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# VET ALUMNUS


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# ROLE OF VETERINARIAN AS AN EXTENSION WORKER

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Veterinarians especially working in the field are always in direct contact with the farmers' community and play pivotal role in their socio- economic up-liftment. For the socio- economic up-liftment of the farmers, the veterinarians apart from their technical responsibilities also have an extensive role as an extension worker for the better lifestyle of the farmers.

**Extension????**

Extension is about motivating, inspiring and taking people to greater heights. It is about an action in which we work with participants on the issues pertaining to what, why and how? Extension is not all about telling or conveying to the end user, rather it's about enabling them to adopt and motivate in right direction. It's all about walking alongside the researchers and farmers.

The latest research and new innovations of the research institutes pertaining to livestock are of no use if they are not reaching to the end users. Secondly, feed back in the form of response to the newly developed innovations is also important for further improvement. So this two way flow of information is very important and it can't be complemented without an extension worker. So, here the veterinarians are a novel link between the research institutes and an end user. A veterinarian extends the information from research institute to farmers and provides feedback of an end user to the researchers. So, this transferring of innovations is broken if the bridge between both ends; A- Veterinarian is weak or not competent.

So it becomes necessary for a veterinarian to establish him/ herself as a competent extension worker. So, here we would discuss few steps to be incorporated in our personality to establish ourselves as competent extension workers.

**What do you know about yourself?**

Extension begins with self- knowledge and it is the basis for character. Character is the root of integrity, which in- turns provides the foundation of extension. Therefore, its necessary that one should be clear in ones thoughts to help and direct others. According to Webster- A competent extension worker is the one who directs, guides and has an influence. Therefore, one needs to develop close linkages with the livestock owners to influence them for the adoption of new innovations. So, it becomes mandatory for a veterinarian working in close proximity with the farmers to imbibe potential in ones personality to influence others and its only possible when you are clear in your thoughts.

**Elements of a competent extension worker:**

As a competent extension worker a veterinarian must be able to direct farmers and more importantly to have these livestock owners accept his directions. To be competent in directing the livestock owners' community, it is necessary to imbibe following aspects in ones personality:

1. Working as an extension worker, veterinarian must be able to create a strategic vision about recent developments in the field of livestock.

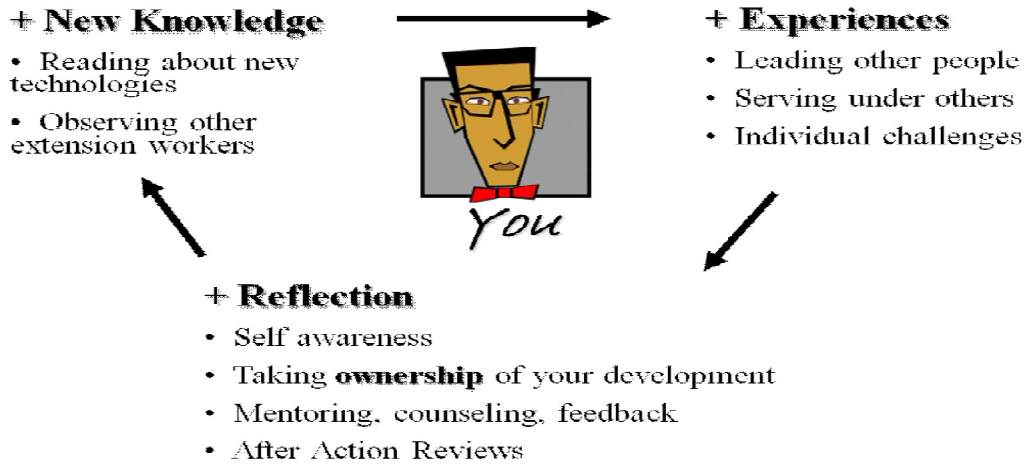
2. One must be efficiently able to communicate one's vision to the livestock owners.

3. Last but not the least, it is very important to build and keep the commitment with the livestock owner.

According to Alexender Graham Bell as an extension worker- Never walk the travelled path because it only leads you where the others have been. Moreover, working as an extension worker, the role of a veterinarian is much more important as he would take the livestock owners on journey where they have not been before.

**Development of a competent extension worker:**

1. It is said that "Good timber does not grow with ease; the stronger the wind, the stronger the trees." Therefore, working in the field it is very important that a veterinarian must be able to take criticism. Though it's a tough medicine to swallow but usually always valuable. Alternatively, if need be criticism should be given kindly.




2. One must be aware of the fact that how livestock farmers are responding to your directions.

3. Self regulation is another key aspect. It helps to develop an ability to manage your emotions and reactions.

While working in the field conditions veterinarians are always under pressure to

restore equilibrium and produce solutions. Moreover, deviants are extension worker's best friend. Moreover, while playing the role of an extension worker one is bound to committee mistakes. So, it's important that how one deals with them? Therefore, one must have ability to handle it with care and put focus on ourselves rather than others. One must be able to acknowledge one's strengths and weaknesses.

**Payoff of Extension:**

As an extension worker it is necessary for us to learn from others mistakes. One will not live long enough to commit them by oneself. Moreover, livestock extension is not about getting people to buy into your ideas, rather it's about teaching livestock farmers to:-

- Recognize and embrace their unique abilities and limitations.
- Work with broader purpose for the development and up-liftment of livestock sector along with fulfilling their specific goals and needs.
- Draw the best out of the aspiring livestock owners by motivating and inspiring them.

Finally, extension is a combination of character and competence of who you are and what you can do. So, veterinarians are always at challenge and their contribution towards the up-liftment of the socio- economic status of the livestock owners of the country cannot be over looked. Moreover, veterinarian's pivotal role in the transfer of technologies and proper implementation of technologies cannot be under estimated.

# PRECISION ANIMAL NUTRITION

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Precision Animal Nutrition is defined as providing the animal (in question) with the feed that precisely meets its nutrients requirements for optimum production, reproduction, health for producing wholesome animal products without having any negative effect on environment. Basic deriving force behind this is to improve profitability and social milieu.

**Objectives of Precision Animal Nutrition**

1) To provide the feed to animal as per their requirements.

2) To improve the profitability or gross return by ensuring the better feed efficiency.

3) To maintain clean environment by lowering the excretion of N, P, K etc in excreta and methane production in rumen.

4) To make effective use of available feed resource (conventional and unconventional).

5) To make the future of mankind bright by preserving feed resource and environment besides providing the wholesome animal food.

To full fill the first objective one should have comprehensive knowledge about the animal (in question) and its nutrient requirements. Feeding standard like NRC and ICAR can be referred and are more prevalent in India. Secondly, in order to form the precision feed or matrix, analytical information of the feed/matrix or feed ingredients must be available. The established values should be used to match the animal's need. Nutrient relationship and ideal ratios of various minerals must be kept in mind while formulating the precise diet for the said animal. For example consider the case of precision feeding of dairy heifer. Feed represents the largest cost associated with heifer production. Therefore controlling feed cost is a major way to control the total costs of raising the heifer. Feed efficiency (kg milk/kg feed) is an important management concept for lactating dairy cows, however, the concept is seldom mentioned for the growing heifer. Feed efficiency for a growing animal is measured as kilograms of gain per kilogram of feed. There are several factors that can greatly impact feed efficiency in the dairy heifer, such as genetics, forage and feed quality, its digestibility, growth rate or stage of growth, body condition or gain in body composition, stress (environmental stresses) and gestation. Feed efficiency is also affected by management, such as housing, feeding pattern and type including balanced diet (in terms of CP, RDP-UDP, energy, fibre vitamins and minerals) and bunk space used for the heifers.

**Nutritional Aspects of Implementing Precision Feeding in heifer**

Feeding dairy heifers a balanced diet is always important. Preferably it must be in TMR form.

**Protein:** Balance feed primarily for crude protein, 14 -15% CP is required.

- Maintain at least 30 to 35% soluble CP in the rations at all times.

- Rumen undegradable CP levels in excess of 25 to 30% are not required
- Heifers require a specific amount of crude protein daily, and for heifers total protein has been shown to be equally as important as the various protein fractions. Research has shown that added rumen undegradable protein (RUP) is of limited value to the heifer beyond what is found in common feedstuffs.

**Energy:** Size, growth rate, and environment of the heifer will influenced the energy requirement of the heifer. Heifer's diet can be formulated at a fixed (generally higher) energy to meet the heifers' energy requirement. Heifers should be fed approximately 130 kcal of metabolizable energy per pound of metabolic body weight ($BW^{0.75}$).

**Fiber (NDF or ADF):** The NDF requirements for growing heifers are not well established and research has yet to find a detrimental lower limit. Heifers fed diets as low as 19% NDF have done very well and have not acquired metabolic or lameness problems under routine management; undoubtedly due to the limitations placed on DMI.

**Vitamins and minerals:** Heifer feed must provide the minimum prescribed vitamin and minerals as precision feeding does not alter their requirement.

**Management aspects of implementing Precision Feeding in heifer**

- In precision feeding systems, heifers will need 14 to 24 inches of feed bunk space per heifer as they progress from 4 months of age to pre-calving.
- Avoid abrupt change in diet. Change must be gradual.
- *Adlib* supply of water

Comfortable environment (mattress, temperature, humidity, air circulation etc)

The target is to achieve the body weight of about 275-300 kg as early as possible.

