For Private Circulation Only Vol. XXXX (No. 1), 2018

ISSN 2319-5762

VET ALUMNUS

.....Official organ of the Alumni Association, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana.....

CONTENTS

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

APPLICATION OF DIAGNOSTIC ULTRASOUND TO AUGMENT BOVINE FERTILITY UNDER FIELD CONDITIONS

S S Dhindsa, Bilawal Singh, Parteek Singh Dhaliwal and Simrinder Singh Sodhi

Department of Veterinary Gynaecoloy and Obstetrics

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

In veterinary science, transrectal ultrasonography is considered as the most profound technological advance in the field of bovine clinical reproduction. This paper is focussed on practical applications of ultrasound for conducting routine reproductive examination in dairy animals to assess ovarian status, to diagnose early pregnancy and to help decide type of hormonal interventions to treat infertility.

Reproductive organs of cow and buffalo are scanned per rectum using a linear-array transducer. Linear array transducer of 5.0 and 7.5 MHz frequency ranges are most commonly used in bovine. Actually, depth of tissue penetration of sound waves and image resolution is dependent upon and inversely related to the frequency of the transducer. Thus, a 5.0 MHz transducer results in greater tissue penetration and lesser image detail, whereas a 7.5 MHz transducer results in lesser tissue penetration and greater image detail. An ultrasound scanner equipped with a 5.0 MHz transducer is most useful for bovine practitioners conducting routine reproductive examinations; however, small ovarian structures such as developing follicles are best imaged with a 7.5 MHz transducer. In general, for pregnancy diagnosis a 5.0 MHz frequency is preferred; however, to assess ovarian structures 7.5 MHz frequency is most suited. Although rectal palpation can be an accurate method for diagnosing pregnancy, rectal palpation is a poor method for resolving ovarian follicles. By contrast, ultrasonic imaging is a highly accurate and rapid method for assessing ovarian structures. Moreover, pregnancy can be diagnosed accurately at an early stage (30-32 days post insemination) with ultrasonography resulting in early identification of non pregnant animals. Presence or absence of a corpus luteum (CL) aids in diagnosing pregnancy status, especially when conducting pregnancy exams early post-insemination. When present, the size and location (i.e. left vs. right ovary) of the CL indicates the location of the conceptus within the uterus if the animal is pregnant. The presence of multiple corpora lutea is a diagnostic indicator of the presence of twin foetuses.

Routine reproductive examinations through ultrasound should include visualization of the uterine horns and major structures on both ovaries. The basic procedure to conduct transrectal ultrasonographic examination is somewhat similar to per rectal examination with hand. The animals must be restrained properly to avoid distortion in the ultrasound image. Before introducing the transducer the fecal material must be removed from the rectum otherwise it will distort the image and screen may look black without demarcation between various structures. A coupling gel should be applied over the transducer to obtain better contact with the rectal wall. The lubricated hand and transducer should then be inserted in the form of cone into the rectum. In order to identify various ovarian structures, each ovary must be individually scanned through several planes by moving the transducer along its surface very gently. The appearance of various structures upon ultrasound examination is

discussed below under individual heads. During each ultrasonographic examination the diameter of follicles and CL can be measured after freezing the best image with minimum distortion and maximum clarity.

Ovarian follicles

These are fluid-filled structures surrounded by an inner layer of granulosa cells and an outer layer of thecal cells. The oocyte is suspended within the antrum by a specialized pedicle of granulose cells called the cumulus oophorous. Because fluid absorbs the ultrasound waves, fluid-filled structures such as follicles appear as black circular structures surrounded by echogenic ovarian tissue on the screen (Figure 1a). Ovarian follicles with a diameter of 2 to 3 mm or greater can easily be resolved by most of the ultrasound machines. It is believed that follicles of 10-15 mm diameter can be detected in just 60% cases by rectal palpation whereas; ultrasound offers 90% possibility to detect these follicles (Figure 1b). The ultrasonographic findings must be correlated with behavioural estrus signs to decide the time of insemination. It is said that a follicle of 10 mm or greater in size may respond to exogenous administration of GnRH analogue, thus insemination may be done in such case along with systemic administration of 10-20 mcg buserelin acetate to improve conception rate in bovine. Another ultrasonographic examination can be done 24 h post insemination to confirm the ovulation of dominant follicle that will be disappeared or reduced in size. In case the size of dominant follicle remains same or increases further compared to previous examination size then another insemination is recommended. The first day of synchronization protocols especially GnRH based methods viz. Ovsynch, Heatsynch etc. may also be decided by ultrasound examination of ovaries in cyclic animals. The success rate of synchronization treatment decreases if ovarian status reveals only presence of small follicles without CL/ dominant follicle.

Corpus luteum (C.L)

The Corpus luteum (CL) is a transient endocrine gland that forms after ovulation from the tissues that previously composed the ovarian follicle. Corpora lutea appear as distinctly echogenic areas (Greyish) within the ovarian stroma (Figure 1c). Many corpora lutea appear as a solid tissue masses but may also contain fluid-filled cavities. Based on ultrasonographic examinations, <“79% of otherwise normal CL contain cavities (that appear black spots surrounded by greyish area) ranging from < 2 to > 10 mm in diameter at some time during the estrous cycle and early pregnancy. Generally, corpora lutea in early diestrus tend to have a fluid filled cavity compared to the corpora lutea during late diestrus and advanced stages of pregnancy. Although ultrasound (B mode) is more accurate than rectal palpation for assessing ovarian follicles, it is difficult to distinguish between developing corpora lutea and older regressing corpora lutea using either technique. However, blood flow to CL may be estimated using color dopler ultrasonography to differentiate between functional and non-functional CLs. In routine practice, a CL of more than 10 mm diameter is considered as a good source of progesterone. To assess the cyclic status of animals repeated ultrasound examinations may be done eg. absence of CL during two examinations at 11-14 days interval reveals acyclicity and recommends progesterone based treatments with improved nutrition after ruling out uterine infection.

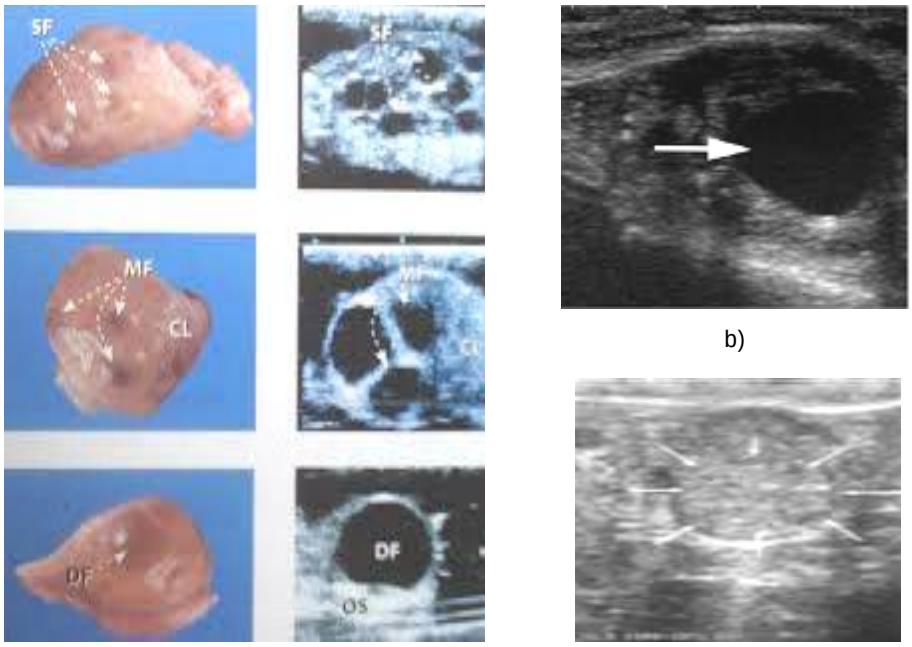


Figure 1: a) Growth of follicles (a comparison between slaughtered and ultrasonographic view of ovary, spmall follicles, SF: 3-5 mm, medium follicles, MF: 6-10 mm, dominant follicle, DF: >10 mm diameter), b) Arrow indicates a dominant follicle near ovulation c) Arrows indicate a mature corpus luteum.

Ovarian cysts

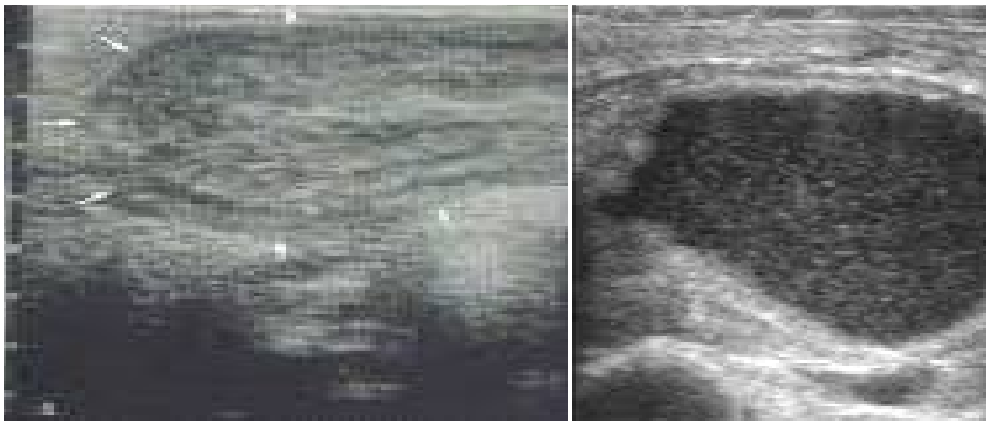
The incidence of cysts is high in dairy cows. Palpation per rectum of a large, fluid-filled structure is commonly used as a clinical indication of a follicular cyst. Differentiation between follicular and luteal cysts via rectal palpation is difficult, even for experienced veterinarians. Accuracy of diagnosis increases when using transrectal ultrasonography. Follicular cysts appear same as follicles. A large black non-echogenic structure of > 25 mm size can be seen on the screen. Luteal cysts (>25 mm diameter) appear as non-echogenic antrum with grey patches within the antrum or along the inner wall (Figure 2). An accurate diagnosis of cysts lead to timely and most effective treatment comprising a combination of gonadotropin releasing hormone (GnRH) and prostaglandins (PG). Manual rupture of follicular cyst must be discouraged due to risk of adhesion formation.

Figure 2: Ovarian cysts in cattle (a: Follicular cyst, b: Luteal cyst)

Uterus

In a non pregnant cycling animal, the uterine tissue appears as an echogenic structure on the screen. Because the uterus is comprised of soft tissue it absorbs a portion of the ultrasound waves and reflects a portion of the waves. In this way we can identify the uterus as a grey structure on the screen. The cross-sectional view of the uterus is identified easily as a round structure like “rosette” that is easily distinguished from other peripheral tissues, whereas the longitudinal section is less recognizable, yet we can differentiate between the elongated view of the uterus and other tissues that may appear similar on critical examination (Figure 3a).

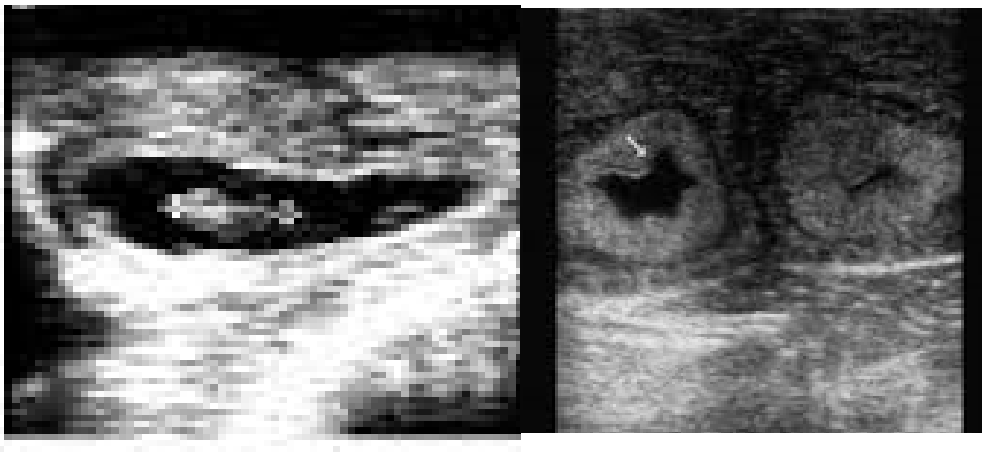
Pathological applications for ultrasound technology have extended to identifying endometritis or pyometra. During endometritis/pyometra, the image appears as small whitish to greyish spots along with black spots (Fluid in the lumen) within the lumen of the uterine horns (Figure 3b).



a) b)

Figure 3: a) Longitudinal section of non pregnant bovine uterus, b) Endometritis in bovine

In pregnant animal, embryonic vesicle can be seen as early as 9-12 days but the fetus can only be visualized beginning at 20 d post breeding and continuing throughout gestation. In routine practice, pregnancy diagnosis may be carried out at 30-35 days post insemination with ultrasonography (Figure 4a) but re-examination after 60 days should always be preferable as loss up to day 60 post insemination is 10-12% in field conditions. One must be able to differentiate 25-30 days of pregnancy from normal estrus fluid (Figure 4b). At present, there is no practical way to reduce early embryonic loss in dairy animals. However, recognizing the occurrence and magnitude of embryonic mortality may actually present management opportunities by taking advantage of new reproductive technologies viz. post insemination hormonal support (LH/HCG/GnRH on 5^{th} day or 13-15^{th} day post insemination), synchronization of estrus (Application of Ovsynch, Doublesynch, Heatsynch, Estradoublesynch or modified protocols with progesterone supplementation/intravaginal insertion), nutritional supplementation (Vitamin E & H, Selenium, polyunsaturated fatty acids, minerals etc.).



a) b)

Figure 4: a) 30 days old conceptus in cattle, b) Uterine fluid during estrus in cattle

In conclusion, transrectal ultrasonography is a great tool that has the potential to improve reproductive efficiency of dairy animals by reducing the period from insemination to pregnancy diagnosis with a high degree of diagnostic accuracy, identifying the non pregnant animals at an early stage, taking timely decision regarding incorporation of hormonal or nutritional interventions, and accurately diagnosing ovarian/uterine pathological conditions. Thus, use of transrectal reproductive ultrasonography must be encouraged among field veterinarians to improve reproduction and production potential of dairy animals in the country.

CLINICAL ANATOMY OF HEAD AND NECK REGION OF CATTLE, BUFFALO, GOAT AND DOG

Anuradha Gupta, Neelam Bansal, Varinder Uppal and Opinder Singh

Department of Veterinary Anatomy

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

Common operations performed in head and neck regions in Veterinary Hospital, GADVASU, Ludhiana are dehorning, enucleation / extirpation of eye ball, drainage of external ear canal, oesophagotomy and oral and dental surgeries. In this lecture we will discuss the application of anatomy in these surgeries.

