation programs should be formulated and implemented. Immediate action is needed for endangered breeds from respective state government.

6. Recognized milch breeds like Sahiwal should be left out of crossbreeding program and these to be improved through selective breeding only. This breed should be used to upgrade local cattle in areas having low availability of feed, fodder and other resources. Crossbreeding should be implemented only in potential areas having availability of quality feeds, demand for cow milk and accessibility to veterinary facilities. Only the non-descript animals should be bred through crossbreeding.

Table-1. Compounded Annual Growth Rate (CAGR) of Milk Production and per capita availability of milk in India and Punjab

Parameter	Year	India	Punjab
Milk Production (in thousand tones)	2000	78286	7706
	2014	137686	10011
	CAGR(%)	**4.12**	**1.89**
Per capita per day availability of milk (in grams)	2000	217	902
	2014	299	961
	CAGR(%)	**2.32**	**0.45**

Table-2. Compounded Annual Growth Rate (CAGR) of Milch animal population, production and productivity of dairy species in India and Punjab

rameter	Year	India				Punjab			
		Ind. cattle	Crossbred /exotic cattle	Buffalo	Goat	Ind. cattle	Crossbred /exotic cattle	Buffalo	Goat
mber of imals milk thousands)	2000	27626	5798	29159	29615	176	608	2400	120
	2014	31035	13756	39286	30912	121	699	2150	117
	CAGR(%)	**0.83**	**6.37**	**2.15**	**0.31**	**-2.64**	**1.00**	**-0.78**	**-0.18**
lk Production thousand tones)	2000	19018	13618	42268	3337	205	1907	5552	42
	2014	28306	33889	70443	5048	292	2816	6845	58
	CAGR(%)	**2.88**	**6.73**	**3.72**	**3.00**	**2.56**	**2.82**	**1.51**	**2.33**
lk productivity g/day)	2000	1.89	6.43	3.96	0.31	3.20	8.57	6.32	0.96
	2014	2.5	6.78	4.91	0.45	6.59	11.04	8.72	1.36
	CGAR(%)	**2.03**	**0.38**	**1.55**	**2.70**	**5.30**	**1.83**	**2.33**	**2.52**

A BRIEF INTRODUCTION ON BLOOD GROUPS IN EQUINES AND NEONATAL ISOERYTHEOLYSIS.

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There are eight major recognized blood groups in horses. Seven of them, A, C, D, K, P, Q, and U, are internationally recognized, with an eighth, T, which is primarily used in research. Each blood group has at least two allelic factors (for example, the A blood group has a, b, c, d, e, f, and g), which can be combined in all combinations (Aa, Afg, Abedg, etc), to make many different alleles. This means that horses can have around 400,000 allelic combinations, allowing blood testing to be used as an accurate method of identifying a horse or determining parentage. Unlike humans, horses do not naturally produce antibodies against antigens that they do not possess; this only occurs if they are somehow exposed to a different blood type, such as through blood transfusion of Trans placental hemorrhage during parturition.

Breeding a mare to a stallion with a different blood type, usually Aa or Qa blood, risks neonatal isoerythrolysis if the foal inherits the blood type of the stallion. This can also occur if a mare is bred to a jack, due to donkey factor. This immune-mediated disease is life-threatening and often requires transfusion.

Ideally, cross matching should be performed prior to transfusion, or a universal donor may be used. The ideal universal whole blood donor is a non-thoroughbred gelding that is Aa, Ca, and Qa negative. If this is not available, a gelding, preferably of the same breed as the patient, may be used as a donor, and cross matching may be crudely accessed by mixing donor serum with patient blood. If the mixture agglutinates, the donor blood contains antibodies against the blood of the patient, and should not be used.

Neonatal Isoerythrolysis

In the horse a homologous disease called neonatal isoerythrolysis (NI) has beenknown for a long time. In this disease the foal's red blood cells (RBC) are destroyed by maternal anti-RBC antibodies. The deleterious antibodies are produced by the mare in response toone or more red cell antigens which the foal has inherited from the sire, and which are absent in the mare. The antibodies are transmitted to the foal through colostrum which is considered the exclusive route of passive immunity from mare to foal. The first NI foal is usually delivered by a mare in the fourth to seventh pregnancy, although NI among foals from earlier parities has been observed.

The available overall data on NI in horses indicate that the blood group factors Aa of the A system and Qa of the Q system are the 2 antigenic determinants involved inthe great majority of cases. Only very rarely have other blood factors been found to provoke the formation in pregnant mares of antibodies deleterious to the newborn foal.

Antibodies to red blood cells (often referred to as anti-erythrocyte antibodies) can be transferred to another horse through either colostrum (as from dam to foal) or through transfusion, or they may develop to a horse's own red blood cells. When anti-erythrocyte

antibodies are transferred from a mare to its foal, a syndrome called neonatal isoerythrolysis (NI) may develop. Anti-erythrocyte antibodies transferred through transfusion may cause several types of adverse reactions, called transfusion reactions. When a horse develops antibodies to its own erythrocytes autoimmune haemolytic anaemia (AIHA) may occur.

Neonatal Isoerythrolysis in Horse Foals

Neonatal isoerythrolysis is a disease of newborn horse foals and mule foals that occurs within the first week of life. It is caused when the mare produces antibodies against the foal's red blood cells and transfers those antibodies to the foal through colostrum during the early stages of lactation and nursing. This syndrome may occur when the blood type of the mare is different than that of the stallion and the foal inherits the sensitizing red blood cell type from the stallion. Mares that are negative for red blood cell factors have the potential to develop antibodies against those factors. Mares may become sensitized as a result of exposure to blood of a fetus with incompatible blood type as a result of placentitis, difficult parturition, or from exposure to blood containing the foreign blood factors from a previous blood transfusion. Horses have 8 different blood group systems, each of which has different factors. Some of the red blood cell factors associated with NI are Aa, Ab, Ac, Ka, Pa, Pb, Qa, Qb, Qc, and Ua. In some cases, a mare may produce sufficient antibody during a first pregnancy which can cause NI in her foal.

Determining the Potential for Developing Neonatal Isoerythrolysis.

A mare that has produced a foal that developed NI is likely to produce others. The risk of producing another NI foal is greater if the mare is bred to the same stallion or a stallion with the same inciting blood type as that of the original stallion. Mares that have previously produced a NI foal are excellent candidates for anti-erythrocyte antibody screening in subsequent pregnancies. Some breeds have a higher risk of having an NI foal, such as Friesians. In addition, mares bred to a donkey are at risk of producing a NI newborn, and they are also excellent candidates for anti-erythrocyte antibody screening to test for the anti-donkey factor.

Diagnosis of Neonatal Isoerythrolysis.

Clinical signs of red blood cell lysis in the affected foal usually occur within 6-72 hours after birth. The major clinical signs are lethargy, elevated pulse (heart rate), increased respiratory rate, anemia and jaundice. If mild, the foal may recover without treatment, however the disease may progress to severe anemia and organ dysfunction leading to death. Diagnosis is supported by demonstrating anti-red cell antibodies in the colostrum or serum of the mare.

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