So, precision feeding of heifers reduces feed costs, reduce nutrient excretion, and increase feed efficiency without compromising future lactation performance. Both nutrient requirements of various animal and analytical compositions of various feed ingredients are dealt in detail somewhere in this book. Once feed is ingested, the digestible nutrients are channelized for maintenance of the body, growth, production and for reproduction purposes. This is known as "Nutrients Partitioning". This is very complex process and is influenced by animal (in question) or genotype of the animal, physiological stage (growth, production or reproduction), and feed availability both in term of quality and quantity and environment. This nutrients partitioning play a major role in productive efficiency. All these point should be given proper care while formulating the precision diet for the animal.

Since driving force behind precision nutrition is profitability. It is necessary to evaluate all pertinent aspect of animal production *e.g.* milk/meat/egg production, feeding cost, vaccination cost, treatment cost (if any), mortality etc. Reducing the cost of feeding can be achieved by a) Proper selection of concentrate ingredients b) Proper preparation and treatment of concentrate and roughage material before feeding c) Computation of balanced and economical rations d) Application of latest advances and nutritional technologies i.e. by pass nutrients and additive (minerals chelates, antibiotics/ probiotics, ionophore,

anabolic and somatotropic hormone and enzymes preparation) e) Rule out risks and hazard on account of antinutritional factors which remain present in several kind of feeds and fodder f ) Ensuring freedom from diseases connected with errors in feeding i. e. bloat, toxaemia, acid indigestion, impaction, ketonaemia, parturient paresis etc.) Tackling the problem of feed shortage by making the good quality hay, silage, chemical treatment of hay and involving the agro- industrial byproducts in the ration.

Ruminant are consider to be an important contributors in greenhouse gases such as methane and ammonia. Out of total methane emitted by the animals, about 90% of methane comes from fermentation in the rumen (foregut) and remaining 10% comes from the hindgut. Livestock are responsible for 18 % of green house gas emission as measured in carbon dioxide equivalent. This includes 9 percent of all $CO_2$ emission, 37 percent of methane and 65 percent of nitrous oxide. Methane has 23 times more global warming potential than $CO_2$. In India major chunk of feed is used for maintenance of low producing animals, resulting in a higher level of methane production per unit of product. Further inferior feeds with poor digestibility have higher emissions per unit of feed intake. The intensive system of animal rearing affects not only the human life, but also their own life and net animal productivity through environment pollution results in global warming. About 8-9% of gross energy (GE) is lost as a result of methane production. This is the disadvantage for both cow and farmers as this energy can be channelised for production purposes. Dietary manipulation by means of supplementation of concentrate, deficient nutrient(s), lipid, UMMB, pelleted feed, green fodder, feed additives ( ionophores, probiotics, antibiotics, organic acids, halogenated methane analogues etc ) reported to lower the methane production. Similarly certain plants and their extracts like Hot water extract of soapnut, *Yucca* extracts, Fruit of *Sapindus saponaria* , leaves of *Entrobium timoba,*Methanol extracts of *Sapindus rarak* fruit

Tree leaves of *Enterolobium ciclocarpum* are also tried successfully. Use of plant secondary metabolites like essential oil and condensed tannin in animal diet also reported to lower the methane production.

Poultry feeds of plant origin contain enough amount of phosphorus which is sufficient to maintain the requirement of the birds but 2/3$^{rd}$ of the total phosphorus in these plant seeds is present in bound form with phytic acid and bird are unable to use this phosphorus due to lack of endogenous enzyme phytase. So, this phosphorus is excreted through poultry excreta and creates the problem of soil and water pollution. Phytic acid can form a variety of insoluble salts with different divalent and trivalent cations. Exogenous supplementation of enzymes phytase not only improve the phosphorus availability to the birds but also increase the availability of other mineral and bound nutrients thereby reduces their excretion in excreta.

Concentrate feed material, green fodder and dry fodder are continuously running short in comparison to their total demand of entire livestock and poultry population. In the recent decades while the position with regards to concentrate and green fodder remains almost the same. The supply of straw has suffered a great setback due to popularization of hybrid dwarf varieties of food crops and use of combine machine for the harvesting of crops. The perpetual shortage of feed and fodder can be overcome under two distinct kinds of measures.

1. Increasing the absolute supply of feed and fodder

   a. Reducing wastage i.e. by resorting to chaffing of Stover's.

   b. More complete extraction of naturally growing unused grasses/ herbages from unexplored terrains like deep forests, hills and desert land etc.

   c. Identifying and developing new agro industries waste products.

   d. Making inedible material (due to presence of anti-nutritional factor) fit for feeding of animals by developing techniques for the removal of toxic substances.

2. **More efficient utilization of existing scarce resources**

   a. Making poor qualities roughages more nutritious by physical, chemical, and biological treatment.

   b. Making the rations of livestock and poultry more balanced and by use of feed additive like probiotics, ionophores and herbal preparation. Compounded feeds can go a long way to achieve this goal.

   c. Adopting intensive and semi intensive system of livestock production in places of traditional extensive system to reduce the requirement of feed for body maintenance.

   d. Cutting fodder at the right stage of maturity.

   e. Converting surplus fodder into hay, silage and dehydrated meal.

   f. Avoid over and under grazing by adopting rotational grazing.

   g. Providing greater comfort from climatic stress and internal and external parasite including fly/ mosquitoes menace.

# IMPORTANCE OF FEEDING PROTECTED AMINO ACIDS IN RUMINANTS

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Protein is an expensive nutrient of dairy animal diet. Improvement in protein nutrition can help in improving the economic performance of dairy farm. However, feeding a diet containing more protein is not a satisfactory solution because the breakdown of dietary protein in the rumen is one of the most inefficient processes in ruminant nutrition. In typical dairy ration, 25-30% of the feed protein reaches the small intestine for absorption. In an attempt to overcome this inefficiency, dietary protein sources that are considered to be good sources of rumen undegradable protein have been used. The other practical way to reach required level and ratio of amino acids is dietary supplementation with rumen protected amino acids so that any amino acids imbalance is corrected and overall utilization of dietary protein is improved. Amino acid nutrition of dairy cows has received a lot of attention over the last decade resulting in several nutritional models which allow for diet formulation on the basis of amino acids.

## Degradation of protein and amino acids in the rumen

Feed proteins are hydrolyzed into peptides and amino acids by the rumen micro-organisms. However, most of the amino acids are rapidly degraded to organic acids, ammonia and carbon dioxide. The ammonia produced is the primary nitrogenous nutrient for bacterial growth. Some species of ruminal bacteria use peptides directly for synthesis of microbial protein. The microbial protein alone is sufficient to meet the needs of cattle at or near maintenance. However, young growing cattle and lactating cows need bypass protein in addition to microbial protein to meet their metabolizable protein requirements.

## Protection of protein from ruminal degradation

To avoid the ruminal degradation of high quality proteins and to reduce wasteful ammonia production in the rumen, it is possible to protect proteins using several procedures such as heat treatment, chemical treatment/modification, inhibition of proteolytic activity and identification of naturally protected protein sources. Heat treatment has been used to increase the undegradable protein of common feedstuffs such as soybeans and grains. Treatment of proteins with formaldehyde is the most widely used process and has been exploited commercially. The use of these techniques improves the supply of amino acids without an increase in ammonia production, resulting in better performance by the animal.

## Limiting Amino Acids

Dairy cattle have amino acid requirements for maintenance, growth, reproduction, and production (NRC, 2001). The amino acids available for digestion and absorption in the intestine come from three sources: microbial protein, undegraded dietary protein and endogenous protein from sloughed cells and secretions in the digestive tract. Ruminants have the ability to synthesize all amino acids. However, ruminants still require dietary amino acids since there is a limit in synthesizing capacity of rumen microbes (Bailey, 2000). Out of

22 amino acids, lysine and methionine are the first two amino acids that can limit production in dairy cattle on maize and soybean based diet, respectively. Recent research has indicated that histidine is probably the first limiting amino acid on grass silage based diet. Lysine and methionine are identified most frequently as first limiting essential amino acid in metabolizable protein of dairy cattle. Balancing amino acids to formulate dairy rations in a way that maximizes microbial protein synthesis. Microbial protein synthesis is important as it contains a good amount of lysine and methionine. Besides, it is economical source of lysine and methionine. The relative concentration of limiting amino acids in milk, tissues and various feed ingredients is presented in Table 1.

**Table 1. Lysine and methionine content in animal products, bacteria and typical dairy feedstuffs (Schwab, 2001)**

| Item | Lysine | Methionine |
|---|---|---|
| | % of Crude Protein | |
| Lean tissue | 6.4 | 2.0 |
| Milk | 7.6 | 2.7 |
| Rumen Bacteria | 7.9 | 2.6 |
| Barley | 3.6 | 1.7 |
| Maize | 2.8 | 2.1 |
| Oats | 4.2 | 2.9 |
| Canola meal | 5.6 | 1.9 |
| Corn gluten meal | 1.7 | 2.4 |
| Cottonseed meal | 4.1 | 1.6 |
| Sunflower meal | 3.6 | 2.3 |
| Soybean meal | 6.3 | 1.4 |

**Methods of amino acid protection**: These can be divided into three main categories

**1. Surface coating with a fatty acid or pH sensitive polymer mixture**

Surface-coating of methionine with enzyme-resistant, pH-sensitive synthetic polymer that is insoluble in neutral pH environment of ruminal digesta but highly soluble in the acidic environment of abomasum is the most effective approach. This approach provides a post-ruminal delivery system that is independent of enzyme, pH difference between the rumen and the abomasum. Polymer-protected methionine has high ruminal protection and intestinal release coefficient (Robert and Williams, 1997; Schwab, 1995).