1. Dehorning is surgical removal of horn. Disbudding is destroying the horn producing cells of horn bud and is removed at age of 5-10 days in calves. It is performed to enhance appearance of animal, to make animal docile and in disease conditions like horn cancer, fractures and broken horn. Adult horn is cut at base, proximal to the outer horn capsule close to head as the epidermis capable of producing horn is not left, cutting of outer horn capsule is avoided and haemorrhage can be controlled by haemostatic forceps.Nerve supply to the horn is by cornual nerve, a branch from zygomatico - temporal nerve arising from ophthalamic nerve. This nerve block site is different in cattle, buffalo and goat

   Cattle: Midway between eye and horn just ventral to temporal line in cattle

   Buffalo: Midway between eye and horn just ventral to temporal line about 4 cm deep into the temporal fossa as the corneal nerve is 4 cm deep into the temporal fossa

   Goat : two injections are given

fratrochear nerve is blocked at dorsomedial margin of bony orbit

Important anatomical structures of horn from without inward

- Outer horn capsule, coronary band and epikeras.
- Corium: area at junction of horn and skin with numerous blood vessels and nerves and is site of horn production.
- Horn bud : The primordium of horn development is the germinal epithelium of horn bud but lying between cornified layer and dermis
- Periosteum: horn bud is attached to periosteum of frontal bone
- Cornual process : of the frontal bone as the horn grows, corneal diverticulum increases in size and extend upto the most cranial part of horn
- Mucous membrane lining the corneal diverticulum
- Cornual diverticulum

2. **Enucleation / Evisceration** of eyeball is performed in neoplastic growth of eyeball and adjacent tissues, irreparable injury and suppurative destruction.

- **Enucleation:** Removal of eye ball, leaving the eye muscles and remaining orbit contents intact
- **Evisceration**: Removal of internal eye contents, leaving the sclera and extraocular muscles intact
- **Exenteration** : Removal of eyeball including all structures (fat, muscles and other contents) of eye and eyeball including eyelids

To anaesthetize the orbit, Peterson's nerve block is used. This nerve block is performed by inserting 12cm curved needle in angle between frontal and temporal processes of zygomatic bone. The needle is then passed across the rostral border of coronoid process of mandible to reach the nerve emerging from foramen orbitorotundum. To prevent closure of eyelids, the palpebral branch of auriculopalpebral nerve is blocked by infiltrating superficially along the zygomatic arch, 7 cm caudal to angle between the frontal and temporal process of the zygomatic bone. Another method is – a line block near the margin of the orbit. Then the eyeball is pressed medially and a 15 cm needle is passed caudally through the lateral conunctival fornix to the apex of periorbita.

I**mportant anatomical structures involved**

- Eyelids : upper, lower and third eyelid
- Conjunctiva : palpebral and bulbar
- Tunics of eyeball : fibrous, vascular and nerous
- Muscles of eyelids : orbicularis occuli and levator palpebrae superioris muscle
- Muscles of eyeball
- Lacrimal gland
- Periorbita and orbital fat
- Optic nerve
- Blood vessels: External ophthalamic artery and ciliary vessels

Drainage of external ear canal is performed in chronic otitis or otorrhoea, neoplastic growth within canal and to correct any anatomical deformity of ear canal. Ear canal in dog consists of vertical and horizontal parts and is about 7 cm long. It is curved at an angle of 110. This causes examination of ear drum difficult. To pass otoscope the ear is pulled downward and laterally so as to direct otoscope in rostromedial direction to view ear drum. To open external ear canal/ lateral ear resection two methods are performed

- Zepp's operation: In this method the skin is removed from the area on lateral side of ear canal to form the drain board.
- LaCroix procedure: the lateral part of vertical canal is completely removed to form few opening

Important anatomical landmarks

- Tragus
- Antitragus
- Intertragic notch
- Annular and scutiform cartilages

3. **Oesophagotomy** is performed either at point of obstruction or at the lower border of jugular furrow along the jugular vein if obstruction is just inside the thorax. The origin of oesophagus

Important anatomical landmarks

- The origin of Oesophagus from oropharynx is dorsal to cricoid cartilage of larynx
- It is median in position and is related to common carotid artery on both the sides
- The change in position of Oesophagus is at about the level of 4th cervical vertebra it passes and then remains throughout in cervical region to the left of trachea

4. Nerve blocks in head region of cattle, horse and dog:

A. Maxillary nerve block is for management of surgical conditions of upper jaw, nose and upper lip.

In cattle it is not possible to approach maxillary foramen for injection because it lies medial to large lacrimal bulla. The maxillary nerve runs dorsal and parallel to the maxillary artery in the pterygopalatine fossa from round/ orbitorotundum foramen to maxillary foramen. So maxillary nerve is blocked by injecting close to its emergence at foramen orbitorotundum. This injection blocks both maxillary and ophthalamic nerve and is commonly referred to as peterson's nerve block. This nerve block is performed by inserting 12 cm curved needle in angle between frontal and temporal processes of zygomatic bone. The needle is then passed across the rostral border of coronoid process of mandible to reach the nerve emerging from foramen orbitorotundum.

In horses the maxillary nerve is blocked at its entrance to maxillary foramen. The needle is inserted into skin at point about 2.5 cm ventral to lateral angle of eye and ventral to zygomatic arch. The needle is then directed medially and slightly rostrally to a depth of 6.5 to 7.5 cm.

In dog the maxillary foramen can be located by two approaches

- Open the mouth, insert the needle behind the last upper molar tooth and direct dorsally and caudomedially 2.5 cm in large dogs.
- Insert needle through skin, ventral to zygomatic arch and lateral to the lateral angle of the eye. Then direct it towards the last of opposite canine tooth.

B. Infraorbital nerve is continuation of maxillary nerve after later gives off nerve fibres to the last four cheek teeth. This nerve passes through the orbital canal and exit at the infraorbital foramen. Infraorbital nerve block anaesthetizes the premolars, incisors nose and upper lips It is blocked by injecting into infraorbital foramen about 3 cm above the gumline of first cheek tooth and slightly rostral to it in cattle. In horses infraorbital foramen is located deep to the levator labii superioris muscle and rostrodorsal to the end of facial crest. Whereas in dog, infraorbital foramen is palpated on line from dorsal border of zygomatic arch to the roof of canine tooth.

C. Mandibuloalveolar nerve block is done for surgical conditions of molar teeth, lower incisors and lower lip and chin and is blocked at its entrance into mandibular foramen. In cattle mandibular foramen is located on the medial aspect of mandible

APPLIED ANATOMY OF HORN IN RUMINANTS

Neelam Bansal, Varinder Uppal, Anuradha Gupta and Devendra Pathak

Department of Veterinary Anatomy

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

Horns: Special adaptations of the integument that grows as a solid structure (horn bud) from the cornual process which becomes hallowed at about 6 months of age to form a fully grown horn.

The horns of cattle, goats, and sheep are generated in the region over the horn process, a germinal center that projects from the surface of the frontal bone of the skull.

Horn bud: Primordium of the horn development. The germinal epithelium of horn bud lies between the cornified layer and the dermis.

Anatomy of horn:

The horn can be divided into three parts i.e. Base (Basis cornus), Body (Corpus cornus) and Apex (Apex cornus)

The horn is consisted of following anatomical structures

Outer horn capsule: The cornified epidermis of the horn forming outermost hard covering.

Cornual rings: Circumferential grooves present on the horn used to estimate the age of animal. These are more distinct in sheep and goat than in the cow.

Epikeras: Ring of soft horn making the transition between skin and horn.

Corium: Area at the junction of horn and skin with numerous blood vessels and nerves.

Periosteum: Outer most layer of cornual process

Cornual process: Process of frontal bone enclosed by horn

Mucous membrane lining the cornual diverticulum

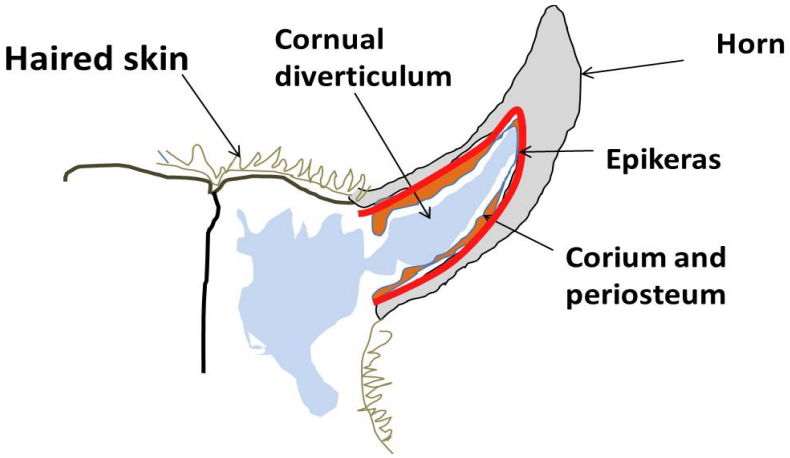
Cornual diverticulum: Cavity inside the horn core forming the hollow part of horn

Blood Supply: The horn is supplied by the cornual artery which originates from the superficial temporal branch of the external carotid artery.

Nerve supply: Horn is innervated by cornual nerve which is a terminal branch the ophthalamic division of trigeminal nerve. This nerve is desensitized while performing any surgery on the horn.

Schematic diagram showing anatomy of Bovine Horn

Functions of horn: These are used to defend themselves from predators, fighting, to root in the soil or strip bark from trees and some animals use them for cooling.



Surgical procedures performed on horns: Dehorning, disbudding and descenting are commonly perfomed surgical procedures.

A. Dehorning: Surgically removal of the horns when these are fully formed from the horn bud. This operation is performed to enhance the appearance of the animal, to make animal more controllable and in disease of horn, fracture and broken horn etc

Physical methods of dehorning: Dehorning can be performed by using embryotomy wire, Guillotine shears, dehorning knives, saws, spoons, cups or tubes or Barnes type scoop dehorner (commonly used)

Standard Cornual nerve block: The block is performed to desensitize the horn in cattle, buffalo and goat.

Site of nerve block:

In cattle: It is midway between the eye and horn just ventral to the temporal line**.**

In buffalo: It is midway between the eye and horn just ventral to the temporal line about 4 cm deep into the temporal fossa as the cornual nerve is 4 cm deep into the temporal fossa in buffalo.

In goat: Horn is innervated by cornual branches from the lacrimal and infratochlear nerves. Therefore, two nerve blocks are given; one is close to the caudal ridge of the root of zygomatic process of frontal bone, to a depth of about 1 to 1.5 cm to block the cornual nerve and the second is at dorsomedial margin of the bony orbit to block the infratrochlear nerve.

In some of the cases, the standard cornual nerve blocks fails due to an abnormal course of the cornual nerve, abnormally long supraorbital /infratrochlear nerves or Abnormally long nerve of the frontal sinus. If failure is due to first two reasons, superficial infiltration around the base of the horn is used to anaesthetize it.

Site of incision to cut off the adult horn: It is at the base, proximal to the outer horn capsule, close to the head as the epidermis capable of producing horn should not be left, to avoid cutting of hard horn capsule and the hemorrhage can be controlled by hemostatic forceps in this area.

B. Disbudding: destroying the horn producing cells of the horn bud and is removed at the age of 5-10 days in calves. Horn buds are removed without opening the frontal sinus.

Methods of disbudding: Various methods of disbudding are chemical methods (Caustic agents) and hot iron disbudding (commonly used). Physical methods are by using knives, shears, dehorning spoons, cups or tubes.

Procedure: When disbudding of calves is done with heat, use a device with a diameter just larger than the horn base, so as to cauterize the skin immediately surrounding the horn bud. The horn bud will slough off in 4-6 weeks. The defect created by this operation is replaced by in growth of surrounding haired skin.

C. Descenting: Surgical removal of scent gland/ Musc gland/ horn gland.

Location: These are large sebaceous and sudariferous glands located in patches of thick skin caudomedial to the base of horn in bucks. These glands secrete pheromones and are located behind the eyes in elephant and in the belly wall of musc deer.

In male goats, these glands give a pungent smell in their secretions during breeding season under the influence of testosterone hormone. Descenting is recommended to eliminate the sexual odour, so these glands are removed with the entire thickness of skin by giving an elliptical incision.

SURGICAL AFFECTIONS OF UDDER AND TEAT AND ITS MANAGEMENT IN BOVINES

Rahul Kumar Udehiya[1] and Sarita Kankoriya

Department of Veterinary Surgery and Radiology

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

Milk is an important source of income for the farmers. The quantity and quality of milk produced by the animals are directly affected by various disease conditions of the teat and udder. Cow and buffalo udder has four quarters each of which is a separate unit. Each quarter is an independent compartment. Affection of one quarter does not necessitate the involvement of the other quarters. In buffaloes the anterior teats are shorter than the posterior. In cow, the teats of the anterior quarters are longer than the posterior. This makes the anterior teats of the cow and the posterior teats of buffaloes more prone to injuries. Milk flow disorders due to traumatic teat injuries, faulty techniques of milking, infection, mucosal lesions, foreign bodies, milk stones and congenital disorders affect the udder health and milk production. This leads to a 50% increased chance of mastitis, which consequently leads to reduced milk yield and milk quality. Thus, early diagnosis and treatment of diseases of teat and udder is very important for maintenance of their health. The conventional diagnostic module includes inspection, palpation, probing, and hand milking of the affected teat, ultrasonography and contrast radiography.

The surgical affections of the udder and teats may be congenital (supernumerary teat, fused teats, hard milker, free milker etc) or acquired (teat laceration, teat fistula, warts, milk stones etc). For teat surgery, anesthesia can be obtained by a ring block at the base of the teat or local infiltration anesthesia in between the teats or inside the teat canal using 2 % solution of lignocaine HCl. The entire area is prepared for aseptic surgery by washing the field of the operation with antiseptic soap and water, swap with alcohol.

I. Congenital anomalies:

1. Sypernumerary teats

This may occur and can be present anywhere on the udder but are most frequently seen posterior to the last two normally placed teats. These additional number teats may or may not have adjacent glandular tissue that will become functional. If there is a glandular tissue that has a functional potential, it will atrophy if not milked. For the management of this condition, it is better to amputate the accessory teats when that animal is young heifer, before the gland becomes active. It is essential that care must be taken to assure that only the supernumerary teats are removed and not normal. It may be desirable to remove the supernumerary teats for cosmetic reasons or because some may be so close to normally placed teats that they interfere with milking procedures.

2. Fused teats

This may occur and can be present in between two collateral teats or the animals often has closely spaced teats on the opposite side. These Fused teats interfere with milking process which cause the milk splashes out. For treatment of fused teats, the skin is divided

in between the two fused teats and cutaneous wounds are sutured separately.

3. Contracted sphincter or teat orifice "hard milker"

The condition may be congenital in origin or may be acquired as a result of trauma to the end of the teat. There is a small stream of milk, and prolonged milking time. There may be loss of milk due to incomplete milking or trauma to the teat due to attempts for strenuous milking methods. Local infiltration anesthesia or instillation of 5 ml of 2 % xylocain or similar local anesthetic into the teat canal will provide anesthesia. The orifice should be cleansed, antiseptic applied, and the orifice enlarged. The enlarging procedure may be accomplished by inserting of lichty teat knife, ringed teat slitter or stoll teat bistoury. The opening in the sphincter is maintained at the desired size by inserting a Larson teat tube and leaving it in place for 5-7 days. Milking is accomplished by removing the cap of the tube.