**2. Surface coating or matrices involving fat or fatty acids and minerals**

Amino acids are formulated as calcium salts or lipids which have poor solubility in the rumen. Several lipid protected methionine products have been evaluated. The greatest challenge with using lipids as the primary encapsulating material is to identify a combination of materials that provide a coating or matrix that give a reasonable degree of protection against ruminal degradation and intestinal release.

**3. Liquid sources of hydroxy analogs**

Amino acid analogs are chemically modified molecules generated from the

substitution of the á-amino group of the amino acids with a non-nitrogenous group such as a hydroxyl group. The most studied amino acids analog is Met hydroxy analog (MHA; DL-á-hydroxy-ã- mercaptobutyrate) or more appropriately called 2-hydroxy-4-methylthio butanoic acid (HMB). Studies indicate that free HMB is more resistant to ruminal degradation than free methionine and ruminants have the enzymes for the conversion of HMB to methionine. Recent research has shown that several esters of HMB enhance ruminal escape of HMB, at least in part because of their apparent ability to be absorbed across the rumen wall. The isopropyl ester of HMB has been shown to have an excellent replacement value for absorbed methionine (Schwab *et al*., 2001).

**Advantages of protection**

Post ruminal utilization of nutrients eliminates energy losses associated with fermentation and protein losses incurred in the transformation of dietary protein to microbial protein. Protection from ruminal degradation enables more amino acids to reach the intestine and therefore provide more absorbable amino acids per unit of absorbable energy.

Lara *et al*. (2006) reported increased milk production (35.8 kg /d) and protein yield (3.16 kg/d) on addition of rumen protected methionine (RPM) and indicated that Holstein cows with a mean production of 35 kg/d milk require addition of ruminally protected methionine (16 g/d) to improve milk production. Similarly, Broderick *et al*. (2009) reported that supplementation of RPM and RPL enhanced the milk yield in crossbred cows. Socha *et al*. (2008) found an increase in milk production on abomasal infusion of methionine and lysine during peak and early lactation while there was no difference in mid lactation. Broderick *et al.* (2009) reported that supplementation of RPM in diet with reduced crude protein level resulted in increase in milk yield, milk fat and protein yield, indicating protein sparing effect of rumen protected amino acids. Thus, use of rumen protected amino acids can be used as an opportunity to reduce crude protein level of the diet and a significant amount of money can be saved.

Amrutkar (2011) supplemented 5g/d of RPM and 20g/d RPL during prepartum period to crossbred cows and found that duodenal supply of methionine and lysine was increased. However, the proportions of saturated fatty acids, unsaturated fatty acids, MUFA, PUFA in milk fat were not affected in cows fed ration fortified with RPM and RPL. Davenport *et al*. (1990) fed rumen protected lysine @6g/head to crossbred calves for 100 days and observed increased average daily gain in calves. Positive growth responses and increased N retention of growing ruminants were reported in several studies when lysine or methionine were infused postruminally or fed in ruminally protected forms. Besides this, methionine has a favorable role in hepatic metabolism through its capacity as a methyl donor. It plays a key role in evacuating triglycerides from the liver to peripheral tissues.

Balancing the diet for methionine and lysine, the two ûrst-limiting amino acids, is now practical and easily accomplished using effective rumen-protected products. Many nutritionists are now reducing ration crude protein levels with supplementation of rumen protected amino acids, thereby, reducing the cost of the diet. Thus, rumen protected methionine and lysine present a great opportunity for economising the dairy rations and optimizing the production performance of animals.

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***Please share any field experience/News/ Interesting events with your colleagues***

***....Editor***

# CAMEL MILK: AN ALTERNATIVE MILK FOR HUMAN CONSUMPTION

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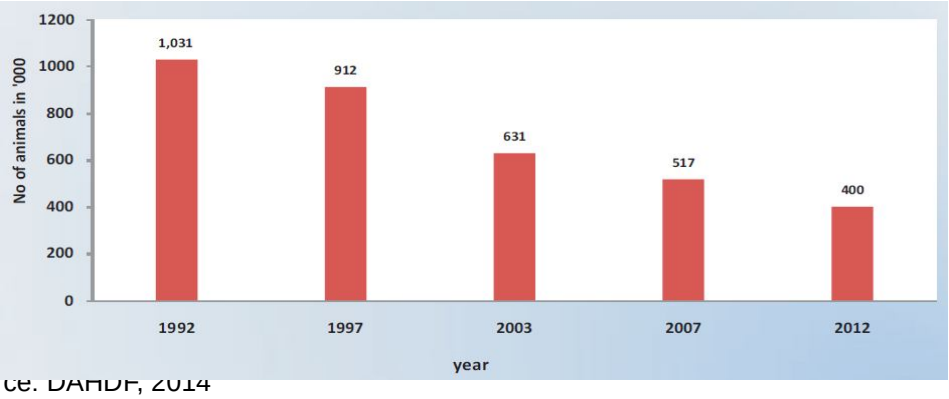
The camel is an important component of Indian fragile desert ecosystem, a proven icon of adaptation with its unique bio-physiological characteristics has formidable ways of living in harsh situations of arid and semi-arid regions. The proverbial ***Ship of Desert*** earned its epithet on account of its indispensability as a mode of transportation and draughtability in desert. However, its utilities are subject to continuous social and economic changes. The camel has also played significant role in civil law and order, defense and battles from the ancient times till date.

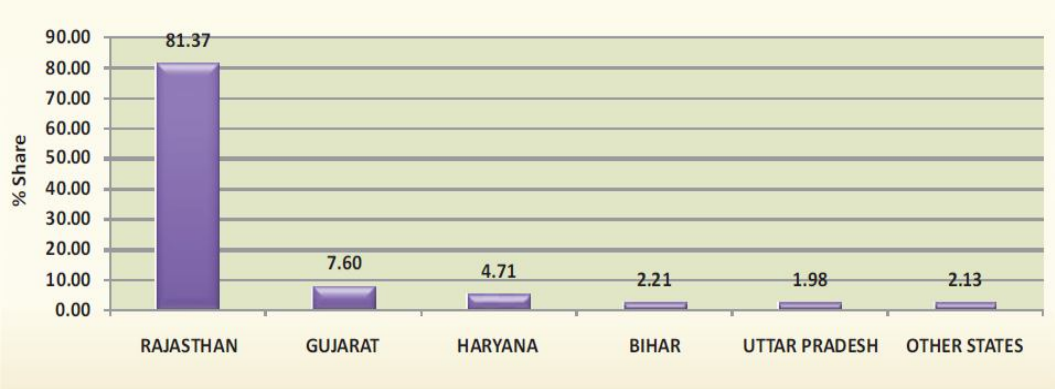
The Food and Agriculture Organization (FAO) estimates the total population of camels in the world today to be 22 million, of which 89% are one-humped dromedary (*Camelus dromedarius*) camels and the remaining 11% are the two-humped Bactrian (*Camelus bactrianus*) generally found in the cold deserts of Asia. In India, the total Camels contributes around 0.08% of the livestock population. The total number of Camels in the country as per 2012 Census is 0.4 million numbers (DAHDF, 2014). Camel population has decreased by 22.48% over the previous census as depicted in fig. 1 and is distributed mainly in Rajasthan, some parts of Gujarat, Haryana, Punjab and few in rest of the states (Fig 2). The camel has many unique qualities to survive and serve under harsh climate and utilize low quality feed resources which other species cannot consume. In fact, the camels are the life line of rural population in remote villages in the present era also. Traditionally, camel were mainly utilized as draught animal in agricultural as well as transport work but due to mechanization of farm operations and transportation, utility of this animal for this purpose has been reduced drastically. Therefore, to sustain the camel population in these areas, the camel husbandry practices are aimed towards promotion of camel as milch animal.

**Fig. 1: Total Camel population (in millions) during 1992-2012.**




Source: DAHDF, 2014

**Fig 2: State-wise percentage share of Camels Population (in millions)**




Source: DAHDF, 2014

**Milk production potential**

Camels have the capability to produce more milk than any other species and for longer periods of time under the harsh conditions of desert ecosystem, while their feed requirements are modest. Total milk production in a lactation period of 8 -18 months ranges between 2000 and 4200 L. On average, the daily milk production is estimated to be between 3 and 10 kg and the yield could increase to 20 L per day under improved feed, husbandry practice, water availability and veterinary care.

Camel milk has an important role in human nutrition in the hot and arid regions of the world. This milk contains all the essential nutrients as found in other milk. Fresh and fermented camel milks have been used in different regions in the world including India, Russia and Sudan for human consumption as well as for treatment of a series of diseases such as dropsy, jaundice, tuberculosis, asthma and leishmaniasis or kala-azar (Abdelgadir, et al, 1998). Recently, camel milk and its components were reported to have other potential therapeutic properties, such as anti-carcinogenic (Magjeed, 2005), anti-diabetic (Agrawal, et al, 2007a), and anti-hypertensive (Quan, et al, 2008), reno-protective potential (Afifi, 2010) and has been recommended to be consumed by children, who are allergic to bovine milk (El-Agamy, et al, 2009). It has also been reported to alleviate oxidative stress and lipid peroxidation in rats (Al-Hashem, 2009).

**Physico-chemical properties of Camel milk**

Camel milk is generally opaque white in color, foamy and slightly salty to taste. This may be due to feeding on certain shrubs and herbs in the arid region. The average density of camel milk is 1.029 g $cm^{-3}$ and has been reported to be less viscous than bovine milk (Laleye, et al, 2008). The pH of fresh camel milk ranges from 6.4 to 6.7. The freezing point of camel milk is between -0.57°C and -0.61°C. The camel milk has a calorific value of 665Kcal/L verses 701Kcal/L for cow milk.

**Camel milk composition and nutritive value**

Camel milk composition was found to be less stable than other species such as bovine milk. However, variations observed in camel milk composition could be attributed to several factors such as analytical measurement procedures, geographical locations, feeding conditions and samples being taken from different breeds, in addition to other factors including stage of lactation, age, and calving number (Khaskheli et al., 2005). Geographical origin and seasonal variations were found to be the most effective factors in camel milk composition. Konuspayeva et al. (2009) have studied the geographical effect on camel milk composition and reported that the milk of East African camels have higher fat content than that of camels living in Africa and Western Asia. The water content varies from 87-90% in camel milk. An inverse relationship was found between total solids in camel milk and water intake by camels (Haddadin et al., 2008).

***Milk Proteins:*** Total protein content of camel milk ranges from 2.15 to 4.90%. Casein content of camel and cow milk is quite similar; however the whey protein fraction is higher in camel milk. The ratio of whey protein to casein in camel milk is higher than in cow milk than in human milk proteins. This may explain why the coagulum of camel milk is softer than that of cow milk.

Casein (CN) is the major protein (1.63-2.76%) in camel milk and constitute about 52-87% of the total proteins. The â-CN content is higher than á-CN, and constitutes about 65% and 21% of total casein, respectively compared with 36% and 38% in bovine milk, respectively. The ê-casein content of camel milk is about 3.47% of the total casein compared with 13% in bovine milk.

Whey proteins constitute about 20-25% of the total proteins and 0.63 and 0.80% of the milk. Of the two major whey proteins, á-lactalbumin is the main component in camel milk and â-lactoglobulin is deficient (Laleye et al., 2008). Other whey proteins present in Camel milk are serum albumin, lactoferrin, immunoglobulins and peptidoglycan recognition protein.

The enzymatic digestibility and antioxidant activity of camel á-lactalbumin were studied recently by Salami et al. (2009). Camel á-lactalbumin has shown higher degrees of hydrolysis (digestibility) with both trypsin and chymotrypsin enzyme than bovine á-lactalbumin, but both proteins shown similar sensitivity to pepsin enzyme. The antioxidant activity of camel á-lactalbumin was greater than that of bovine á-lactalbumin because it contains higher antioxidant amino acids residues, in addition to the differences in conformational features of both proteins.

***Milk Fats:*** The fat content of camel milk ranges between 1.2 to 4.5% depending upon the level of nutrition, stage of lactation, breed, season etc. Camel milk fat is characterized by the higher proportion of unsaturated fatty acids compared with other species. This may the main reason for waxy texture of camel milk fat (Zhang et al. 2005). Higher contents of long chain fatty acids were also reported for Dromedary camel milk fat compared with bovine milk fat (Konuspayeva, et al, 2008). Camel milk has a lower content of carotene than bovine milk (Stahl, et al, 2006). This lower carotene content could explain the whiter color of camel milk fat.

***Lactose:*** The lactose content of camel milk remains almost unchanged over a season and under hydrated or dehydrated conditions and it ranges between 3.5-4.5%.

***Mineral content:*** The total mineral content of camel milk varies from 0.60 to 0.90%. Camel milk is rich in Zn, Fe, Cu, and Mn and richer in Cu and Fe than cow milk. The concentration of other major mineral Ca, Mg, P, Na, and K in camel milk is almost similar to those of cow milk. Camel milk is a rich source of chloride due to the forage eaten by camels, such as Atriplex and Acacia, which usually contains a high salt content (Yagil, 1982). The reduction in major milk components and increase in chloride content of milk from dehydrated camels might be another cause for the salty taste in camel milk (Yagil & Etzion, 1980). The ratio of Ca: P is 1.5 for camel milk verses 1.29 and 2.1 for cow and human milk, respectively. This ratio is important, since if the camel milk- based formula used for feeding infants contains high phosphate, this may lead to hyperphosphatemia and low serum calcium.

***Vitamins:*** Among water-soluble vitamins, camel milk is richer in niacin and vitamin C than cow milk. Vitamin $B_1$, $B_2$, folic acid and pantothenic acid are low in camel milk; $B_6$ and $B_{12}$ content are quite similar to those of cow milk and higher than in human milk. The content of vitamin A camel milk is reported to be lower than that of bovine milk and it ranges between 100-380ìg/L.

According to the USDA (2009), camel milk (250 ml) provide an adult with about 15.5% of cobalamin ($B_{12}$), 8.25% of riboûavin ($B_2$), 5.25% of vitamin A and 10.5% of ascorbic acid (C), thiamin ($B_1$) and pyridoxine ($B_6$) of the Recommended Daily Intake (RDI).

**Medicinal values and functionality of Camel milk**

Milk is considered as complete food for mammal's neonates because it provides the complete nutritional requirement of each corresponding species. It also contains components that provide critical nutritive elements, immunological protection, and biologically active substances to both neonates and adults. Camel milk have been acknowledged for a long time in different parts of the world to provide a potential treatment for a series of diseases such as dropsy, jaundice, tuberculosis, asthma, and leishmaniasis or kala-azar (Abdelgadir et al., 1998). These potential health beneûts are obtained through a number of bioactive components in camel milk. These components are reported to exist naturally in camel milk or derived from camel milk proteins using probiotic strains.

***Antimicrobial and Antiviral properties:*** Antibacterial activity of camel milk is due to the presence of antimicrobial substances such as lysozyme, hydrogen peroxide, lactoferrin, lactoperoxidase and immunoglobulins. Camel milk was reported to have an antimicrobial effect against Gram positive and Gram negative bacteria, including *Escherichia coli, Listeria monocytogenes, Staphylococcus aureus* and *Salmonella typhimurium* (Benkerroum, et al., 2004; El-Agamy et al., 1992). The inhibitory action of camel milk against *L. monocytogenes, S. aureus* and *E. coli* might be attributed to the presence of lactoperoxidase, hydrogen peroxide and lysozyme respectively (Benkerroum et al., 2004). The growth of *Salmonella typhimurium* was inhibited by lactoferrin in camel milk through binding iron and making it unavailable for its growth (El-Agamy et al., 1992; Ochoa & Cleary, 2009).

The amount of lysozyme, lactoferrin and immunoglobulins were found to be greater in camel milk than bovine or buffalo milk. These antimicrobial agents were reported to completely lose their activity in camel milk if heat-treated at 100°C for 30 min (El-Agamy, 2000a).

Rotaviruses are the most frequent cause of nonbacterial gastroenteritis in infants or calves in most parts of the world. The stronger anti-rotavirus activity was reported in camel milk and colostrum (El Agamy et al., 1992; El Agamy, 2000b). This indicates that raw camel milk is considered a strong viral inhibitor to human rotavirus. These findings may explain the reason for use of camel milk as a remedy to treat diarrhea by camel herds-men.

The virucidal and virus-inhibiting properties of Shubat, fermented camel milk drink in Kazakhstan, against ortho- and paramyxoviruses were also reported by Chuvakova et al., (2000). The antiviral activity of Shubat is suggested to be due to the presence of sialic conjugates and metabolic products of lactic acid bacteria and yeasts.

The ability of camel milk proteins to inhibit and/or block the hepatitis C virus (HCV) entry and replication inside the cell system has been explored by El-Fakharany et al, (2008) and Redwan and Tabll (2007). Camel lactoferrin was demonstrated a remarked in-vitro ability to completely inhibit the HCV entry and replication into human peripheral blood mononuclear cells (PBMC), hepG2 and replication inside those cells system.

***Angiotension I-converting enzyme (ACE) inhibitory activity:*** ACE-inhibitory peptides are present in the primary structure of various food protein sources including milk proteins. These peptides are also found in fermented camel milk. Probiotic bacteria have been shown to hydrolyze the major components of milk proteins to increase the number of peptides and amino acids to enable their growth. *Lactobacillus helveticus* 130B4 has been used to release the ACE-inhibitory peptides from camel milk proteins; the amino acid sequence was identiûed as Ala-Ile-Pro- Pro-Lys-Lys-Asn-Gln-Asp (Quan et al., 2008).

***Useful for diabetes management*:** Presence of high concentration of insulin/insulin like substances in camel milk such as half-cystine (Agrawal et al., 2003), the effect of small size immunoglobulins of camel milk on â- cell (Agrawal et al., 2007b) and the lack of coagulation of camel milk in the human stomach, contributes to the hypoglycaemic effect in type-1 diabetes in human (Agrawal et al., 2003), rats (Sahani et al., 2005) as well as in alloxan-induced diabetic dogs (Sboui et al, 2010).

***Cholesterol lowering property:*** Fermented camel milk, Gariss containing *Biûdobacterium lactis* (BB-12) administration have been reported to possess a hypocholesterolaemic effect in-vivo in rats (Elayan et al., 2008). The hypocholesterolaemic mechanism of camel milk is still unclear, but different hypotheses have been proposed, including: interaction between bioactive peptides derived from camel milk proteins and cholesterol, which result in cholesterol reduction, and the presence of orotic acid in camel milk known to be responsible for lowering cholesterol level in human subjects (Buonopane, et al, 1992) and in rats (Rao, et al, 1981).

***Camel milk is safe for person allergic to bovine milk:*** Dromedary camel milk was recently suggested as a food alternative to children with allergenicity to bovine milk. Hypoallergenicity of mothers' milk was reported to be due to the high percentage of â-CN,

low percentage of á-CN, deûciency of b-lactoglobulin and similarity of the immunoglobulins. It has been reported that camel milk could be a new protein source for children allergic to bovine milk. It is expected to cause little hypersensitivity reactions because camel milk protein percentages are similar to that found in human milk (El-Agamy et al., 2009).