4. Enlarged teat orifice "Free Milker" or (Leaker)

This condition is due to a relaxed or a traumatized sphincter. Milk leaks from the teat at times other than milking and result in milk loss. The condition may be helped by injecting small amounts of sterile mineral oil or lugol's solution around the orifice to reduce its size to the desired effect. This may have to be done more than once to obtain the optimal size for milk flow. If it is overcorrected and result in stenosis, handle as contracted sphincter or orifice.

5. Occlusion of the teat orifice:

This is a congenital anomaly characterized by the occlusion of the teat orifice deposit the teat fills with milk at the time of lactation. It may also be acquired as a result of trauma at the teat orifice that results in healing with occlusion. A small amount of local anesthetic is injected into the area. Insert a septic hypodermic needle where the opening should be located. Insert the needle into the teat canal until milk flows out; then withdraw the needle and enlarge the opening as described for contracted sphincter.

II. Acquired surgical affections:

1. Teat laceration

Lacerations of teat may be superficial or deep. Superficial skin lacerations of teats and or udder are treated with thorough cleaning and debridement of dead tissues and antiseptic dressing. In large wounds that do not penetrate sufficiently to allow milk to flow from the wound but muscles and skin are forming flaps, suturing should be done using a non absorbable suture material after thorough cleaning and debridement of non viable tissues. Deep lacerations involving the mucosa should debrided first and a sterilized teat siphon is inserted. The mucosa is closed with simple interrupted or simple continuous pattern using absorbable suture. The submucosa and muscularis are sutured in simple continuous pattern. The skin is closed with simple interrupted or vertical mattress pattern using non absorbable suture. Antibiotics are infused into the teat after surgery.

2. Teat Fistula

The term, teat fistula, refers to an opening in the wall of the teat, connecting the exterior to the pre-existing channel, the teat canal is characterized by persistent outflow of milk. Such fistula may be congenital or acquired. It is mostly acquired as a result of penetrating wound that extend to the teat canal or cistern and fails to heal completely because of the

continuous drainage of milk. Fistula will vary in size from that one which is so tiny, it is difficult to locate to large ones through which the mucous membrane may be seen. For the management of teat Fistula, apply a suitable tourniquet (rubber band) at the base of the teat and a teat siphon to the affected teat. The wound edges should be debrided and flushed properly with antibiotic. Suturing of the teat fistulas is carried out in two rows including all layers with the exception of the mucosa using non absorbable, noncapillary suturing material. A vertical mattress or similar stitch is used to effect the apposition of the edges deep in the tissue and superficially. The apposition must be complete and firmly held in place or milk seepage will cause the fistula to recur. A teat bougie is applied to prevent adhesion of both sides of the teat cistern and the tourniquet is then removed. The stitches may be removed in 10-14 days post operatively. Intramammary infusion of broad spectrum antibiotic administration for a week is indicated.

3. Obstruction in milk flow

Obstruction in milk flow may be due to milk stones, polyps, teat spider or teat cistern obstruction. The obstruction due to milk stone can be removed by manipulation during milking or crushed by means of special forceps or by enlarging the teat opening. Polyps can be removed using a tumour extractor or, teat bistoury or teat polyp extractor. Congenital cases Teat spider with no milk pocket is allowed to atrophied as the prognosis is poor. If milk pockets are palpated, surgical treatment using Hudson's teat spiral or a small teat bistoury can be done.

4. Lactiferous Calculi (Milk Stones)

Milk stones which are found in the udder may result from accumulation of lime salts of milk over a point of crystallization. The latter may be desquamated epithelium. Sometimes, these calculi are freely movable in the teat canal if their sizes relatively smaller than the diameter of the canal. When being larger in size, they obstruct the lumen of the teat canal. If the calculi are of small size, they can be removed by manipulation during milking. Larger calculi obstructing the teat canal can be crushed by means of special forceps. In other cases of milk stones, it may be necessary to enlarge the opening at the end of the teat by cutting through the sphincter of the teat canal one or more times.

5. Haematoma of the Udder

Haematoma of the udder is relatively common in cattle having pendulous udder as a result of contusion and rupture of a subcutaneous blood vessels. The condition is characterized by its sudden onset and fluctuency. A septic puncturing the swelling may be necessary to confirm diagnosis, but this is not preferable. If the haematoma is subcutaneously, it can be palpated out if parenchymatus it cannot be detected by visual examination and the diagnosis in such cases depends upon the sudden onset of bloody milk. Haematoma of the Udder Haematoma should be opened week post occurrence. The blood clot is removed and the cavity is painted with tincture of iodine. The cavity is then packed tightly to guard against further bleeding.

6. Abscess of the Udder

Abscesses of the udder may develop beneath the skin as a result of infection of a haematoma. It may occur in the parenchyma of the udder as a result of chronic mastitis especially in goats. It may also occur as a result of supramammary lymphadenitis. Generally, abscess formations most commonly occurs secondary to the traumatic wound. Udder

Abscesses should be treated on the general principles for treatment of abscesses. If there are multiple abscesses, mastectomy (partial or total) according the involvement of one quarter or more on the entire udder, is then indicated.

If animals suspected any of these surgical affections on dairy farm about above condition immediately treatment should be done. Delay treatment may worst the surgical condition and may cause poor prognosis. Postoperative care is very important for all these surgical conditions.

Teat fistula

Teat laceration

References

Singh J, Singh P and Amold JP. 1993. The mammary glands. In: Ruminant Surgery (eds. Tayagi RPS and Singh J). CBS Publishers and Distributers, New Delhi, India, PP: 167 – 174.

Purohit GN, Mitesh Gaur, Chandra Shekher. 2014. Mammary gland pathologies in the parturient buffalo. *Asian Pacific Journal of Reproduction* **3(4):** 322-336.

Horney FD. 1984. Bovine skin and mammary gland. In: Jennings PB, eds. The Practice of Large Animal Surgery. Philidelphia: WB Saunders PP: 263-271.

Seeh C, Melle T, Medl M, Hospes R. 1998. Systematic classification of milk flow obstruction in cattle using endoscopic findings with special consideration of hidden teat injuries. *Tierarztl Prax Ausg Grosstiere Nutztiere* **26(4):** 174-86.

Singh P, Singh J, Sharma PD. 2003. Surgical conditions of udder and teats in buffaloes. *Intas Polivet* **4(II):** 362-365.

Rambabu K, Makkena S, Suresh Kumar RV, Rao TS. 2011. Incidence of udder and teat affections in buffaloes. *Tamilnadu J. Veterinary & Animal Sciences* **7(6):** 309-311.

Tiwary R, Hoque M, Kumar B, Kumar P. 2005. Surgical condition of udder and teats in cows. *The Indian Cow* 25-27.

ENDOCRINOLOGY OF HIGH AND LOW LIBIDO BREEDING BULLS

Khushpreet Singh, Ajeet Kumar, Ravdeep Singh and Bilawal Singh

Department of & Animal Husbandry Extension Education

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

High libido bulls are advantageous as they provide higher number of services and better semen quality whereas low libido bulls poses problem at the time of semen collection. Various studies on bull endocrinology suggest that testosterone, estradiol, prolactin and thyroid hormone levels in serum play an important role in manifestation of libido. Screening and selecting bulls for desirable reproductive traits and high libido is known to improve the reproductive performance of the herd. The reproductive potential of a bull is also influenced by factors such as management, age and nutrition. Serum testosterone concentration has a direct influence in the expression of sexual interest in bulls and testosterone to estradiol ratio plays an important role in exhibition of libido (Singh *et al.,* 2009). Thyroid hormones not only regulate growth, protein, carbohydrate and lipid metabolism but are also necessary for the expression of the changes in the neurosecretary system (Webster *et al.,* 1991) thereby modulating reproduction. Measures of prolactin in the sire can be useful predictors of lactational ability of their daughters. Mating ability is the physical capability to mate and is crucial for fertility. Reaction time (time taken from introduction of bull in test area till semen ejaculation) and refractory period (time gap between the first and second ejaculation) are important factors affecting libido. High serving capacity bulls are the most desirable than to moderate and low serving bulls. So, endocrine status of bulls could demarcate the good and poor libido bulls.

Testosterone: Testosterone concentrations are higher in good libido bulls as compared to poor libido bulls (Singh *et al.,* 2016). Increased concentration of testosterone is associated with high libido in breeding bulls. There is a direct influence of testosterone on libido in breeding bulls (Dias *et al.,* 2009). Ultrasonographic based evaluation of testicular echotexture also reveals homogeneous testicular echogenecity in high libido bulls (Singh *et al.,* 2015a). Lower testosterone values had been observed in poor libido bulls (Verma and Singh, 1992). Range of testosterone level from 0.02 to 27ng/ml with respect to libido had been reported (Kumar *et al.,* 2008a). Threshold level of testosterone is required to show sexual activity in breeding bulls but libido can be altered by increased or decreased concentration of testosterone (Blockey and Galloway, 1978).

Estradiol level: Estradiol concentrations in good libido bulls are lower as compared to poor libido bulls (Singh *et al.,* 2009) .Certain amount of estradiol is required for the function of postpubertal bull testes and to regulate sperm motility (Devkota *et al.,* 2008). Increased concentration of estradiol can affect libido as testosterone and estradiol have been found to be negatively correlated to each other (Javed *et al.,* 2000).

Testosterone to estradiol ratio: The ratios of testosterone to estradiol are more important than their individual values in regulating libido. Testosterone to estrodiol ratios can be used to demarcate high libido bulls from low libido bulls (Singh *et al.,* 2015b). Testosterone to

estradiol ratio is higher in good than the poor libido bulls (Kumar *et al.,* 2008b). Increased estrogen in comparison to testosterone is associated with poor libido in breeding bulls (Muller *et al.,* 2012). Testosterone levels are higher in good libido bulls and estradiol levels are higher in poor libido bulls. The reason behind this change is that the leydig cells produce testosterone, which gets converted to estradiol by aromatization in sertoli cells, adipose tissues and hypothalamic pre-optic area (Michael *et al.,* 1987). Increased aromatization of testosterone to estradiol causes decreased testosterone to estrogen ratio. So, decreased testosterone and increased estradiol level is associated with poor libido in breeding bulls.

Prolactin level: Serum prolactin level at ejaculation increases six times the normal basal level (Convey *et al.,* 1971). Prolactin is required for maintaining good libido and manifestation of sexual activity. Prolactin secretion is heritable and its level in sire could be predictors of lactational ability in daughters which could be useful in identification of superior dairy animals (Klindt, 1988).

Thyroid Hormones: TSH (Thyroid Stimulating Hormone) is positively correlated to testosterone secretion (Brown *et al.,* 2007) and as threshold concentration of TSH is required for sexual activity, severe decrease in circulating level of TSH can lead to poor libido. Lack of relationship between sexual behavior and circulating levels thyroid hormones was found by Boyd *et al* (1988). Normal circulating levels of (T3-Triiodothyronine, T4-Thyroxine) T3 and T4 have not been found to be correlated with libido. However, hypothyroidism reduces the concentration of serum sex hormone binding globulin (SHBG), which might alter the plasma testosterone concentration (Ford *et al.,* 1992) thereby affecting libido. Serum concentrations of T3 and T4 were similar in good and poor libido bulls.

It can be concluded that testosterone to estrodiol ratio can be used to demarcate the bulls with good and poor libido.

REFERENCES

Blockey, M. A. and Galloway, D. B. (1978). Hormonal control of serving capacity in bulls. *Therio.,* 9: 143–151.

Boyd, G. W. and Corah, L. R. (1988). Effect of sire and sexual experience on serving capacity of yearling beef bulls. *Therio.,* 29 : 779.

Brown, J. L., Somerville, M., Riddle, H. S., Keele, M., Duer, C. K. and Freeman, E. W. (2007). Comparative Endocrinology of Testicular, Adrenal and Thyroid Function in Captive Asian and African Elephant Bulls. *Gen. Comp. Endocrinol.,* 151: 153-162.

Convey, E. M., Bretschneider, E., Hafs, H. D. and Oxender, W. D. 1971. Serum levels of LH, prolactin and growth hormone after ejaculation in bulls. *Biol. of Reprod.,* 5: 20-25.

Devkota, B., Koseki, T., Matsui, M., Sasaki, M., Kaneko, E., Miyamoto, A., Montoya, C. A. and Miyake, Y. (2008). Relationships among age, body weight, scrotal circumference, semen quality and peripheral testosterone and estradiol concentrations in pubertal and postpubertal Holstein Bulls. *J. of Vet. Med. Sci.,* 70: 119-121.

Dias., J. C., Andrade, V. J., Emerick, L. L., Martins, J. A. M., Valhe Filho, V. R. and Silva,

M. A. (2009). Libido test in young guzerat bulls and their associations with reproductive tracts and serum testosterone levels. *Arch. Vet. Sci.,* 14: 204-213.

Ford, H. C., Cooke, R. R. and Keightley, E. A. (1992). Serum levels of free and bound testosterone in hyperthyroidism. *Clin. Endocrinol.,* 36: 187-192.

Javed, M. T., khan, A. and Ali, M. (2000). Influence of season on seminal plasma testosterone and oestrogen in healthy and abnormal buffalo bulls and their relationship with other semen parameters. *Vet. Arh.,*70: 141-149.

Klindt, J. (1988).Relationships among growth hormone and prolactin secretory parameter estimates in Holstein bulls and their predicted differences for lactational traits. *J. of Ani. Sci.,* 66: 2784-2790.

Kumar, A., Singh, J., Dhaliwal, G. S. and Singh, P. (2008a). Incidence and factors associated with poor libido in breeding buffalo bulls. *Ind. J. of Ani. Sci.,* 78: 143-45.

Kumar, A., Singh, J., Honparkhe, M., Dadarwal, D. and Dhaliwal, G. S. (2008b). Gonadal steroids and thyroid hormones in non responding GnRH treated poor libido breeding bulls. *Ind. J. of Ani. Rep.,* 29: 181-184.

Michael, R. P., Bonsall, R.W. and Rees, H.D. (1987). Sites at which testosterone may act as an estrogen in the brain of the male primate. *Neuroendorinol.,* 46:511.

Muller, G.,Andrade, A. J., Santos, A. S., Reghelin, A. L., Garcia, D. M., Ana, G. R., Spercoski, K. M., Meyer, K. B., Torres, S. M., Silvajunior, V. A. and Morais, R. N.(2012). Testicular testosterone: Estradiol ratio in domestic cats and its relationship to spermatogenesis and epididymal sperm morphology. *Therio.,* 78: 1224-1234.

Singh, K., Kumar, A. and Dadarwal, D. (2015a).Comparison of ultrasonographic testicular echotexture in good and poor libido breeding buffalo bulls. *Ind.vet. J.,* 92: 88-89.

Singh, K., Kumar, A. and Honparkhe, M. (2015b).Endocrine status of serum testosterone, estradiol, prolactin and thyroid hormones in good and poor libido breeding buffalo bulls. *Ind. Vet. J.,* 92:39-40.

Singh, J., Kumar, A., Honparkhe, M., Dadarwal, D. and Dhaliwal, G. S. (2009). Effect of GnRH therapy on Plasma steroids, thyroid hormones and and libido in Breeding Bulls. *Ind. Vet. J.,* 86:584-585.

Verma, M. C. and Singh, N. P. (1992). Histopathological changes in relation to testosterone levels in bulls with complete loss of libido. *Ind. J. of Ani. Sci.,* 62: 1170–1171.