**Conclusions**

Fresh camel milk and their products are a good nutritional source for the people living in the arid and semi-arid areas. The production of camel milk is gradually increasing due to an increased interest by consumers in recent years. Camel milk was found to be different in some aspects from milk of other animal species, such as bovine milk. Various dairy products were reported to be produced successfully from camel milk with some modiûcations to their production procedure. Fresh and fermented camel milk were reported to provide particular health beneûts to the consumer depending on the bioactive substances in milk. More extensive research is needed to conûrm these proposed health beneûts.

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# ANATOMICAL DIFFERENCES IN APPENDICULAR SKELETON OF CATTLE AND BUFFALO

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The anatomy of the buffalo resembles cattle very much except very few differences. Sometimes in veterolegal cases, intermingled skeletal remains of cattle and buffalo are presented before veterinarians to give expert opinion and to differentiate the bones of cattle and buffalo. The differences in the skeleton of cattle and buffalo are very few. Earlier we have reported some important anatomical differences in the axial skeleton of cattle and buffalo and in this paper we have listed some salient differences in the appendicular skeleton of cattle and buffaloes which can be taken into account while identifying the skeletons of these two closely related species.

Appendicular skeleton comprised of bones of forelimb and hind limb. Forelimb is comprised of scapula, humerus, radius and ulna, carpals, metacarpals, and phalanges and hindlimb comprised of os coxae, femur, tibia and fibula, tarsals, metatarsal and phalanges.

**Forelimb:**

**Scapula**

- The scapula of the buffalo is more regularly triangular in outline and is relatively wider at vertebral end as compared to cattle.
- Scapular spine start slightly ventral to vertebral border in buffalo but from the vertebral border in cattle
- Supraspinous fossa is wider in buffalo as compared to cattle
- Acromian process present at the end of scapular spine is blunt in buffalo whereas it is sharp in cattle.
- Scapular spine is straight in buffalo and backward directed in cow
- Tuber scapula is less pointed in buffalo but more in cattle
- Proximal 1/3$^{rd}$ of scapular spine have distinct tuber in buffalo but not very prominent in cattle
- Coracoid process is prominent in buffalo but short and rounded in cattle

Humerus

- Musculospiral groove is more deep in buffalo as compared to cattle
- Summit of humerus is more pointed in buffalo.
- Deltoid tuberosity is more prominent in buffalo as compared to cattle.
- The groove for extensor muscles is shallow in buffalo as compared to cow

**Radius and ulna**

- Olecranon process is large in buffalo as compared to cattle
- The groove between two interosseous spaces of radius is deeper in buffalo.

Metacarpal

- Metacarpal is wide and short in buffalo as compared to cattle
- Proximal and distal foramina on dorsal metacarpal groove are absent in buffalo but

present in cattle

There were no significant differences between carpals and phalanges of cattle and buffalo.

**Hindlimb:**

**Os coxae**

- Tuber coxae is triangular in cross section in buffalo but quadrilateral in cattle
- Wings of os coxae are wider in buffalo as compared to cattle
- The tuber sacrale is separated from the opposite angle by a wider interval than in the cattle
- Tuber sacrale are widely placed in buffalo as compared to cattle
- The dorsal border of ilium is almost straight in the buffalo which is undulating in the cattle
- The wings of ilium are wider in buffalo as compared to cattle
- Ischial tuberosity is bifid in buffalo and trifid in cattle.
- Gluteal lines are more prominent in buffalo as compared to cattle
- Distance between tuber sacral and tuber coxae is more in buffalo as compared to cattle.
- Isciatic arch is more curved (U shaped) in buffalo and V shaped in cattle
- Internal and external pelvic diameter are more in buffalo as compared to cattle.
- On the ventral surface of pubic symphysis, cranial and caudal tuberosities are more prominent in buffaloes as compared to cattle.
- The triangular area for muscular attachment below the tuber coxae is larger than that of buffalo.

**Femur**

- Medial ridge of trochlea is thick in buffalo as compared to cattle
- Non articular surface of patella has rough tuberosity in cattle than buffalo

**Tibia and Fibula**

- Tibia is massive in buffalo but thin in cattle
- Tibial tuberosity is large and grooved in buffalo as compared to cattle
- Popliteal lines are more in buffalo as compared to cattle

**Tarsals**

- Tubercalcis of fibular tarsal are somewhat rounded in buffalo and roughly triangular in cattle

**Metatarsal**

- Dorsal metatarsal groove is wider and shallow in buffalo whereas it is narrow and deep in cattle
- More broader in buffalo as compared to cattle

**Phalanges**

- Phalanges in hindlimb are similar in both cattle and buffalo but third phalanx is large as compared to cattle.

# ROTAVIRUS: DIARRHEA IN CALVES

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Livestock farming plays an important role among the development programs in India. The future of any dairy operation depends upon a successful program of raising calves. However, it has been observed that large number of calves die at an early age. Clinical and post mortem examinations reveal diarrhea as major cause of this menace. Diarrhea and enteric infections are very important especially in young calves, because at this stage most of the calves are unvaccinated and majority of them do not carry protective levels of maternal antibodies. Rotaviruses are recognized as the single most significant cause of severe gastroenteritis, malnutrition and diarrhea. These losses are much greater in developing countries like India where socio-economic conditions favor the survival of virus in the environment.

The virus has a typical cart wheel appearance with a genome consisting of 11 double-stranded RNA segments. The RNA-PAGE technique can separate the 11 dsRNA segments and a characteristic visual pattern known as RNA electropherotype is generated. The RNA electropherotype of group A rotavirus has 4–2–3–2 pattern, group B has 4–2–2–3 and group C has 4–3–2–2 pattern. There are six structural proteins (VP1 to VP4, VP6 and VP7) and six non-structural proteins (NSP1 to NSP6). VP6 is a group specific antigen that is common to all rotaviruses. Rotaviruses belonging to species A, B and C infect humans and various animal species.

Rotaviruses can survive in fecal material of infected animals for long periods and remain a source of infection to susceptible animal population. They are even stable at low and high relative humidity, pH range of 3 to 9 but there is reduction in infectivity of the virus at higher temperatures. Thus fecal-oral route is the main route of transmission and the feces of an infected animal can contain more than 10 trillion infectious particles per gram.

After entry through oral route rotaviruses replicate in the cytoplasm of epithelial cells of small intestinal villi. As the infection progresses, the mature cells are sloughed off and immature cells from crypts cover the villus surface creating a sudden change in the ratio of absorption and secretion which results in the accumulation of fluid in the lumen of intestine. The loss of mature enterocytes also results in ion imbalance leading to acidosis.

Rapid and accurate detection of the etiological agent is important to control the spread of infection in animals. Generally, the diagnosis of rotavirus is based on isolation and identification of the virus in intestinal contents or feces. Laboratory tests such as viral RNA-based PAGE, ELISA, RT-PCR, Immunofluorescence test (IFT), immunoperoxidase test (IPT), Latex agglutination test (LAT) can be employed for the diagnosis.

Rotaviruses are important human and animal pathogens with high impact on public health and livestock industry. Rotaviral infections are found to have a complex epidemiology because of co-circulation of different serotypes of the virus primarily due to genetic shift or genomic rearrangements. The mechanisms driving rotavirus diversification include positive accumulation of single point mutations, inter-segmental recombination, rearrangement and reassortment.

For prevention and control of rotaviral infections good management and hygienic practices are essential at the farm. Also vaccinating the dam to confer protection to neonates is a common method of preventing the infection. The pooled colostrum from vaccinated dams can help to prevent diarrhea and virus shedding in calves.

# OBESITY IN DOGS: AN ALARMING HEALTH CONCERN

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Obesity in companion animals is a serious health concern, resulting in a shorter life span and greater disease morbidity. As per an estimate, 25-44% pet dogs in the world are overweight. Even in India, a sedentary life style and poor dietary habits have resulted in the growing incidences of the obesity in the companion animals. It is estimated that one in two animals will be overweight by 2013, if the trend continues at the current rate. Obesity in dogs is a vicious circle, that is, a dog that has gained weight has reduced physical activity, thereby making it all the more difficult for the canine to lose weight. Moreover, most dog owners do not even realize that their pets are overweight, until they are taken to the veterinarian for other reasons. Dogs may become overweight for many reasons. Whether the obesity is due to simple Overfeeding, reduced physical activity or as a result of a disease process, the bottom line is the same: the dog is taking in more calories than he is using. Regardless of the cause of obesity, the owner is ultimately responsible for regulating the dog's caloric intake and use, and in seeking veterinary assistance in maintaining the dog at the optimal weight.

**Conditions Caused or Complicated by Obesity**:

The conditions caused or complicated by obesity include decreased life expectancy (obese dogs live 2-years less compared with non-obese paired littermates), increased incidence of hip dysplasia and degenerative joint disease, pulmonary and cardiovascular disease, reduced immunity, exercise and heat intolerance, hyperlipidemia and dyslipidemia, increased incidence of pancreatitis, dystocia and possibly decreased fertility, hypertension, increased incidence of mammary tumours and transitional cell carcinoma of the urinary bladder, diabetes mellitus, skin fold dermatitis, difficulty with performing surgical procedures, increased morbidity and mortality during and after anaesthesia.

Some of the more common diseases and conditions which can contribute to obesity in the dog are discussed below.

**1. Food type, availability and palatability**: While some dogs are choosy and eat only when they are hungry, some eat whatever is available to them and look out for more, irrespective of the hunger pangs. Feeding your dog all the time is a sure-shot way of making it overweight. Also, the type of food that you are giving your dog directly affects the weight of a dog. Table scraps, treats (pizza, burger, fried chicken, ice-cream, chocolates, potato chips etc.) and high-energy dog foods can easily contribute to obesity.

**2. Activity level:** Activity level plays a major role in determining the caloric needs of a dog and thus has tendency to become overweight. An active dog will use more calories. In addition, an active dog's mental state may make him less likely to eat more because of boredom or stress.

**3. Neutering and spaying**: Neutering and spaying dogs lowers their metabolic rate such

that they require fewer calories than intact dogs. In addition to changes in metabolism, androgens and estrogens (male and female sex hormones, respectively) stimulate roaming behavior and general physical activity. Estrogen, in addition, has the effect of decreasing appetite. Spayed animals never have the extra energy demands of pregnancy or raising a litter. Since their energy needs are less, if we feed them what we would feed intact dogs, neutered and spayed dogs will, of course, gain weight. In truth, most neutered and spayed dogs are overfed and under exercised and are twice as likely to become obese as intact dogs. Neutering and spaying themselves do not cause obesity; it is how we care for the dogs afterwards that predispose them to becoming overweight.

**4. Breed predispositions:** Some breeds have more chances of becoming overweight or obese than other breeds. Labrador Retrievers, Dachshunds, Beagles, Cairn Terriers, Cocker Spaniels, Collies, Shetland Sheepdogs (Shelties) and Basset Hounds are some breeds that are more prone to gain weight.

**5. Age:** Dogs between 2 and 12 years of age, especially around the 6$^{th}$ year, are more likely to become overweight. While growing into adults, their tendency to become overweight reduces significantly. Young dogs, too, are less likely to gain weight since they are highly energetic and more active. A dog who has become overweight in less than two years will continue to remain overweight throughout its life, so weight reduction should occur as soon as possible and every effort should be made to maintain the optimum weight.

**6. Social environment:** Many people will acknowledge they eat more when they are stressed, and often eat less nutritious food. Animals have similar responses to stress. This stress could include new persons entering the household (e.g. a baby), changes in the household routine, etc. Some nutritionists feel dogs may overeat simply because they are bored and there literally is not much else to do. Some dogs may not get into the garbage can because they are hungry, but because they need something to do – the food they find is just a bonus. Dogs that live in multi-dog or even multi-pet households often tend to eat more and/or faster than those in one-dog households. The change in behavior when other animals are present is called *'social facilitation*.' The competition for food, whether perceived or actual, makes some dogs much more focused on their food and can lead to obesity.

**7. Medications:** Various medications can influence metabolism and appetite. These include the glucocorticoids such as prednisone and dexamethasone, the barbiturates such as phenobarbital which is used to control epilepsy, and a class of drugs called benzodiazepines which include valium.

**8. Illness:** Certain conditions, such as hypothyroidism, Cushing's disease, pancreatic cancer and pituitary problems, further enhance obesity in dogs.

Symptoms

The following are some tips for identifying dog obesity signs and symptoms:-

Ø Significant weight gain in comparison with past weight and fat accumulation in the belly or lower back. Coming to weight gain, obesity can be simply defined as a body weight that is 30% more than the ideal body weight. Such ideal body weight may vary with the breed and age.

- Veterinarians adopt different techniques to determine the rate of obesity in dogs. Such a diagnosis is done on the basis of weight charts as well as body condition scoring.
- In case of obese dogs, you may find it difficult to feel the ribs as the fat layers will be thick. Such overweight dogs will lack abdominal tuck as well as proper waist. In severely obese dogs, you may find a sagging abdomen, due to large fat deposits. Even the back of the animal will be much wider.
- In obese dogs, you may not be able to feel the bones near the base of the tail. This applies to the bones of the spine, shoulders and even hips. Make sure to take into consideration the anatomy of the particular dog breed, while looking for these parameters.
- Overweight dogs will be less active and refrain from exercise and play. They may also avoid climbing stairs or jumping into cars. They will be lazy and tired and may also pant constantly.

**Treatment of obesity**

Dietary therapy forms the cornerstone to weight management in dogs, but increasing exercise and behavioral management comprise useful adjuncts.

- Take your dog to a veterinarian for a thorough check-up. The vet would not only advise you the diet which you should adhere to for your pet, but also inform you of the exercise plan required to lose weight.
- *Dietary management*: Reduce the intake of fat and carbohydrate rich foods. Since obese dogs are likely to eat more, give them more water and fiber to satiate their hunger. Protein supplementation is important because the amount of lean tissue lost is minimized even though the weight loss is not more rapid. Supplementation of micronutrients ensures that deficiency states do not arise.
- *Lifestyle management*: Increasing physical activity is a beneficial when used in combination with dietary therapy; it promotes fat loss and may assist in lean tissue preservation. Exercise may help in prevention of the rapid regain in weight that can occur after successful weight loss. Increase the frequency of dog's walks and avoid treating it with tidbits. Start off with short walks and gradually increase the duration.
- *Monitoring of weight loss*: It is essential to continue to monitor body weight after the ideal weight has been achieved to ensure that weight that was lost is not regained.

# CLINICAL OBSERVATIONS AS AN INDEX FOR SELECTING INTERVENTIONAL STRATEGIES IN UTERINE TORSION AFFECTED BUFFALOES

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The present study was conducted on 27 uterine torsion affected buffaloes to test the hypothesis that how clinical observations assist in selecting managemental strategies for the treatment of uterine torsion. The most common type of torsion found in pluriparous buffaloes was complete gestation, post cervical, right side and of 180°. Those uterine torsion affected buffaloes, which fulfilled the criteria Viz., presentation within 72 hour of its occurrence, complete gestation, absence of uterine oedma, fully developed udder and fully relaxed pelvic ligaments, had better prognosis in terms of detorsion success, per- vaginum delivery as well as survival rate of dam.

Uterine torsion in buffaloes is considered to be the major malady amongst various causes of dystokia leading to high calf and dam mortality (Vasista 1983, Prabhakar et al 1994). The incidence of uterine torsion in buffaloes in India is the highest (Manari and Tadkod, 1976). The managemental strategies to treat uterine torsion include detorsion by plank method followed by per-vaginum delivery and caesarean section. The adoption of managemental strategy is the key factor governing the success of delivery and dam's survival rate. It has been seen that for the effective selection of type of managemental strategies, the history and clinical observations may play a major role in determining better outcome of treatment and subsequent reproduction. So, the present paper discusses how the history and clinical observations could be correlated with the outcome of uterine tension which will be useful clinically under field conditions.

The present observations were made on 27 buffaloes, with an average age 4 to 10 years, affected with uterine torsion presented in the clinics, College of Veterinary Science, Ludhiana. On a pre designed performa of each torsion affected buffalo was filled regarding parity, gestation period, site of uterine torsion, side of uterine torsion, degree of uterine torsion, odema of uterus, duration of uterine torsion, udder development and pelvic ligaments relaxation. Per-vaginal and per-rectal examinations were carried out to assess the side, site and degree of uterine torsion along with any adhesions of uterus with omentum or other abdominal visceral organs. Based on clinical observations, the type of managemental strategy was decided and the outcome of all cases regarding success of the detorsion, per-vaginal delivery of fetus or caesarean section was recorded. Odema of uterus was diagnosed pre-rectally with indication of non palpability of fetal parts due to thickened uterine wall. The available data on different clinical observations were correlated with outcome of managemental strategies and expressed in percentage.

The history, general examination and clinical observations in uterine torsion affected buffaloes are summarized in Table 1. The present data on animals with uterine torsion

revealed that there was high incidence of torsion in pluriparous (81.40%) as compare to primiparous buffaloes. Amongst the total cases, 74% had completed their gestation. Clinical findings revealed that most of the animals had post cervical uterine torsion (88.80%) where as only 11.10 percent were having pre- cervical uterine torsion. The most common degree of uterine torsion 180 degree (59.2%) followed by more than 180 degree (25.9%) and 90 degree 14.8percent.

The data on gestation period, let down of milk, relaxation of sacro-ciatic ligaments, odema of uterus in relation to success of detorsion, survival rate of dam and delivery of fetus through per-vaginum or by caesarean section in uterine torsion affected buffaloes is depicted in Table 2. The buffaloes diagnosed to have odema of uterine wall had very low success of detorsion (50%) as well as low survival rate of dam. The buffaloes having no apparent sign of odema had high success of detorsion (94%) and 84 percent of them delivered fetuses per-vaginum and survival rate of dam was up to 94 percent.

Majority of the buffaloes had complete gestation period, and were detorted successfully in 85 % cases and their delivery was achieved per-vaginum in 75% cases and rest required caesarean section. The animals with incomplete gestation, the success of detorsion was as that of complete gestation, However only 57% of these cases delivered per-vaginally, while the rest of cases required caesarean section for delivery of fetus. The survival rate of dam was 100 and 40% in cases delivered per-vaginum and by caesarean section, respectively in buffaloes with complete gestation.

The uterine torsion affected buffaloes which were presented within 72hr of occurrence of torsion, detorsion was achieved successfully in 94-100% cases, the fetuses were delivered per-vaginum in 82-100% cases with survival rate of 77-100%. Only 2 cases needed caesarean section for delivery of fetus. On the other hand animals presented after 72hr of occurrence of torsion, most of them had odema of uterine wall and low detorsion rate 57 percent. Only 28 percent delivered their fetuses per-vaginum and majority (71%) needed caesarean section with survival rate of dam 60 percent.