Webster, J. R., Moenter, S.M., Woodfill, C.J.I.and Kirsch, F.J. (1991). Role of thyroid gland in seasonal reproduction: II. Thyroxin allows a season specific suppression of gonadotropin secretion in sheep. *Endocrinol* .,129:176-183.

CLIMATE CHANGE: A MAJOR THREAT TO DAIRY ANIMAL'S ABILITY TO REPRODUCE

Sarvpreet Singh Ghuman

Department of Teaching Veterinary Clinical Complex

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

The word 'climate change' refers not only to global changes in temperature but also to changes in wind, precipitation, the length of seasons as well as the strength and frequency of extreme weather events like droughts and floods. Various scientific studies produced by the Intergovernmental Panel on Climate Change have clearly confirmed the climate change. Studies indicate that the mean air temperature over the Indian region has increased at the rate of 0.56^{o}C/100 year during the period 1901-2007. An accelerated warming was observed between 1971-2007 which was mainly due to an increase in temperatures in winter and post-monsoon periods. Unless we successfully reduce the impacts of these threats, these are going to contribute to the loss of reproductive potential of dairy animals like cattle and buffalo.

Buffalo - the main dairy animal of Punjab state suffers thermal stress when exposed to solar radiation and denied access to wallow or cooling shower. They are less tolerant to extremes of heat and cold than various breeds of cattle. The body temperature of a buffalo is lower than that of a cow in spite of the fact that its black skin absorbs much heat and its skin has only one-sixth the density of sweat glands that a cow skin has. This explains why buffalo like to wallow in water when the temperature and humidity are high. Lactating buffalos are more prone to heat stress than other dairy/lactating animals as they are unable to maintain their internal temperature within the thermo-neutral zone because of their special characteristics such as black colored body and more affiliation to water for maintenance of body temperature and various productive and reproductive phenomenon. Thermal stress is one of the major factors responsible for impairment of infertility in tropical and subtropical countries (India, Pakistan, Sri Lanka, Nepal, Bhutan, Bangladesh, Thailand and Myanmar) and need effective applicable strategy to overcome the harmful effects of thermal stress.

In tropical countries, global warming is a challenge for us with regard to the sustainability of dairy farming, a major source of alternate income for the large population of small and marginal farmer. Under heat stress, the maintenance energy requirement in dairy cattle is increased by 20-30% and dry matter intake is decreased by 10-20%. Thus, the energy intake available for milk production decreases and there could be a loss of 10-25% in milk production. In addition, decreased synthesis of hepatic glucose and lower non-esterified fatty acids in blood during thermal stress causes reduced glucose supply to mammary glands resulting in low lactose synthesis and low milk yield. Exotic cattle breeds show sharp decline in milk production if ambient temperature goes beyond 26^{o}C. In Punjab state, during summer season, the temperature remains constantly >26^{o}C and this becomes more severe during July-August when humidity increases drastically, and evaporative cooling reduces followed by reduced production. The climatic heat stress causes significant changes in the physiological reactions, heat storage and heat load index in lactating buffalo and also negatively impact milk yield, that necessitates adequate mitigation strategies to improve their productive potential.

The combined effect of high environmental temperature and relative humidity known as 'Temperature-Humidity Index (THI)' is considered as the prominent indicator of physiological strain to animal system. Thermal stress begins to occur in dairy animals when THI is >72 (Table).

Impact of thermal stress on dairy cattle. *THI-Temperature-Humidity Index*

THI	Stress level	Comments
<72	None	Nil
72-79	Mild	Animal will adjust by seeking shade, increasing re spiration rate and dilation of blood vessels. The effect on milk production will be minimal.
80-89	Moderate	Both saliva production and r espiration rate will increase. Feed intake may be depressed and water consumption will increase. There will be an increase in body temperature. Milk production and reproduction will be decreased.
90-98	Severe	Animal will become very uncomfortable due to high body temperature, rapid respiration (panting) and excessive saliva production. Milk production and reproduction will be markedly decreased.
>98	Danger	Potential death

Following exposure to solar radiation, high ambient temperatures and high relative humidity during summer and hot humid seasons, cattle and buffalo respond with an acceleration of physiological processes to increase the rate of heat loss. Thermal stress can compromise reproductive function mainly due to redistribution of blood flow from body core to periphery and thereby increasing sensible heat loss. In addition, reduced feed intake decreases metabolic heat production, affects energy balance and availability of nutrients for reproductive ability such as functions of germ cells, cyclicity, establishment of pregnancy and early developing embryo. Thermal stress causes increased incidence of retention of placenta, dystocia, abortion and prolapse among crossbred dairy cattle.

Reproductive endocrine axis and estrus expression: Buffalo, in particular, reproduce poorly in summer season. This is going to be a serious concern for buffalo farming in case of rising temperature scenario. Thermal stress induced change in ovarian hormone production might be reason behind decrease in fertility in summer. Under high environmental temperature, the frequency of luteinizing hormone (LH) surge remains stable, however, LH peak is lowered and altered. Consequently, the dominant follicle develops under lower plasma LH, plasma estradiol concentrations are decreased, thus depressing the reproductive index. Further, the lowering of plasma progesterone also has adverse impact on follicle and ova development and embryo implantation, thus influencing fertility. Moreover, heat stress has direct influence

on the ovary and reduces its sensitivity on gonadotropin hormones, hence leading to ovarian cyst formation. Global warming induced increase in production of adrenocorticotropic hormone inhibits sexual behavior, increases the incidence of silent heat and lowers intensity of estrus in dairy cattle. A seasonal pattern of reproductive activity in tropical regions is attributed to changes in rainfall resulting in fodder availability or to heat stress resulting in prolactin secretion, whereas changes in photoperiod and melatonin secretion may have a role in both tropical and temperate regions.

Development of follicle, embryo and pregnancy: During summer, the development of dominant follicle is less manifested, more middle size follicles grow and regress without ovulation. The cattle exposed to high ambient temperature from the first sign of estrus until 15-20 h following artificial insemination (AI) express poor embryo development. Increased uterine temperature lowers the efficiency of fertilization. Thermal stress disturbs the endometrium by altering protein synthesis and secretion, and hence embryo development. In high producing lactating cattle, thermal stress prior to and immediately after AI causes reduction in conception rate. Embryonic mortality is increased following dam's exposure to elevated ambient temperatures especially in tropical areas. During winter, early embryonic mortality in buffaloes was 20% that increased to 45% in summer. Therefore, strategies can be developed to optimize fertility during periods of reduced reproductive activity.

Male fertility: Thermal stress causes degeneration of meiotic germ cells and hence spermatogenesis in the seminiferous tubules, lowers plasma testosterone and decreases libido, influences the structure of spermatozoa DNA, lowers sperm count and progressive motility, decreases sperm acrosome reaction, and fertilization with heat-damaged sperm cells leads to premature embryonic death.

Adjusting the impact of climate change on dairy animals

Breeding: The germplasm of dairy animals need to be improved and the low producing animals should be culled. In scenario of climate change, production ability of animals is going to decrease, however, if the animal is producing well the losses will be minimal. Farmers should breed their animal with high quality germplasm available from government hospitals.

Climate resilient housing: Minimize overcrowding and shade reduces the effect of radiation. The airflow over the housing area must be 4-5 mph, thus, the addition of fans can assist in increasing airflow. Wallowing tanks, fan, fogger, misters, desert coolers, air conditioners can be used to increase evaporative cooling by wetting the skin depending upon the requirements and the type of farm. A fan cum mist system can be used to ameliorate the thermal stress effects on buffalo by lowering physiological responses and water intake and also by improving the feed intake and growth rate. Showering of buffaloes twice a day, wallowing and cool drinking water diminishes the effect of thermal stress and increases conception rate from 21-30% and there is marked increase in milk production by 20-25%. Feeding anti-oxidants during hot weather can improve health status and fertility rate of dairy animals.

Feeding strategies: Feed with high digestibility lowers the heat produced by nutrient utilization within an animal. Select higher quality forages and use of non-fiber byproduct feeds such as soy hulls, beet pulp or citrus pulp. Add additional fat to ration, but fat levels

should not exceed 5-5.5% of total ration dry matter. Protein should be balanced properly in the ration to minimize its losses in the rumen. Adding buffers (sodium bicarbonate, magnesium oxide, and sodium sesquicarbonate) helps in maintaining a normal rumen environment. Increase potassium and magnesium levels in ration to counteract the losses in heat-stressed animals. Fresh, palatable, rations mixed uniformly should be in the feed bunk at all times to provide maximum opportunity for feed consumption. To compensate, animals should eat more feed during the cooler times during the day. Minimize high fiber diets like straws and stovers. Minimize high levels of rumen degradable protein. Supplement salt and minerals (area-specific). Use ionophores, pro and pre-biotics to improve rumen fermentation. Use treated straws (urea, molasses) and increase feeding frequency.

Water: It plays an important role in counteracting with thermal stress. It should be taken care that watering devices should contain clean and fresh water, enough water space should be available for animals. There should be at least 2-3 inches of water space per animal. As the water intake may increase by 20 to >50% during heat stress conditions, so adequate quantity of water should be available for drinking purpose.

Conclusion: It is well known that the productivity remains unaffected relatively within the zone of thermal comfort. The productivity of livestock undergoes seasonal changes and is affected both directly and indirectly by climatic extremes. To reduce production losses and to provide comfort to animal, there is a need to modify the environmental conditions at micro levels. Growth rate and milk yield of cattle and buffalo declines due to rise in ambient temperature especially during hot and hot humid seasons. Therefore, a proper shelter is necessary for maintaining the productivity under different agro-climatic conditions. Heat alleviating measures like fan, coolers, foggers, mist, showers, and wallowing may be used for reducing the thermal stress effects. The impact of climate change will be felt by both developed and developing countries, but developing countries will be mostly impacted because of lack of resources, knowledge, veterinarian and extension services and research technology development.

UTILIZATION OF TREE LEAVES AS FEED RESOURCE FOR RUMINANTS

Jasmine Kaur and Jaswinder Singh
Department of Animal Nutrition
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

India is basically an agricultural country and about 70 per cent of its people live in villages. Their livelihood is dependent mainly on agriculture and animal husbandry. Though India has a huge livestock population, yet the production of milk per animal and other livestock products is lower than the developed countries. A major constraint to livestock production in the tropics is the seasonal fluctuation in forage yield and quality from grasses. There is usually adequate forage of fair to good nutritive value in the wet season, but in the dry season, available forage from natural pastures is usually inadequate both in terms of quality and quantity to meet even the maintenance requirements of livestock. Trees and shrubs have been shown to be capable of providing high quality fodder in the dry season. The role of fodder trees and shrubs in the diet of animals is considered particularly important in countries like India where small land holdings and large ruminant densities result in an especially severe problem of feed availability. Tree leaves are generally used for feeding sheep and goat and are sometimes fed to cattle during periods of fodder crisis.

Ruminants in Tropics are mostly fed on low quality roughages. Addition of tree leaves in ruminant diets improve the utilization of low quality roughages mainly through supply of nitrogen to rumen microbes. Tree fodders are important source of nutrients for small ruminants. Fodder tree leaves can serve as an alternative source of livestock feed in scarcity period. Goats prefer to browse on small bushes rather than grazing, but due to the limitation of bushes, tree leaves form a major part of their diet. Most of tree leaves are rich in crude protein and total digestible nutrient (TDN) contents which can meet the requirements of goats. Tree leaves like *Alianthus excelsa* and *Morus alba* can even fully satisfy the maintenance requirement of goats and sheep, respectively. The leaves of *Ficus bengalensis* are consumed in greater quantities by goats.

Table 1. Commonly used shrubs and tree fodders

Common name	Botanical name
Babul	*Acacia nilotica*
Cassava	*Manihot esculenta*
Mulberry	*Morus indica*
Erythrina	*Erythrina variegata*
Bamboo	*Dendrocalamins strictus*
Banyan	*Ficus bengalnensis*
Pipal	*Ficus religiosa*
Gliricidia	*Gliricidia sepium* *Gliricidia maculata*
Jackfruit	*Artocarpus heterophyllus*
Subabul	*Leucaena leucocephala*
Beri leaves	*Zizyphus jujuba*
Khejri	*Prosopis cineraria*
Agathi	*Sesbania grandiflora* *Sesbania sesban*
Tamarind	*Tamarindus indica*

Nutritive value of tree leaves: Generally, the dry matter content of the various tree leaves varies from 20 to 40%. Ether extract fraction is also fairly high compared with grasses and hays. Tree leaves contain comparatively low percentage of crude fibre compared with grasses and hays. Younger tree leaves before flowering have more protein contents than mature leaves after flowering. The crude protein content decreases and the crude fibre content increases with increasing age of tree leaves. The fibre of tree leaves is complex and highly lignified at maturity. Palatability, digestibility and nutritive value of tree leaves decreases as the leaves advance in maturity. The tree leaves contain 8–33 percent crude protein, 1–19 percent ether extract , 11–50 percent crude fibre, 0.2–3.0 percent Ca and 0.1–0.3 percent P. The digestibility coefficient of dry matter, crude protein, crude fibre, ether extract and nitrogen free extract in tree leaves ranges from 40–75, 28–83, 24–82, 32–65 and 51–85 per cent, respectively (Rai *et al.,* 2007). Calcium content of tree leaves is 2-3 times more than that of cultivated fodders or grasses. The phosphorus content is, in general, low, resulting in a wide calcium to phosphorus ratio. Tree fodders are rich in protein and mineral contents as compared to grasses and thus can be supplemented to low quality grasses. Plants take up minerals readily during early growth, but as growth accelerates, dry matter accumulates more rapidly than minerals so the content of most minerals therefore fall with advancing maturity. *Leucaena sp, G. sepium and Acacia sp.* fix atmospheric nitrogen which is now an important component in the farming system in many countries in the tropics.

Deleterious principles in tree leaves: Disadvantage of the trees is the presence of anti-nutritive and toxic factors which can produce toxic effects in ruminant animals. Presence of antinutritional factors like mimosine in *Leucaena leucocephala,* triterpinoid derivatives (azadirachtin, nimbidin) in *Azadirachta indica* and phenolics in most of the leaves limit their use as animal fodder. The presence of tannins in tree leaves has been found to adversely affect the dry matter digestibility and use of nutrients, and an inverse relationship exists between tannin content and crude protein digestibility because of their inhibition of proteolytic and cellulolytic enzymes. However, the inclusion of a limited quantity of tree leaves in animal feed is recommended to improve rumen function and productivity. Goats can consume tree leaves at higher level because they have tannase enzyme in their saliva which detoxifies tannins. It is always better to feed wilted tree leaves than freshly chopped leaves as wilting helps in reducing the antinutritional factors as well as increase palatability. The presence of tannins is an advantage as they protect the proteins from excessive microbial degradation and make proteins more available posterior to the rumen.