The buffaloes with partial to full development of udder at the time of presentation had high success of detorsion 100%. Delivery of fetus in most of the cases was achieved per-vaginum (91%) and 83% animals survived, whereas only 40 percent animal could be detorted successfully and 60% survived in cases with reabsorbed udder. Similar to udder development, pelvic ligament relaxation affected the prognosis of case. The buffaloes with full relaxation of sacro-ciatic ligaments had very high success of detorsion (100%) and most of fetuses were delivered per-vaginum (92%). In cases of nil to tightened pelvic ligaments, success of detorsion was 30-40% and the fetuses were mostly delivered through caesarean section (66-75% ) with overall survival rate of dam up to 60 percent.

To conclude, the uterine torsion cases in buffaloes with the history of labour pains within 36 hrs, complete relaxation of pelvic ligaments and complete let down of milk could be successfully detorted with plank and delivery could be made effective per-vaginum, and dam's survival rate is very high. On the other hand delayed cases beyond 72 hrs of labour pains, reabsorbed milk and tightened pelvic ligaments should be resorted to caesarean section for achieving success in terms of survival rate, and such cases should never be subjected to detorsion using plank.

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**Table 1 History, general examination and clinical observations of uterine torsion affected buffaloes (n=27)**

| S. No. | Particulars | Categories | No. of animals | Percentage |
|---|---|---|---|---|
| 1 | Parity | Primiparous | 5 | 18.50 |
| | | Pleuriparous | 22 | 81.48 |
| 2 | Gestation period | Complete | 20 | 74.00 |
| | | Incomplete | 7 | 26.00 |
| 3 | Feed intake | Normal | 7 | 24.08 |
| | | Partially anorectic | 10 | 38.46 |
| | | Complete anorectic | 10 | 38.46 |
| 4 | Body temperature | Normal | 18 | 66.66 |
| | | Sub-normal | 9 | 33.33 |
| | | High | - | - |
| 5 | Site of uterine torsion | Post -cervical | 24 | 88.80 |
| | | Pre-cervical | 3 | 11.10 |
| 6 | Side of uterine torsion | Right | 25 | 92.50 |
| | | Left | 2 | 7.40 |
| 7 | Degree of uterine torsion | 90° | 4 | 14.80 |
| | | 180° | 16 | 59.20 |
| | | >180° | 7 | 25.90 |
| 8 | Success of detorsion | Achieved | 22 | 81.00 |
| | | Not achieved | 5 | 19.00 |

**Table 2 Success of detorsion, delivery of fetus and survival rate of dam in relation to gestation period, odema of uterus, duration of uterine torsion, udder development and pelvic ligament relaxation in uterine torsion affected buffaloes (n=27)**

| S. no. | Particulars | No. of Animals | Success of detorsion achieved / tried (%) | Delivered per – vaginum (P/ v) (%) | Delivered by caesarean section (C/s) (%) | Survival rate of dam | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | P/v (%) | C/s (%) | Overall (%) |
| 1 | Gestation period | | | | | | | |
| | Complete | 20 | 17/20 (85) | 14* (75) | 5 (25) | 14 (100) | 2 (40) | 16 (80) |
| | Incomplete | 7 | 6/7 (85.7) | 4 (57.1) | 3 (42.8) | 3 (75) | 2 (66) | 5 (71) |
| 2 | Odema of uterus | | | | | | | |
| | Present | 8 | 4/8 (50) | 2 (25) | 6 (75) | 2 (100) | 2 (33.3) | 4 (50) |
| | Absent | 19 | 18/19 (94.73) | 16* (84.2) | 2 (15.8) | 16 (100) | 2 (100) | 18 (94) |
| 3 | Duration of uterine torsion (h) | | | | | | | |
| | 0-36 | 18 | 17/18* (94.4) | 14** (82.2) | 2 (17.8) | 14 (77.7) | 1 (50) | 15 (83) |
| | 37-72 | 2 | 2/2 (100) | 2 (100) | - | 2 (100) | - | 2 (100) |
| | >72 | 7 | 4/7 (57) | 2 (28.5) | 5 (71.4) | 2 (100) | 3 (60) | 5 (42) |
| 4 | Udder development | | | | | | | |
| | NIL | 4 | 2/4* (50) | 1** (25) | 2 (50) | 1 (100) | 2 (100) | 3 (75) |
| | Partial | 6 | 6/6 (100) | 6 (100) | - | 5 (83) | - | 5 (83) |
| | Fully | 12 | 12/12 (100) | 11 (91.6) | 1 (9) | 10 (90) | 1 (100) | 11 (92) |
| | Reabsorbed | 5 | 2/5** (40) | 1* (50) | 3 (60) | 1 (100) | 2 (66.6) | 3 (60) |
| 5 | Pelvic ligament relaxation | | | | | | | |
| | NIL | 3 | 1/3* (33.3) | 1 (33) | 2 (66.6) | 1 (100) | - | 1 (33) |
| | Partial | 5 | 5/5 (100) | 5 (100) | - | 4 (80) | - | 4 (80) |
| | Fully | 14 | 14/14 (100) | 13 (92) | 1 (8) | 12 (92.3) | 1 (100) | 13 (93) |
| | Tightened | 5 | 2/5** (40) | 1 (25) | 3 (75) | 1 (100) | 2 (66.6) | 3 (60) |

*One animal was taken back after detorsion as the fetus was alive

** one animal died before delivery

# NEW OFFICERS OF GADVASU

Dr Amarjit Singh Nanda, joined as Vice-Chancellor of Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana. Dr Nanda a former Professor of Veterinary Gynaecology and Obstetrics and founder Director of Research of GADVASU was earlier worked as Vice-Chancellor of Nanaji Deshmukh University of Veterinary and Animal Sciences Jabalpur, (MP). Dr Nanda also served as the Animal Husbandry Commissioner Govt. of India, an Additional Secretary rank in the Central Govt from 2010 to 2013. Born in a small village Kanjali, near historical Kali Wein in Distt Kapurthala, he has meritorious academic record. After his graduation and Masters in Animal Reproduction from PAU Ludhiana, he completed his *Fellowship of the Royal Veterinary College of Sweden (*FRVCS) from Sweden in 1983 and Ph. D. from UK in 1989. He has the distinction of working as the Regional Expert on Animal Production at the *Food and Agriculture Organization* (FAO) *International Atomic Energy Agency* **(**IAEA) Headquarters in Vienna, Austria, and as a Visiting Professor in Hiroshima University Japan and in University of SauPolo, Brazil. As consultant, Dr Nanda visited more than 35 countries. As Head of Department and as the Director for Centre of Advanced Studies in Veterinary Gynaecology and Reproduction, he gave leadership to applied research in animal reproduction. Dr Nanda has more than 200 publications in journals of national and international repute on his credit.

Dr Sushil Prabhakar joined as Registrar. Earlier he was Controller of Examinations of varsity. He has put more than 30 years of service including service as Head of the Department of Teaching Veterinary Clinical Complex. Dr Prabhakar has worked extensively on calving abnormalities in buffaloes and has published 172 papers in different international and national journals of repute besides presenting papers in several conferences. He has guided 7 MVSc and one PhD student. Dr Prabhakar has pursued post-doctoral fellowship at the University of Liverpool, UK. Dr Prabhakar has been awarded Young Scientist award by the ISSAR twice for best scientific presentations.

Dr.S.P.S.Sangha joined as DSW cum Estate Officer for second term. Dr. S.P.S. Sangha did his master's and doctorate in Biochemistry from P.A.U., Ludhiana. He has a teaching experience of more than 30 years in the field of Veterinary Biochemistry. He has guided more than 10 students for their master's thesis. Prior to his joining as DSW cum EO he served as Controller of Examinations, GADVASU. He has guided 12 students for their Master's thesis and has about 50 research publications in various national and international journals.

Dr. Simrat Sagar Singh joined as Dean Post Graduate Studies. Dr. Singh an alumni of PAU did his PhD a from university of Liverpool, UK. Earlier he has served Vet Varsity as Registrar and Dean, College of Veterinary Science. More than 100 researches papers, 2 review papers and 18 research papers in international journals are on his credit. He has more than 31 years teaching, research and administrative experience. Dr. Singh achieved junior research fellowship of ICAR and Commonwealth Academic staff scholarship for PhD and a number of gold medals and awards. He is a fellow of Indian Society for veterinary surgery.

Dr. Harish Kumar Verma, joined as Director of Extension Education. Dr. Verma joined PAU as Assistant Professor in May 1989. He is among those faculty members in university who worked in the field for the benefit of farmers. He has been frequently interacting with farmers to provide tips for optimizing production through adequate management of their animals through lectures, animal welfare camps, field days, Radio and TV talks. He has more than 450 Popular and 75 Research articles, eight books and four manuals, 18 training compendia and editor of 19 publications to his credit. Dr Verma was bestowed with a number of prestigious awards.

Dr. Harpal Singh Sandhu, joined as Dean, College of Veterinary Science, GADVASU, Ludhiana, was born in 1959 at Bilaspur (Chhattisgarh). It is his second term on the same post. He did his B.V.Sc. & A.H., M.V.Sc. and Ph.D from Punjab Agricultural University, Ludhiana. His field of specialization is Veterinary Pharmacology & Toxicology. He has about 30 years of experience of teaching, research and extension. Dr Sandhu has served as Head, Department of Veterinary Pharmacology and Toxicology. He has guided 15 M.V.Sc. and Ph.D. students. He has been honoured with several National Awards. Dr Sandhu has more than 170 publications to his credit. He has authored 4 books and 5 laboratory manuals.

Dr Anil Kumar Puniya joined as Dean, College of Dairy Science and Technology (CODST) of Guru Angad Dev Veterinary and Animal Sciences University (GADVASU). Before joining this assignment he was Principal Scientist of Dairy Microbiology Division of National Dairy Research Institute (NDRI), Karnal Haryana. An esteemed academician and a leading researcher for past 21 years Dr. Puniya did his master's and Ph.D from N.D.R.I., Karnal. More than 130 research articles on his credit were published in national and international repute journals. He has edited two International books and has been associated with over 20 research projects from different funding agencies. He has guided 8 Ph. D students. During his research career, Dr Puniya has developed strong associations with academicians and researchers of over 15 countries.

Dr PPS Dhaliwal, has joined as Comptroller of University. He has 30 years of experience in the Field of Clinical Vety Medicine. Earlier to this, he had been the State Public Information Officer of GADVASU for Right to Information Act. Presently he is also working as Liaison Officer for the establishment of New Vety College & Hospital at Rampura Phul Distt. Bathinda. He did his graduation & post graduation from the Punjab Agricultural University, Ludhiana and joined as Assistant Professor in 1984.

Dr. Narinder Singh Sharma, joined as Controller of Examination, GADVASU. He is a renowned academician and a leading researcher for the last 27 yrs. He has established Clinical Bacteriology, Mycology, Mycotoxin and Molecular Biology Laboratory in the department. He has guided 9 M.V.Sc. & 1 PhD students. At present Dr Sharma is the Principal Investigator for 9 Research Projects. He has been invited as FAO Expert to attend Joint FAO/WHO expert meeting at Rome in 2007. He has to his credit a number of awards like Mid-Career Scientist Award, Shiksha Rattan Puruskar, Outstanding Alumni Award, Scientist Award, five Best Poster Presentation awards and Editor Punjab Veterinary Journal.

Dr. Rajinder Singh Brar has joined as University librarian. He did his B.V.Sc. & A.H., M.V.Sc. and Ph.D. from Punjab Agricultural University, Ludhiana. Presently he is Professor, Veterinary Pathology and Incharge Veterinary Educational Museum GADVASU. He has over 25 years of experience of teaching, research and extension education. Dr. Brar has more than 100 publications to his credit and has authored 2 books and 4 laboratory manuals. Dr. Brar has already served as University Librarian for more than 2 years from 2011-2013 and introduced many new concepts in University Library.

Dr Parkash Singh Brar, Professor-cum-Head Department of Veterinary Gynaecology and Obstetrics, COVS, GADVASU has joined as Director, Livestock Farms of the University. This will centralize the working of various dairy, poultry, goat and other livestock farms operational at main campus and at regional research stations of the university. The aim of directorate will be to improve production and availability of superior germplasm (mainly semen and bulls) for farmers at state and national level. It will help in producing more milk/meat from lesser number of animals making livestock farming a viable, economical venture. Modern, comfortable, mechanized farms will be developed to improve production and reproduction of animals and for demonstration to farmers.

Dr. JPS Gill, has joined as Coordinator Research. Presently he is Director School of Public Health and Zoonoses and is a renowned academician and a leading researcher for the last 26 yrs. He is also Adjunct Professor at University of Saskatchewan. Dr Gill has vast research experience of managing 28 research projects as Principal Investigator/CoPI and has successfully developed seven International Collaborations and Research Proposals with University of Saskatchewan, Canada; Canadian Food Inspection Agency; University of Sydney, Australia; Princeton University, USA; Royal Veterinary College London UK; Free University Berlin, Germany; London School of Tropical medicine and Hygiene UK. He has established Residues analysis lab for pesticide, antibiotic, and Heavy Metal Residues, Food safety Lab, Zoonoses Diagnostic and brucellosis lab.

# ROLE OF LABORATORY TESTS IN ANIMAL HEALTH

**S.K. KANSAL & R. S. BRAR**

**Department of Veterinary & Animal Husbandry Extension Education, GADVASU, Ludhiana.**

It is evident that prevention is better than cure. The approach should be directed towards the prevention of diseases through better management practices as well as through vaccination programme. Even after possible control measures, the animals fall ill due to one reason or the other. In earlier day of veterinary practices, no doubt, much of the diagnosis was based on the history of the disease told by the owner which many a times lead to incorrect diagnosis, thereby delaying the treatment of the animal. This makes the treatment part costly and sometimes ineffective as well. The owner/farmer comes under heavy economic loss due to rising cost of treatment and the decreased productivity of the animal.

Under such circumstances, the early and cost effective treatment becomes the need of the hour to prevent further production losses. To attain this objective the routine laboratory tests make a valuable contribution in early diagnosis of the disease condition, so that the problem can be dealt with on scientific lines. Therefore, in modern veterinary practice the laboratory tests are having a key position so as to ensure better prognosis as well as minimizing the treatment cost. These tests gain further significance since these help in prevention, control, containment and eradication besides deciding the line of appropriate treatment. The laboratory test play vital role in making early and correct diagnosis which cautions about introduction of a new disease among animals paving a way for its early containment that can save valuable resources of a nation in terms of money and man power. For laboratory tests, different materials are taken from the animal and are subjected to a series of techniques in the laboratory to get information about the health/disease status of the animal. The collection process and the importance of some useful materials for undertaking/laboratory tests is given here.

**Blood:** It is the most important body fluid that performs different kinds of functions in the body. For taking blood, a small amount of spirit is applied at the site of a superficial vein. With the help of a sharp hypodermic needle, the blood is collected in a clean glass vial containing a very small amount of an anticoagulant. An anticoagulant is a substance which prevents clotting blood and EDTA is used @ 1 mg/ml of blood. After collection, blood vial should be tightly closed, gently rotated between the palms, however, should not be vigorously shaken to avoid unnecessary damage to the blood sample. The sample should be taken to the nearest veterinary diagnostic laboratory or to the GADVASU Hospital as soon as possible. But, if its immediate transportation is not ensured, then it can be kept for one day in refrigerator (4°-8°C). About 2-3 ml of blood is sufficient for haematological and prozoal examination. The haematology, in general tells us about anaemia, dehydration and the disease status of the animal. The prozoal examination helps to diagnose some common diseases like trypanosomiasis, babesiosis, anaplasmosis and theleiriasis etc.

The serum (fluid portion of the blood) is obtained by collecting the blood without anticoagulant. This is analysed for enzymes and other constituents/toxic substances to monitor the function of different organs/systems of the animal. In additional to this, it also constitutes an important material for the diagnosis of diseases like brucellosis, haemorrhagic saepticaemia (Gal Ghotu), foot and mouth disease (Muh Khur) etc. The help of the Veterinary

Doctor of your area may be taken to collect the blood sample.

***Urine*:** The blood is filtered through kidneys. The extra substances and water which is not required by the body excreted out in the form of urine. So the composition of urine reflects the functioning of urinary system from kidney to urethra and of other systems as well. About 100 ml of urine should be collected in a clean dry and colourless bottle and should be transported in a ice pack. The examination of urine helps in the diagnosis of albuminuria, ketouria, jaundice and other infectious conditions of urinary tract.

***Stool (Feaces)*:** The stool or faecal examination of the animal is performed to detect the presence of particular parasite/ova in the animal body. This help in the specific treatment of the animal. The stool sample should preferably be collected in the morning in a bottle or a match box or in polythene bag. If the stool sample is to be collected from the floor then the sample from the mid internal portion should be taken out with the help of a small stick. The sample should reach the laboratory as early as possible.

***Milk*:** Examination of milk helps to defect the cause and cases of mastitis. For this, hands should be washed thoroughly with soap and water for collection of milk. Remove any dirt from the udder and then wash it with a dilute solution of disinfectant (potassium permanganate 1:1000 water). Dry the teats with the help of clean muslin cloth and apply some disinfectant at the end of teats. For culture and sensitivity the milk sample should be collected in sterile test tubes after discarding first, two or three streams. It should be sent for examination as soon as possible in a container having ice.

***Culture and sensitivity test (CST):*** This test consists of two processes: 1. Culturing of the organisms present in blood/milk/urine/stool on some particular media, to identity the causative agents. Its second part consists of selecting medicine which is most effective against these causative agents. In this way the treatment becomes accurate, rational and also economical. The sample should be collected strictly according to instructions of the Veterinarian.

***Radiography:*** *(X*-ray) and ultrasound scanning: Radiography is often used to diagnosis and confirm fractures of bone and to locate other lesions of the musculoskeletal system, the cases of foreign body ingestion and diseases of feet. Ultrasound scanning is used to diagnose the conditions like urolithiasis, gallbladder stones, tumors, intestinal obstructions and pregnancy diagnosis etc.

***Biopsy:*** For this a small portion of the affected part is surgically removed or taken with instruments from the living animal and is examined under micro-scope after the portion has been subjected to a series of different techniques. This procedure is mostly used to diagnose different kinds of tumours or growths in and outside the body.

***Post-mortem*:** It is the examination of the body and organs after death. It can be conducted on all animals and birds. The body parts and organs are examined for changes in gross appearance, or microscopically for changes in tissues. Postmortem examination should invariably be got done. Its results can help save lives of other animals and birds.

It is hereby advised that one should make efforts to bring their animals or samples early for diagnosis. This can give better dividends in terms of saving lives of animals and to prevent economic loses.

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