Some of the commonly used tree leaves as livestock feed have been discussed below:

1. Mulberry leaves (*Morus indica)*

Mulberry leaves have an appreciable potential as protein source in small ruminants feeding, thus leaves of mulberry can also be used as main feed for small ruminants. Mulberry tree leaves contain 23.5% and 18.2% crude protein with 12.8% and 23.1% ash contents at young and mature stages of growth, respectively. Digestible crude protein is 7.8% and TDN content is 48.4 %. The biomass yield of fresh leaves is nearly 35-45 tonnes /ha/year. In countries such as India, where mulberry is primarily grown for sericulture, excess leaves and leftovers are fed to cattle, sheep and goats. In hilly areas, where mulberry trees are abundant, their leaves are fed to animals. Of the different species available, *Morus alba* and other species that are suitable for silkworm rearing are cultivated in the plains and on hilly ground. Mulberry trees can be grown under varied climatic conditions, including fallow and wastelands not fit for agriculture and can be used for producing nutritious green fodder.

2. Pipal leaves (*Ficus religiosa*)

Pipal is a big spreading tree and is found in all parts of the country, remains green throughout the year. Digestible crude protein is 7.05% and TDN content is 48.22 %. Cu content is high in *F. religiosa* leaves. The leaves of pipal have 36.3 dry matter, 83.5 % organic matter, 9.3 % crude protein, 2.9 % ether extract, 26.1% crude fibre, 45.3% nitrogen free extract, 16.6 % total ash, 47.6 % neutral detergent fibre, 33.1% acid detergent fibre, 14.4% hemicellulose, 2.4 % Ca, 0.22 % P, 1.46 % tannin and 0.57% oxalate, on DM basis (Niranjan *et al.,* 2007). Pipal leaves when fed alone could form a maintenance ration.

3. Banyan leaves (*Ficus bengalensis)*

This tree is large spreading and grows throughout India. The leaves contain 3.81% digestible crude protein and 49.78 % TDN. Banyan leaves have 4.41% crude protein, 34.0% crude fibre, 2.6% Ca and 0.49% P. Banyan tree leaves play a vital role in feeding of goats and other ruminants in lean periods. The leaves are consumed in greater quantities by goats as compared to bullocks.

4. Subabul (*Leucaena leucocephala)*

Subabul is vigorous rapidly growing drought tolerant tree and can be grown under wide range of agro-climatic conditions. During the 1970s and 1980s, it was promoted as a “miracle tree” for its multiple uses. The wood part of the Subabul tree is used for making pulp in the pulp and paper industry. It has also been described as a “conflict tree” because it is used for forage production but spreads like a weed in some places. Biomass yield is 50 tonnes/ha/annum. The digestible crude protein content is 11.73% and TDN is 51.97% in cattle while it is 16.03 and 61.58%, respectively in goats. Subabul leaves are rich in carotene and calcium. They provide a valuable source of protein, energy and sulphur for the rumen bacteria. Subabul seed contains mimosine which is a toxic amino acid and leads to loss of hair or wool leading to skin lesions and salivation. Subabul should not be fed in excess to ruminants as it affects thyroid function and reduces the level of tri-iodothyronine and tetra-iodothyronine leading to goitre. Mimosine and its degradation products 3,4-dihydroxy pyridine cause poor growth, alopecia, swollen and rough coronary bands, lameness, mouth and oesophageal lesions, depressed thyroxine levels and goitre. Heat treatment of *Leucaena* leaf meal and drying by exposure to sunlight and high temperatures cause considerable reductions in mimosine. Moist heat treatments such as cooking, dipping leaves in hot water and autoclaving leaves reduce the content more than dry heat. Washing with water and soaking the leaves have also been reported to significantly lower the mimosine content. Supplementing *Leucaena* with mineral (iron, zinc) salts has been known to reduce mimosine toxicity in rats, chicks and goats. Reduction of mimosine toxicity by ferrous ions may be due to the formation of a ferric chelate of mimosine after oxidation of ferrous ions to ferric ions. Goats can utilize subabul efficiently than sheep. Supplementation of *Leucaena leucoephala* to small ruminants provides higher concentrations of rumen metabolites, which naturally improve rumen function and digestibility. *Leucaena* provides palatable, digestible, and nutritious forage for ruminants such as cattle, water buffalo, and goats, and thus helps to increase milk production in both the humid and the monsoonal tropics.

5. Beri leaves (*Zizyphus jujuba)*

Zizyphus jujuba is a commonly grown shrub. Beri leaves have high crude protein of 18.6%. Beri leaves are used as a conventional fodder for sheep and goats. They are comparatively more palatable than pipal leaves.

6. Babul (*Acacia nilotica)*

Babul is a N-fixing legume that can be grown with grass or cereal crops in order to enhance their N value. In Punjab, this species has been widely planted in strips along road and canal side plantations. It occurs naturally in pockets in riverain sites along Siwalik hills. Dry matter yield of tree leaf fodder is 0.2 to 2.0 ton/ha/year. Leaves contain about 7-15% crude protein, 20.1-33.3% crude fibre, 1.2-2.6% calcium and 0.1-0.2% phosphorus. In dry areas, it is heavily browsed by camels and goats. The tree provides shade and shelter and is an excellent soil binder, which makes it useful in soil conservation works. As a fodder source, babul pods and leaves are fed to livestock. Pods and leaves are protein rich feedstuff, generally dropped during the dry season and thus providing nutritive feed during scarce periods.

7. Neem leaves (*Azadirachta indica)*

The neem is a non-leguminous multi-purpose tree which belongs to the family *Meliceae*. Neem plant remains green throughout the year and is drought resistant. Neem leaves contain appreciable amount of protein, minerals, carotene and adequate amount of trace minerals except zinc. Neem leaves have been reported to contain 15.8% crude protein, 14.6% crude fiber, 8.5% ether extract, 4.5% ash, 13.0% moisture and 56.6% nitrogen free extract. These values vary from one place to another due to variations in nutrient composition of the soil where the neem plant is grown. Neem leaves contain anti-microbial, anti-inflammatory, antihyperglycaemia, anti-ulcer, anti-malaria, anti-fungal compounds and antioxidants. The presence of some anti-nutritional factors such as tannins, phenolic compounds and oxalates have also been identified in neem leaves. Tannin concentration in neem leaves is less than in *Leucaena leucocephala* and below the level that will depress feed intake. Neem are consumed by camels, goats and in drought by cattle also. Neem leaves added as supplement to basal diets of crop residues have been shown to improve feed utilisation and animal performance in ruminants. In a study in which 30% of mustard straw was replaced with either neem, both dry matter and crude protein intakes were increased, indicating that neem leaves supplied critical nutrients needed to enhance ruminal microbial growth and fermentation of feed. Other studies have shown that neem leaves can replace up to 50% of soybean meal in ruminant diets with no negative effects on feed intake, dry matter and fibre digestibility as well as body weight gain. Improved performance of ruminants fed neem leaves may be partly attributable to the effects of the bioactive compounds in the leaves on intestinal parasites.

Tree leaves and twigs form a natural part of the diet of many ruminant animals. The availability of a variety of these feeds enables the herbivores especially the goats to meet their feed preferences. Thus, it is of vital importance to enhance the fodder production by improving top feed tree species. The problem of fodder scarcity can also be taken care of to some extent by plantation of trees and shrubs.

References:

Datta R.K., Sarkar A., Rama Mohan Rao P. and N.R. Singhvi. 2002. Utilization of mulberry as animal fodder in India. http://www.fao.org/docrep/005/X9895E/x9895e0h.htm.

Niranjan P. S., Shririvasava, Udeybir and Verma D. N. 2007. Nutritional evalution of Pipal leaves in Barbari kids. *Indian J. Anim. Nutr*., 24(2): 128-129.

Rai P., Ajit and Samanta A. K. 2007. Tree leaves, their production and nutritive value for ruminants: a review. *Anim. Nutr. Feed Technol*., 7 (2): 135-159.

Sethi P. and Kulkarni P.R. 1995. *Leucaena leucocephala*: A nutrition profile. *Food and Nutrition Bulletin Volume* 16, Number 3.

LIVESTOCK WASTE MANAGEMENT IN FARM ANIMALS

Megha Kose[1], Khushpreet Singh and Ravdeep Singh

Department of Animal Reproduction, Gynaecology and Obstetrics, Nagpur Veterinary College, Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra

Livestock and Agriculture is the largest contributor of any resource sector to the economy. The first goal of any waste management system is to maximize the economic benefit from the waste source and maintain acceptable environment. If waste is not properly handled they can pollute surface and groundwater and contribute to air pollution. Manure is an important component farm waste in a livestock operation can also include waste forage, dead stock, and silage effluent and milk house waste.

Management that puts into practice the principles of the four R's of Reduce, Reuse, Recycle and Recover is the best first option:

- Reduce the amount of waste product generated.
- Reuse the waste product on the farm or provide it for others to use.
- After reducing and reusing as much of the waste product as possible, recycle the product either on-farm, such as with land application of manure, or recycling programs.
- Recover methane gas from manure waste.

The increasing size of farm operations and the expanding residential land use in rural areas has greatly increased environmental concerns over nuisance odours and the potential for water pollution. With good manure management practices, proper storage facilities, and adequate separation distances between non-compatible land uses, most environmental problems can be avoided. Manure management encompasses manure collection, storage, transport and land application. The goal of manure management must be to maximize the soil amending value of manure and minimize the potential for environmental degradation.

Nature of the Resource

Manure and contaminated runoff water are valuable sources of fertilizer and organic matter for soil. Manure is a dynamic organic material, continually undergoing biological and chemical changes. The value of manure as a fertilizer depends on the quantity and form of nutrients present when it is applied to land. Each phase of management may result in loss or change to the beneficial nutrients in the manure. Manure includes the faecal and urinary wastes of livestock and poultry, plus materials such as bedding and added water. The combined moisture level of faeces and urine ranges from 75% in poultry manure to 85% for swine manure. Depending on the amount of water or bedding added, manure can be solid, semi-solid or liquid. Manure contains about 75% of the nutrients fed to livestock including

nitrogen, phosphorus and potassium. Animals use only about 25% of nutrients and excrete the rest. About 50% of nitrogen and 75% of potassium in manure is found in the liquid portion. Therefore, it is important to contain the liquids for land application. Almost all the phosphorus is in the solids. When manure is diluted by water, nutrient concentrations are reduced.

Manure Handling and Storage

Livestock manure is classified as solid, semi-solid or liquid using the following criteria:

- **Solid** - contains greater than 20% solids. Bedding material contributes to the solid content of the manure. It can be stacked and handled by any equipment that will move bulk materials.
- **Semi-solid** - (also referred to as slurry) - contains 5% to 20% solids. Semi-solid manure is produced in livestock housing systems where limited bedding is supplied. The resulting semisolid does not flow as readily as liquid manure.
- **Liquid** - contains less than 5% solids. The additional liquid comes from washing and spillage from watering systems. When agitated, liquid manure can be pumped or moved by gravity flow. Milkhouse washwater and other types of wastewater are often added to the liquid manure. Manure which includes bedding or waste feed will require dilution if it is to be handled as a liquid. The moisture content of the manure determines the type of handling and storage system.

Storage

A manure storage facility which is of sufficient size reduces the chance of pollution from spills and allows land application to take place when soil is dry, when crops require nutrients, and when work schedules permit. Manure storage should be large enough to store manure, bedding, wasted feed, precipitation and all liquids for at least 210 days. A one year storage capacity is optimal. The required volume of open manure storages and confinement yards will have to be increased by 0.6 cubic metres/sq metre (2 cubic feet/ sq ft) of surface area to allow for precipitation.

Proper management of all liquids is essential for effective and economical manure handling and storage. Since all water which comes into contact with manure must be handled as a waste, the key to efficient management is to minimize that contact. Surface runoff should be diverted away from livestock and manure storage areas. Runoff from solid manure storage and exercise yards, milking centre washwater, silo seepage and livestock housing washwater must be stored and properly handled to ensure that groundwater, streams and other surface waters are not polluted.

Solid Manure

There are three common and acceptable ways of storing solid manure. These are related to the kind of livestock housing system in use. Farmers should consider animal density and roof costs versus the cost of runoff collection systems when planning a solid manure storage system.

- **In Barn (solid manure pack)** - Manure can be stored where produced, in confined, bedded pack housing systems.
- **Curbed concrete slab with runoff retention** - Manure is removed and stored on a curbed concrete pad with a runoff containment system. Manure is usually moved by a tractor with a scraper blade, a front-end loader, a stable cleaner and elevator/ stacker or by a ram/piston pump/air mover system.
- **Curbed concrete slab with roof** - Manure is removed to a roofed storage area with a concrete floor and partial sidewalls constructed of reinforced concrete.

Semi-Solid Manure

There are two common and acceptable ways of storing semisolid manure.

- **Curbed concrete slab with earthen banks** - This type of storage requires a sloped concrete floor, concrete curbs and ramp to allow easy tractor access. Earthen sidebanks must be properly designed and constructed to prevent seepage. Environmental approval will require certification by a qualified engineer. The sloped floor allows the liquid portion of the manure to flow to the lowest point, where it can be removed by pumping. The remaining solids can be removed by a tractor fitted with a front-end loader.
- **Concrete storage -** Where soils are low in clay content, semisolid manure may best be stored in a roofed structure with reinforced concrete sidewalls on three sides. A concrete floor sloping downward from the open side is required to contain drainage of the liquid portion. The floor should be sealed at the walls to prevent seepage.

Liquid Manure

All liquid manure storages must have some type of impermeable enclosure, including concrete tanks, above-ground glass-lined steel tanks and earthen ponds. These storage systems can be covered or open. Liquid manure storages are most common in confined swine operations and free stall dairy systems. Common types of liquid manure storage are:

- **Underbarn Concrete Storage -** Rectangular tanks with reinforced concrete walls sealed to a concrete floor; may be located below a slatted barn floor. Toxic and explosive gases may be produced when manure is agitated prior to removal, so barns should be well-ventilated.
- **Exterior Concrete Tank** - Circular or rectangular tanks with reinforced concrete walls and floors may be partially or entirely in-ground. Covers may be installed to reduce odours, to keep out precipitation or to ensure safe operation. Covers chosen to reduce the strong odours common to liquid storage can include temporary floating straw crusts, tarpaulins, plastic domes or permanent steel, wood or concrete structures. For safety reasons, in-ground or partially in-ground storage outside the barn must be fenced or have a reinforced concrete cover which will support vehicle traffic. The floor elevation of the storage must be 0.5 metres (1.6 ft) above the

maximum water table and bedrock elevation.

- **Earthen Lagoons:** Earthen lagoons are not as environmentally reliable due to the risk of puncturing the liner during cleanout. The liner must have a permeability rating of 10-7 cm/sec. Soils must be tested to determine their permeability. The floor elevation of the storage must be 1 metre (3.3 ft) above the maximum water table and bedrock elevation.

DERMATOPHYTOSIS (RING WORM) INFECTION IN DOGS

Paviter Kaur and N S Sharma

Department of Veterinary Microbiology

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

Introduction: Dermatophytosis, more commonly referred to as ringworm, is a superficial fungal infection affecting skin, hair and or nails (claws) of animals. It is common all over the world and infects all spp. of domestic animals including dogs. It is commonly called ringworm due to appearance of round, raised, red, ring like lesions commonly seen in case of human ringworm infections.

Host: Occurs in dogs, cats and other species of farm, domestic and wild animals including humans. Infection is relatively rare in sheep and quite rare in goats. Puppies less than one year old are more susceptible. Malnourished, immunocompromised and stressed dogs are at greater risk.

Etiology: The fungi responsible for the disease belong to a special group of keratinophilic fungi called dermatophytes, so the name dermatophytosis is given to the condition. Most commonly isolated fungal organisms are *Microsporum canis*, *Trichophyton mentagrophytes* and *Microsporum gypseum*. All the three species of fungi are zoonotic and can cause disease in humans also.

Transmission: Ringworm is highly contagious, infectious and can spread to healthy animals and humans by direct contact with the infected animals or asymptomatic animals or humans or contaminated objects like bedding, brushes, clippers and cages or infected soils. The disease can also spread in shelters and other places where dogs are in close environment. Unsanitary conditions and conditions in which there is poor nutrition increases the risk of ringworm in dogs living in those conditions. Poor management practices and lack of adequate quarantine period are other pre-disposing causes. Disruption in skin like worm or flea infestation also increase susceptibility to ringworm.

Pathogenesis: Fungal spores remain dormant for upto 18 months on environmental surfaces , furniture, combs, bedding, carpets etc. and spread through shedding/ breaking of infected hairs. Incubation period ranges from seven to fourteen days and in some cases it may extend to 21 days also. Dermatophytes grow and live in the outermost layer of skin and in hair follicles of infected dogs and occasionally in nails so it is quite easily transmitted. The infection is superficial in nature since the fungi feed on the keratin found in the outer layers of skin, hairs and nails. Infection affects only a few areas in the body of dogs. The contact with fungus may not always result in an infection since infection depends on the amount of environmental contamination, age of the animal or human. The infection occurs readily in young children, elderly people, persons with immunocompromised state or skin sensitivities.

Symptoms: Typically lesions are seen on head, ears, paws and forelimbs. Symptoms include patchy areas of hair loss (alopecia) that are rougly circular; crusted, circular, bald spots that sometimes look red in the centre; red or ulcerated and darkened skin, scales at

the skin surface, Inflammation and . Itchiness (pruritis) may or may not be present. Less frequently, a raised nodular lesion called kerion can develop that may ooze. Brittle or rough or misshapen nails can also be seen due to infection of nail and claw folds. As the lesions enlarge, they start to heal in the centre leading to patching appearance that may become inflamed or scabbed. Hair loss or changes in coat appearance viz. poor hair coat can also be seen. In mild cases, few broken hairs are seen. Severe forms can involve whole body. Some dogs may not show any symptoms of the disease though they may harbour the fungus in their hair or skin. Such dogs referred to as asymptomatic / inapparent carriers can still pass the disease onto humans and other animals. In humans, red itchy areas on the skin are seen. Though generally harmless, but it is highly contagious to humans esp. children and elderly and those with immunocompromised systems. The affected hairs shafts are fragile and easily broken. In severe cases, several patches of alopecia can be seen spread throughout the body. Ocassionally, nail infections can occur in which the folding of skin bordering the nails occur and the claws become rough, brittle and broken.

Diagnosis: Diagnosis of ringworm requires thorough clinical examination of the affected dogs. Diagnosis can be made from the signs of skin problems viz presence of typical ringworm lesions on the skin but this is not a foolproof method and misdiagnosis can occur. Examination of infected hairs under ultraviolet light known as Wood's lamp examination also helps in diagnosis but diagnosis made on basis of Wood's lamp examination is not always reliable since some types of fungi causing ringworm fluoresce when exposed to light under Wood's lamp but others donot. So, additional testing may be required. Hair may be gently plucked from areas surrounding the lesion and visualised under the microscope for presence of fungal spores attached to the hair shaft. Best method for diagnosis is by culture of the affected area. If results of other tests are inconclusive and species of ringworm needs to be identified, then fungal culture is preferred.

Differential diagnosis: Allergic skin diseases, hyprothyroidism, Cushing's disease, a nutrient imbalance, presence of different parasites or even another type of infection altogether.

Treatment: Though treatment depends on severity of infection, but, regardless of the severity of the case, treatment should always be carried out. The most common treatment regimen usually consists of topical therapy, systemic therapy and environmental decontamination. Topical medicated antifungal shampoos or ointments are used. It is important to use shampoos or ointments recommended by the veterinarian since other products can aggravate the condition. In mild cases, antifungal creams and ointments can be applied directly onto the affected areas. If infection is widespread, then medicated shampoos should be used. Though topical therapy takes several months to fully eliminate the infection but this helps in prevention of contamination of environment. Oral medications are used in conjunction with a topical therapy. Clipping of hairs from large haired dogs and shaving hairs from affected areas helps to cure the condition as it allows the topical ointments and medicines to be absorbed directly into the skin. Once treatment begins, lesions usually heal in about 1-3 weeks. Full schedule of treatment as prescribed by the veterinarian should be followed even if the animal is fully cured. Diagnostic tests should be carried out to ensure cure. After two consecutive negative cultures by lab diagnosis, the treatment can be stopped. But despite treatment being carried out, there is no guarantee that reinfection would not occur. In addition, environmental decontamination needs to be carried out so as to prevent the further

spread of infection.

Control and Prevention: Usually prevention measures for ringworm are not actually important until and unless a case of ringworm has been there in the pets. For prevention, regularly clean the home environment, bedding, furniture, carpets etc. that the animals are in contact with. If symptoms of ringworm are seen in animals, the veterinarian should be contacted immediately. Avoid direct (skin to skin) contact with infected animals or humans, sharing of clothes and contact with infected bedding, furniture, brushes etc. Keep infected dogs in hard floors and restrict the movement of dogs to rooms that are easy to clean. Cleaning and mopping with a disinfectant or vacuuming helps to eliminate contaminated hairs and skin cells that may have fallen down and this prevents the spread of ringworm. Environmental decontamination of the areas that are accessible to the infected dogs should be done daily. During the course of treatment which may last upto six weeks, it is necessary to have minimum contact with the animal.

Though ringworm infections are not life threatening, but, they may be unsightly and reinfection can occur which is the biggest risk. If not treated under the supervision of a veterinarian, the cycle of infection can perpetuate itself. Cleaning of environment and homes during and after ringworm episodes can help in the prevention of outbreaks in the future.

Ringworm lesion in dog

https://www.munch.zone/ringworm-in-dogs/

References

1. https://pets.webmd.com
2. https://www.petmd.com
3. https://vcahospitals.com
4. https://www.vetwest.com
5. www.akc.org (Anna Byrke. Ringworm in Dogs-Symptoms, Treatment, and Prevention)
6. https://canna-pet.com
7. Debnath C, Mitra T, Kumar A and Samanta I. 2016. Detection of dermatophytes in healthy companion dogs and cats in eastern India. *Iranian Journal of Veterinary Research*.17(1): 20–24

8. Jand S K and Singh K B. 1994. Veterinary Mycology. BR Publishers Ludhiana.

9. Moriello K A, Coyner K, Paterson S and Mignon B .2017. Diagnosis and treatment of dermatophytosis in dogs and cats. Clinical Consensus Guidelines of the World Association for Veterinary Dermatology. *Veterinary Dermatology.* https://doi.org/10.1111/vde.12440

10. Murmu S, Debnath C,Pramanik A. K, Mitra T, Jana S, Dey S, Banerjee S and Batabyal K. 2015. Detection and characterization of zoonotic dermatophytes from dogs and cats in and around Kolkata. *Veterinary World.* 8(9): 1078–1082.

LIVELIHOOD SECURITY OF SMALL AND MARGINAL FARMERS THROUGH SUSTAINABLE BACKYARD POULTRY FARMING

Shakti Kant Dash

Directorate Livestock Farms

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

The growth of poultry among all the species in animal husbandry sector has been phenomenal. Annual growth rate in poultry sector is 8 to 10% with the broiler sector growing at 10% and table eggs sector at 4 to 5% annually (iasri.res.in). Over the years steady growth has been seen in poultry sector and per capita availability of egg has increased from 5 eggs per annum during 1950-56 to 55 eggs in 2011-12. The per capita meat availability is 2.2 kg per head per annum against the ICMR requirement of 10.8 kg per head per annum. Poultry meat and eggs are rich sources of nutrients having high digestibility (90 to 97%). Punjab animal husbandry sector contributes about 13% of the state GDP. The present day organised poultry production is mostly private owned and it is estimated that the poultry population is about 1,60,68,790 of which around 60% are layer, 35% are broiler and 5% are backyard poultry (Statistical Abstract Punjab, 2017).

The per capita availability of eggs in Punjab is 150 per person per annum (husbandrypunjab.org) which is still lower than ICMR recommendation of 180 eggs per person per annum. The country's population by 2050 is going to be 2097 million, it is estimated that the poultry production needs to increase by 5 to 10 folds (Vision 2050, DPR). There is huge scope for improvement in poultry production in the form of rural poultry, as there is increasing demand for organic meat and brown shelled eggs from coloured broilers and layers. Various strains have been developed at poultry research institutes across the country to boost rural poultry production, raising the income and ensuring livelihood security for small marginal and landless farmers. The following are the salient features of backyard farming.

Backyard Poultry

Poultry birds which are raised with little or no input are known as back yard poultry birds. These birds meet their nutritional demands through scavenging and have good disease resistance potential. Backyard poultry varieties birds are also known as low input technology birds; indigenous breeds of poultry in the country are mostly reared under backyard system. Under the backyard poultry system depending upon the area and natural food available, the preferred flock size should be 40 birds per household.

Housing

In backyard poultry for housing the birds small low cost houses made of bricks and mud/cement, bamboo are used for housing the birds during morning and evening. During the day birds are let loose for scavenging. Wire mesh should be used in making doors to allow light and ventilation in the house. Provision of bulb 60 to 100 watts should be there for chicks and layers. 48 hours of lighting should be provided to the chicks, 10 to 12 hours for growers and 16 hours of light for adult layers. There should be provision of wooden nest or earthen vessels with paddy straw bedding for egg laying by laying birds.

Feeding management

In organised poultry the feeding cost are 65% of the total input, whereas, feeding cost are minimum under backyard poultry. Under free range management for first 10 to 15 days the chicks should be fed starter ration under confinement. Birds after 4 weeks can be let free for scavenging during morning and evening. The birds need to be initially trained foraging/scavenging during daytime to return to the nest in the evening for night shelter. The night shelter should have good ventilation and protection from predators and plenty of clean water should be made available. Stagnation of water should be prevented inside and near the sheds. Excess males can be reared and marketed for meat purpose after attaining an average mature weight of 2.5kg.

In case of grower birds, besides the feed material available in free range, natural food or greens like broken rice, germinated seeds, mulberry leaves, azolla, drumstick leaves and subabul leaves (high protein sources). The need for extra feed depends on the free range available, intensity of vegetation, availability of waste grains, insects and grass seeds. During foraging the birds can meet the protein requirement but the energy may be deficient, to overcome this cereal supplementation (rice, ragi, bazra, jowar etc) should be given. In the laying stage calcium sources like lime stone powder and stone grit can be supplement at the rate of 4 to 5 gms/bird/day.

Azolla Feeding

Awareness can be created regarding the benefits of azolla feeding. Azolla is known for its high crude protein content of 22 to 30 per cent due to nitrogen fixing bacteria *Anabaena azollae* present in its leaves. Scientific reports have indicated that poultry stocks can be raised on adlib azolla feeding and have performance near to farm standards in backyard farming. Azolla can be cultivated in village ponds or small pits near to the poultry houses.

Labour

Labour requirement in backyard poultry is met from household, no extra labour is employed in backyard poultry. Flock size should be restricted according to the labour available in the family.

Vaccination and Preventive medication

Though the backyard farmers use minimal medication in their flock however extension services should be provided for creating awareness among the farmers regarding benefits of vaccination and deworming for minimisation of loses due to mortality. The regular vaccination schedule includes Marek's disease in day old's (Sub cutaneous), F1 Ranikhet on 7th day (Nasal/ocular), Gumboro (IBD-Live) on 14th day (drinking water), Lasota 21st day (drinking water), Gumboro (IBD-Live) on 28th day (drinking water), Ranikhet (R2B) on 45th day (intra muscular), Fowl Fox on 55th day (wing web method), Ranikhet (R2B) on 112th day (intra muscular) and Gumboro (IBD-Killed) on 119th day (sub cutaneous). Deworming should be practised every three months interval and mineral-vitamin supplementation should be carried out for achieving optimum production.

Varieties to Rear in Backyard Farming

Various established strains are available for backyard farming in the country *viz*. Vanaraja, Srinidhi, Giriraja, Chabro. The chicks of broiler and layer varieties suitable for

backyard farming are available at Guru Angad Dev University hatchery. Priced at rupees 15 per chick (IBL-80, RIR, Kadaknath, Punjab Red), these varieties are known for their excellent performance in Punjab state.

The IBL-80 broiler variety attains a weight of 1500 to 1600 grams in 40 days of age under farm conditions with minimal 6 weeks mortality of less than 5 per cent. Among the layer varieties RIR and Punjab Red have reddish brown plumage and produce brown shelled eggs much to the liking of farmers. These varieties produce more than 250 eggs per annum. Kadaknath chicks are also available at university hatchery; this breed is known for its black plumage and currently very popular among indigenous breeds of the country.

Marketing

Poultry produce from backyard farming fetches higher premium round the year. The meat and eggs of the birds are considered delicacy and there is a huge demand for these organic products in the urban markets. The birds after attaining a mature weight are sold at minimum price of Rs.500 and the price of the brown shelled eggs range from 10 to 15 rupees.

Livelihood Security and Income

Backyard poultry farming serves as a tool for nutritional security and poverty alleviation and source of additional income for small marginal and landless farmers/labourers. It is a very good means of employment for women through self-help groups and other community development initiatives. The following table indicates the estimated cost and income on rearing 40 chicks of backyard poultry variety of the university. Based on the profitability the flock size can be increased on yearly basis for realising higher income;

Particulars	**Amount (Rs.)**
A. Fixed cost	
a) Land	Nil
b) Poultry Shed with lighting	Rs.8000
c) Equipments	Nil
Total fixed cost	Rs.8000
B. Variable cost	
a) Cost of day old chick 40 nos. @ Rs.15/chick	Rs.600
b) Cost of feed up to 20 days of age considering chicks consume 20 grams fed per day @ Rs.22/kg	Rs.8800
Total cost of production(A+B)	**Rs.17400**
C. Income	
a) Sale of Adult birds (considering 2% mortality) @ Rs.500 per bird	Rs.19000
b) Income from sale of egg @ annual average price of Rs.7 per egg and per bird 72 weeks egg production being 170 nos.	Rs.22610
Total Income (a+b)	Rs. 41610
Net Income (Total Income- Total cost of production)	**Rs. 24210**

SELECTION OF BREEDING STOCKS IN CAPRINE

Shahbaz Singh, Bilawal Singh, Ravdeep Singh and Harmanjeet Singh Sidhu
Department of Veterinary Gynaecology & Obstetrics
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

It is important to select and replace breed does and bucks in order to improve the productivity of goat herds. The choice of good breeding stock is an important factor and fundamental in a meat goat operation. A replacement herd sire or buckling can be selected from the contemporary at weaning (3 to 4 months of age) based on weaning weight. Subsequently, a post-weaning growth evaluation can be made by 6 to 8 months of age. At 8 months of age, a buckling can serve a small number of females in a herd. At two years of age, bucks are considered adults capable of serving a large number of does in heat.

Selection of Herd sire:

Herd sire/ buck is the most important animal in the herd. It is said that "The buck is half of the flock". The buck contributes 50 percent of the genetic makeup of every kid born and determines overall pregnancy rate of the herd. In general, a good herd sire should be selected based on structural and breeding soundness. A buck must be dominant and display mating behavior, including a good libido or sexual interest throughout the breeding season in the presence of a doe in heat to effectively present a good serving capacity. Structurally, a good buck must present male characteristics such as masculinity, adequate muscling, conformation of the head and neck, and standard buck vocalization.

a. Visual appraisal

Visual appraisal is a selection method where we visually inspect animals and judge which individuals are closest to the ideal for desired traits. While easy to use, visual apply a systematic method in evaluating and comparing characteristics of different animals. The main weakness of visual appraisal is that type and general appearance are lowly correlated with some factors that influence productivity and efficiency.

- ***General conformation:*** Good conformation is vital for goat to achieve maximum efficiency. A goat with good conformation has:
  - A wide, straight back;
  - Smooth shoulders, Fullness through the heart area;
  - A good spring of ribs; and
  - A long, well balanced body, with adequate skeletal size.

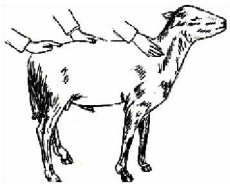


Figure 1: Check shoulder, back and loin area for covering of firm flesh; See also if the buck to be selected has bold masculine head with bright eye and correct mouth.

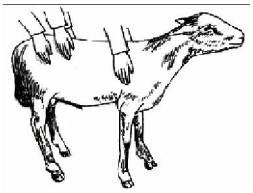


Figure 2: Check spring of rib, width of loin area and fleshing over rump

- ***Feet and legs***: - Pursue bucks with good feet and legs.
  - The legs of good looking buck should be straight and set squarely under the corners of the body.
  - The legs should not be very close at the hocks or very widely apart or bowed.
  - Strong feet and pasterns guarantee a buck to remain in the flock enabling it to have a long, productive life.
  - Hoofs should be trimmed when necessary to prevent feet and leg problems.
  - Avoid bucks with feet problems such as laminitis and arthritis, which causes pain, reduces libido, and prevents copulation.

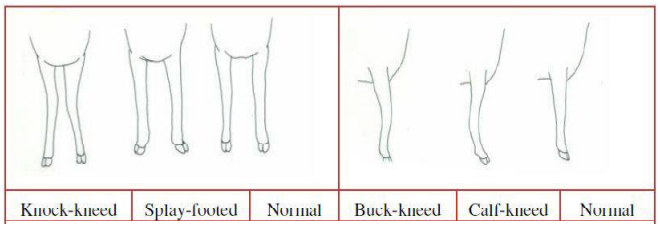


Figure 3: Front and Side view of front leg structures

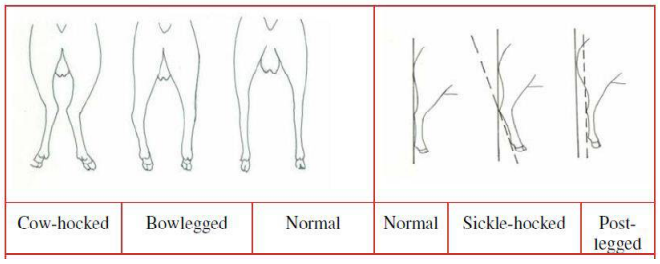


Figure 4: Rear view of knee structures

- *Mouth: -*

- Adult buck have eight incisors on the lower jaw.
- In normal, the upper dental pad and lower jaw are correctly aligned. The length of the upper and lower jaw should be equal, with the lower teeth touching the superior dental pad.
- Bucks must not present abnormality of the mouth such as an undershot or overshot jaw; should cull animal with overshot jaws or parrot mouths where the lower jaw is shorter than the upper jaw.
- Similarly, animal with undershot jaws where lower jaw is too long must also be culled from the flock.
- Young and healthy animal require less attention than old broken-mouthed ones.
- Broken-mouth refers to that have lost their incisor teeth. Mouth malformation will provoke bad bites.
- Buck will not be able to eat efficiently and this trait can be transmitted to the offspring.

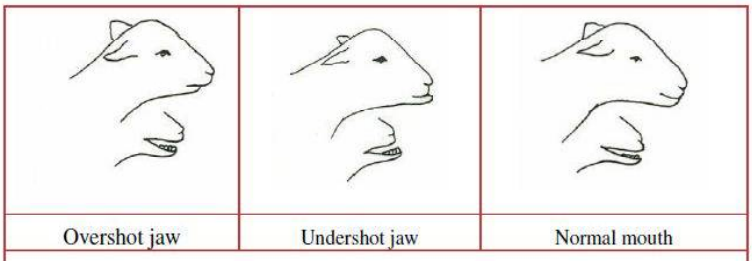


Figure 5:- Jaw structures

- ***Testicles: -***
  - A buck must first be physically examined to see if it is sound to be used as a breeding buck, including the external genitalia.
  - One important factor when evaluating a buck's breeding potential is testicle size. There is a direct correlation between testicle size and semen quality. Bucks must have two testicles in the scrotal sac.
  - The testicles should have a firm consistency, elasticity at palpation, good mobility in the scrotal sac, and be oval-shaped.
  - The scrotal circumference measured around the widest point of both testes is a good indicator of healthy scrotal size.

- Yearling should have a scrotal circumference of at least 25cm.
- The testicles should also be firm when palpated and of equal size. Testicular size is positively correlated to daily sperm production and output.

Figure 6: Buck with firm mobile testicles: Buck must present firm elastic testicles and have good mobility in the scrotal sac.

- **Semen production of the buck:**
- ***Sexual maturity and sexual behaviour:***
  - The initiation of sexual behaviour in young bucks (sniffing, flehmen, nudging, mountings) appears at variable ages, from a few weeks after birth to 1 year old. In the adult male, sexual motivation and efficiency depends directly on hormonal secretions and social events. The beginning of the sexual season is preceded by the secretion of testicular androgens (Hoffman et al., 1972), as revealed by a spectacular increase in plasma testosterone concentration (Saumande and Rouger, 1972). Triggering of the sexual act involves interaction between androgen secretion and social events, the latter being the initiator. Motivation and sexual efficiency of the buck can be modulated by competition and the dominance hierarchy within a group. The social environment has an important role in facilitating the full expression of sexual behavior in males and stimulates the production of semen. Estrous females play an important role in facilitating the expression of full sexual behavior in males (Rouger, 1974) interacting with factors such as nutrition or season (Walkden-Brown et al., 1994a).
- *Sperm production*
  - Few investigations have been carried out in the buck to assess sperm production. The evaluation of daily sperm production (DSP) per testis, varied from (2.76 to 7.23) x 10^9 spermatozoa per testis, with a slight seasonal and breed variations (Derashri et al., 1992; Walkden-Brown et al., 1994b). In mature Australian cashmere bucks the testis weight and total testicular sperm were closely associated with scrotal circumference (r=0.88 and 0.72 respectively). The scrotal circumference provided the simplest and most accurate indirect estimate of testis size and testicular sperm content.
- **Penis and Prepuce:** A buck must be dominant and display mating behavior, including a good libido or sexual interest throughout the breeding season in the presence of a

doe in heat to effectively present a good serving capacity. It's important for bucks to:

1. Present a good sense of smell
2. Structural soundness
3. Present a good erection and be able to ejaculate. Look for malformation of the penis and prepuce. Pursue the ability to produce fertile spermatozoa. It is recommended, when possible, to have fertility tests run.

- ***Age: -*** The age of a breeding buck influences the number of does he could serve at a given breeding season. The number of does to be served by a buck in a season ranges from 25 to 40 depending on his age.
- ***Muscling:*** An important consideration is adequate muscling in the loin and rump areas as these parts provide high priced carcass cuts in case of slaughtering.

b. Performance

Performance selection is based upon measurable indicators or observable responses such as growth rate measured through bodyweight from birth and at various stages of growth. The advantage of performance selection over visual appraisal is that there is less risk of subjective evaluation or guesswork as more emphasis is placed on characteristics of high economic importance. Keeping individual production records of both bucks and does will allow the producer to select and cull accurately and objectively.

c. Pedigree

Pedigree selection occurs when animals are selected along family lines, especially from sire lines. Line breeding is a modified form of inbreeding that uses pedigree selection to concentrate the genetics of a superior ancestor. However, inbreeding in any form is in general detrimental and should be avoided. The use of pedigrees in selection will enable decisions that minimize the use of bucks that are closely related or the matings of animals that are closely related.

d. Culling of Bucklings and Bucks:

Eliminate buckling from the herd that displays poor conformation such as cryptorchidism, a genetic malformation where only one or no testicles descend in the scrotum. A buckling with hypoplastia or undeveloped testicles is usually a sign of genetic abnormalities. A buck presenting testicular hypoplasia, or testicular underdevelopment, may be infertile and display an abnormal penis and prepuce. In addition, watch for orchitis, an inflammation of the testicle(s). These conditions can cause sterility or a permanent incapacity to reproduce. Bucks with a permanent incapacity to copulate or that display poor fertility must be culled.

Figure 7: Buck with Orchitis, an inflammation of the testicle.

Selection of Doelings:

Selection of Doelings in a breeding program is a multi-step process; based on breed, season of birth, and management practices. The first screening begins at weaning when the doelings are between 3 to 4 months of age. It is based on weight and development. Doelings are selected from their contemporary group in a herd and kept for further evaluation. At 6 to 8 months of age, the doeling should be re-evaluated based on their growth and development within their contemporaneous group. Only doelings that have achieved good growth and are structurally sound should be kept as replacement stock.

Further selections are made at the yearling stage when the female is ready to breed. In this stage, choice is based on cyclicity and pregnancy. Young does that do not show estrous cycles or do not become pregnant are cull candidates. The final selection is made after young does have weaned their first kids. Replacement prospects are determined according to whether the does adequately raised their kids. This practice is only valid when doelings are under the same management practice. Other traits to be considered are:

- Females must be feminine, which includes good structural conformation including good feet and legs.
- The vulva must not be infantile. A small vulva with a tuff of hair is a sign of intersexuality.
- The length of the upper jaw should be equal with the lower teeth touching the superior dental pad. Mouth malformation will provoke bad bites and will prevent the animal from eating efficiently. This trait can also be transmitted to offspring.
- Watch for a higher average daily weight gain during development in comparison to their contemporary group.

Selection of Breeding Does:

Selection of does for breeding is also very important. One should first consider the qualities that he looks for before purchasing or selecting breeding does. The maintenance of mature does in the breeding stock should be based on higher reproductive performance. Does are expected to wean kids annually. A doe should also exhibit good structure. The methods used for selecting breeding bucks stated above such as Visual appraisal,

Performance and soundness could also be used in selecting breeding does. A goat production system should rely on does with higher reproductive performance; does that can reproduce, raise, and wean the kids with lower input. The reproductive efficiency of a goat herd is determined by the kidding and weaning rates in a herd. Another important trait is the prolificacy or the ability to deliver multiple kids. Goats should have a weaning rate of 1 kid per year. A rate of 1.5 kids per year is a good herd goal, the percent herd prolificacy can be calculated by the total number of kids born over the total number of does kidded in a season X 100.

Apart from these, it is also important to consider some or all of the following 7characteristics:

- **Health:** Health in goats is shown by a general alertness and appearance. The doe to be selected must have bright eyes, smooth and shiny hair cover, sound udder and feet. Normally, a person quickly notice sick animals based on symptoms like dull appearance and paleness of skin and eyelids. In most cases, sick doe separate themselves from the rest of the flock or stand under a tree/hedge. Sick animals may also be coughing, have discharges from the eyes and nose and diarrhea.

- **Body size:** It is a well known fact that large breeds (mature live weight 70 kg and above) produce kids that grow faster and consequently reach market weight earlier than the smaller breeds (mature live weight 30 - 45 kg).

- **Udder:** A doe to be selected for breeding must have a good sized normal udder. The udder must be of good structure, not pendulous, and with good ligaments, with one functional teat on each half to facilitate nursing of the kids. The producer should turn up the doe; gently probe the udder skin to see if there are any abnormalities such as swellings and lumps. Such abnormalities indicate a previous history of mastitis or other infections. The udder skin should be soft and pliable. One should also examine the two teats to see that they are normal, free from injury and not blind. Sometimes a doe may be found with damaged teats or lost through predator bite. Having oversized teats is a cull factor.

Figure 8: Culling does: Cull does with poor conformation of the udder and teats, and/or with mastitis, an inflammation of the mammary gland that will prevent kids from milking.

- **Temperament and mothering ability:** Disposition or Temperament of does is an important characteristic considered during selection. Some breeds are difficult to handle. Other breeds are relatively docile and hardly excited when somebody walks round them. This characteristic is particularly important during kidding time. Does

with good mothering ability will suckle their kids readily and try to defend their offspring if predators or strangers approach. Poor mothers take little interest in their kids and sometimes they even abandon them.

- **Conformation and milking ability:** Some studies indicate that there is a connection between body conformation, fleshing quality, ability to fatten and milking ability. Such analogy also exist in cattle where we have beef breeds that fatten faster, yet the cows produce very little milk compared to dairy breeds such as Holstein Friesian, Jersey or others. However, the mutton breeds produce enough milk to support their offspring.
- Other valuable traits:
    - A doe must be capable of breeding with no more than two services (rate to effect a pregnancy) required to conceive in a breeding season. The does must be able to carry out a pregnancy to term.
    - She must be prolific with a history of kidding multiple births and have raised the kids up to weaning unassisted. Keep in mind that the reproductive merit of a doe cannot only be measured by the number of kids she has kidded, but by the number of heavy kids she has weaned.
    - Does must have good milk production as indicated by the weaning weight of the kids.
- **Culling of Does:**

The maintenance of poor reproductive performers will lower profitability. Following are some criteria that can be considered for culling:

1. Eliminate does with poor health and higher susceptibility to nematodes (worms) as compared to others in the herd. Also, make sure that does do not test positive for caprine arthritis encephalitis (CAE), toxoplasmosis, CL abscesses, or chronic mammary and/or uterine infections.
2. Avoid does that present frequent prolapsed uterine, or the eversion of the internal uterine layer to the outside the doe's vagina. These abnormalities may be attributed to the genetic makeup of the doe, or are common among does with a history of dystocia or difficult labor.
3. Eliminate does that have poor or lower milk production and are incapable of rearing kids to wean unassisted. Does with poor conformation of the udder and teats prevent kids from suckling adequately.
4. Cull does with poor fertility rates, such as older does that are no longer reproducing; does that fail to reproduce in a production year; or does that require several services per conception. A reproductively sound doe needs no more than two services per conception. However, if the majority of does return to heat in a breeding season, an examination of the buck's ejaculation and an evaluation of management practices

must be considered.

5. Remove does that fail to maintain adequate body condition.

Conclusion:

The selection of good breeding animals is vital for a successful goat production enterprise. Selection of superior breeding animals is the basis for goat improvement programs. Only through superior animal productivity can enterprises be sustainable and profitable. A reasonable selection program should focus on economically important traits identified to meet the goals of the enterprise. To do this, a person should select and choose breeding stock based on performance records of traits that can be readily measured and accurately evaluated.

References:

1. Derashri, H.J., Pathak, A.K., Bansal, K.K., Sharma, A.K., Verma, S.K., 1992. Reproduction in buck: 2. Daily sperm output, extra-gonadal sperm reserve, daily sperm production rate and seminiferous tubule length. In: Pre-Conference Proceeding, Abstract of Contributory papers, 5th Int. Conf. on Goats, New Delhi vol. 1 p.264.
2. Elwishy, A.B., Elsawaf, S.A., 1971. Development of sexual activity in male Damascus goats. Indian J. Anim. Sci. 5, 350–355.
3. Hoffman, B., Leidl, W., Karg, H., 1972. Seasonal rhythm of reproduction in the male goat. In: Proc. 7th Int. Cong. Anim. Reprod. A. I., Munich vol. 3 pp. 2065–2068.
4. Lall, H.K., 1947. Some common breeds of goats in India. III. Indian Farming 8, 322–327.
5. Rouger, Y., 1974. Study of the interactions of environment and sex hormones in the regulation of sexual behavior of Bovidae. Ph.D. thesis, University of Rennes, 197 pp
6. Saumande, J., Rouger, Y., 1972. Seasonal variations of androgen levels in periphtheric blood plasma in goats. C. Acad. Sci. 274, 89-92.
7. Walkden-Brown, S.W., Restall, B.J., Norton, B.W., Scaramuzzi, R.J., 1994a. The 'female effect' in Australian cashmere goats: effect of season and quality of diet on the LH and testosterone response of bucks to oestrous does. J. Reprod. Fertil. 100, 521–531.
8. Walkden-Brown, S.W., Restall, B.J., Taylor, W.A., 1994b. Testicular and epididymal sperm content in grazing cashmere bucks: seasonal variation and prediction from measurements in vivo. Reprod. Fertil. Dev. 6, 727–736.

REVISITING EMBRYO TRANSFER TECHNOLOGY TO IMPROVE INDIGENOUS CATTLE BREEDS IN INDIA

Narinder Singh, Sumit Singhal, V S Malik and Prahlad Singh

Directorate of Livestock Farms

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

Embryo transfer technology (ETT) is a important tool to improve bovine germplasm at faster rate by using the genetic contribution of the superior male and female animals at the same time. The dairy and beef industry has been benefitted by this technology by production of breeding bulls and bull mothers for their breeding programs in countries like USA and Canada. In India, the crossbreeding of indigenous cows with exotic cattle breeds known for their milk production was initiated in 1960s. However, the crossbreeding has not given the desired results, rather the crossbred cows are more sensitive to heat stress and certain diseases prevailing in tropical environment.

The global warming of the climate system is one of the major challenges which is going to have adverse effect on milk production and reproduction efficiency of dairy animals. National Dairy Development Board (NDDB) estimated that the climate change due to global warming would lead to >3 million tonnes decline in milk production per year by 2020. The milk production efficiency of crossbred cows is expected to be most affected followed by buffaloes and then indigenous cattle.

Most of the animal scientists are of opinion that the local cattle breeds should be improved and propagated at farmer level to alleviate the impact of global warming on milk production. However, the population well known Indian milch breeds like Sahiwal, Gir, and many others have got decreased drastically due to their indiscriminate use for crossbreeding with exotic cattle. Here comes the role of the reproductive biotechnique like multiple ovulation & embryo transfer (MOET) which can be used to produce embryos from elite cows and transferred to recipients of crossbred, non-descript or low potential cows/heifers of any breed to facilitate the propagation of superior indigenous cattle germplasm at faster rate.

ETT activities in India and Punjab

In India, the first ET calf in cattle and buffalo was produced at National Institute of Immunology, New Delhi and National Dairy Development Board, Anand, respectively in late 1980's. Thereafter, to improve dairy animals "National Dairy Development Board (NDDB), Anand", initiated a pilot project in 1986 and its encouraging results lead to the launching of National Science and Technology project on Cattle Herd Improvement in 1987. The project was implemented by the Department of Biotechnology (DBT), Ministry of Science and Technology, India. More than 1000 cattle and buffalo calves were produced by ETT under the aforesaid project. ETT Lab, Guru Angad Dev Veterinary & Animal Sciences University (GADVASU), Ludhiana (formerly part of PAU) was also the one of the centre to implement the project activities in the Punjab. After this project, no substantial activity or project related to the usage of ETT for breed improvement was undertaken in India.

In the year 2009 to 2012, GADVASU extended the services to farmer's doorsteps under the State sponsored ETT project "*Improvement of Dairy Animals through Embryo Transfer Technology at the Institutional farms and field conditions*". The project was a joint

venture with Department of Animal Husbandry, Punjab. The project program envisaged on identification of elite dairy cows with the progressive dairy farmers, superovulation to produce embryos and transfer of collected embryos into the recipient animals of the dairy farmers to multiply only the elite dairy cows. Under this field project, more than 136 elite donor cows were super-ovulated for production of elite embryos. Out of which, 119 (87.5%) donor cows super-ovulated responded to the super-ovulation treatment. A total of 686 embryos with an average of 5.61 ± 0.68 were collected out of which 385 (56.1 %; 3.23 ±0.68) were transferable.

Non-surgical embryo transfer was done in 144 recipients, out of which 42 got pregnant resulting pregnancy rate was 29.2% and a total of 213 transferable embryos were frozen under the project. During the implementation of the project, results indicated that to achieve the best possible results through embryo transfer, high fertility donor and recipients should be used, preferably heifers should be used as recipients (surrogate mothers) over the cows; and the heifers/cows with a history of repeat breeding should be discouraged for embryo transfer work. The developmental stage and site of embryo placement do affect the pregnancy rates and therefore due emphasis should be given to such factors while undertaking embryo transfer work in the field.

Embryo transfer in indigenous cattle

To conserve and develop indigenous cattle as commercially viable milch breeds the Government of India has initiated “Rashtriya Gokul Mission Scheme” during the 12th Five Year Plan. Under this, the scheme “National Mission on Bovine Productivity (NMBP)” has been launched to strengthen the propagation of superior indigenous cattle germplasm by using the latest reproductive biotechniques at farmer level. At National level, twelve ETT labs have been selected in the first phase to execute the project at farmer level. ETT Lab, GADVSU has been given the responsibility of propagating Sahiwal breed. Mass Embryo Transfer Programme was organized and executed for indigenous breeds under this scheme from 2nd to 10th October 2017. Under this programme, 54 recipients were transferred with fresh embryos out of which 24 got pregnant resulting in pregnancy rate of 44%. This indicated the ETT has the potential and can be applied successfully for production of superior germplasm which could be used as the seed stock for propagation of indigenous cattle breeds.

Elite Sahiwal calf produced from HF crossbred cow by ETT

Limitations of the embryo transfer technology

High cost of ETT is still the major limiting factor in harnessing the benefits of this technology. The cost of producing each progeny is several-fold higher than that from the natural process. Unavailability of disease free and high fertility donors as well recipients is hindering the application of technology at farmer level. The donor females are removed from routine breeding programme for the period they are used as embryo donors resulting in their prolonged open days and reduced overall milk production. Therefore, many a times the farmers are unwilling to spare their best animals for the ETT programme. Due to small animal holdings, the non availability of sufficient number of disease free animals at one place is another major impediment in implementing the programme. Most of the times repeat breeder cows were used as recipients and donors which is the one of the reason for lower pregnancy rate under field conditions. Seasonal variations also have adverse effects on embryo production and transfer results.

Summary

The technology is successfully used over last 3 decades for the production of breeding stocks in several western countries and even today majority of breeding bulls in the North-America are produced by this method. In spite of the proven utility, the relevance of ETT has invariably been questioned due to high cost and its success rate in India. However, even at present level of efficiency of *in vivo* embryo production and their use for the bull production, the embryo transfer technology is the ideal and the most economical and efficient method for the faster multiplication of breeding stock, especially bulls for wider dissemination of superior genetics through AI. Therefore, the farmers interested in rearing indigenous milch cattle breeds like Sahiwal and Gir, should participate in the ETT projects implemented by GADVASU and State Animal Husbandry Department to produce future breeding bulls and bull mothers. There is provision to buy back the ETT male calves born under the project, whereas, the female could be retain by the farmers which could be used as future bull mothers and will also help in increasing milk production at farmer level.

DIABETES-AN EMERGING PROBLEM IN DOGS: IT'S ALL ABOUT SUGAR

Harneet Kour, Sushma Chhabra & Ravdeep Singh

Department of Veterinary Medicine

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

Dogs are the closest companions to man because of their sophisticated social behaviour and share the same living environment as humans. Several human endocrine disorders are known to occur as similar, spontaneous endocrinopathies in companion animals also. Endrocrinopathies are an escalating global health problem both in humans as well as domestic animals that stem from imbalances in hormone levels. Diabetes mellitus (DM) is a common disorder of endocrine pancreas, with a prevalence of 0.32–1.33% affecting mostly females and middle aged (> 5 years) to geriatric dogs. The disease is characterised by hyperglycaemia and glucosuria when blood glucose concentration exceeds 180 – 220 mg/dl in dogs. Diabetes/Diabetes Mellitus is characterized by either lack of insulin, a hormone secreted by the pancreas, or an insufficient reaction to the insulin.

After each meal digestive system breaks food (carbohydrates) into glucose, transportation and uptake of which to various cells and tissues is modulated by insulin. In absence or improper response to insulin, it is very difficult for a dog to use glucose properly and so its concentration increases leading to hyperglycemia (increased blood sugar levels). Diabetes occurs in three conditions the gestational diabetes that occur during pregnancy and is rare, type I diabetes occurs due to lack of insulin production, type II diabetes is result of the body's inability to use the supplied insulin properly. There is another variant of diabetes called diabetes **Insipidus,** also known as **water diabetes**. This condition has to do with the body's inability to conserve water, and is unrelated to diabetes mellitus.

Symptoms of Diabetes in Dogs

The early symptoms that could indicate the diabetes in a dog are excessive urination (polyuria), excessive thirst (polydipsia), hunger (polyphagia), weight loss even with normal appetite, elevated blood glucose levels, glucose in the urine that has unusually sweet-smelling or fruity breath and delayed wound healing. As the disease progresses, the late signs can be loss of appetite, lethargy and depression, vomition, cataract, worsening weight loss, recurrent infections, skin problems and many more.

The following signs are common in untreated/ unresponsive dogs:

- **Polyuria** and **polydipsia** because the blood glucose concentration exceeds the renal threshold. The owner may complain of nocturia.
- **Polyphagia** in the face of **weight loss** because peripheral tissues are not able to utilise blood glucose and body reserves of carbohydrate, fat and protein are degraded to meet the metabolic energy requirement. This pair of clinical signs are sometimes romantically described as resembling 'starvation in the face of plenty'.

- **Muscle wasting** occurs in advanced cases when body protein reserves are mobilised.
- **Hepatomegaly** results from increased storage of glucose as glycogen in hepatocytes. Individual hepatocytes shown signs of hydropic change or 'cloudy swelling' as they accrue increasing amounts of glycogen.
- **Cataracts** develop as the metabolism of the lens is altered to compensate for hyperglycaemia.

Chronic or recurrent pyoderma, **urinary tract infection** or **respiratory tract infection**

If diabetes is untreated it can lead to various diabetes complications like diabetic ketoacidosis, uveitis, ketoneuria etc.

Diabetic Ketoacidosis (DKA) – is a life threatening complication of unregulated diabetes and is a metabolic acidosis caused by the breakdown of fat to ketones in the liver. As glucose and ketone bodies exceed their respective renal thresholds, the extent of the osmotic diuresis worsens causing dehydration. Electrolytes are also lost in the urine as cations (sodium, potassium and magnesium) move to balance the negative charge of the ketone bodies. Progressive dehydration leads to reduced cardiac output, tissue perfusion and renal output.

The elevated concentration of acidic ketone bodies produces a **metabolic acidosis** as the buffering capacity of the plasma is overwhelmed, a phenomenon which is exacerbated by the production of lactic acid as underperfused tissues switch to anaerobic glycolysis and by the losses of extracellular fluid in vomiting and diarrhoea. Dogs show depression, vomiting, diarrheoa, coma and death.

Causes of Diabetes in Dogs -

The underlying roots of the disease are not clear. It is believed that sedentary lifestyle and environmental factors play an important role including obesity, autoimmune disease, pancreatitis, hormone therapies, steroids and Cushing's Disease. Genetic predisposition may also play a role.

Diagnosis of Diabetes in Dogs -

Detailed medical history of dog's health leading up to the onset of symptoms and details of the exact symptoms will be taken. Standard tests will include a complete blood count, chemical profile, and urinalysis. The defining indicator of diabetes mellitus is persistent fasting hyperglycaemia with glycosuria. Single measurements demonstrating hyperglycaemia are not sufficient to make a diagnosis as transient hyperglycaemia frequently occurs after stress, eating or excitement. Urine glucose is therefore measured to confirm the diagnosis These tests should be sufficient for diagnosis and initial treatment.

Typically, with diabetes, an unusually high concentration of glucose will be found in the blood and urine. Abnormally elevated liver enzymes ALP, ALT and AST due to widespread hepatic hydropic change and because hepatomegaly may also cause slight hepatic cholestasis and electrolytes imbalances are also common. Affected animals may also have

elevated serum concentrations of triglyceride and cholesterol due to increased lipolysis Animals with DKA are often severely hyperkalaemic and it may be possible to measure serum ketone bodies. In severe cases, urine test results may also show evidence of abnormally high levels of ketone bodies — water-soluble compounds produced as a by-product of fatty acid metabolism in the liver and kidney. A numbers of other abnormalities may also be found.

Radiographic studies, including x-rays and ultrasonography, can be helpful for the diagnosis of concurrent diseases and complications due to diabetes. Abdominal X-rays and ultrasound will help to determine the presence of kidney stones and/or inflammation of the pancreas and liver as well as other associated abnormalities. Fructosamine, glycosylated haemoglobin, electrocardiogram can also be estimated.

Treatment of Canine Diabetes -

Treatment is generally based on supplementing insulin and making alterations to the management of the animal that result in stabilisation of the disease. A dog that's extremely ill may need to be hospitalized to return its blood sugar levels to normal. Animals with DKA require immediate stabilisation and intensive monitoring. A less severely affected dog may just need a change in diet and lifestyle. Since diabetic dog's pancreas is incapable of providing insulin, injections will take the place of natural production.

Insulin

Recombinant insulin is available in a variety of different preparations. NPH insulin is Intermediate-acting and administered subcutaneously twice a day. Lente insulin (a zinc salt preparation) is used most commonly in dogs and it may be given once or twice per day.

Individual insulin requirements will vary from dog to dog, so the proper dosage should be established. Once that's established, an owner can learn how to administer the injections subcutaneously himself. In the case of female dogs, spaying will prevent the periodic surges of hormones associated with fertility that can impact blood sugar levels.

Stabilisation

Animals presenting with DKA often collapsed, comatose and severely dehydrated. Stabilisation would involve the following aspects of care:

- **Intra-venous fluid therapy** with a suitable product. The priorities of fluid therapy are to hydrate the animal and prevent further damage due to poor tissue perfusion and to provide sodium which will have been lost with the osmotic diuresis. With the latter aim in mind, 0.9% sodium chloride solution is recommended. Fluid deficits should be replaced over 24 hours and fluids should not be infused at rates much above twice maintenance to prevent cerebral oedema for occurring due to rapid alterations in electrolyte concentrations. It would also be advisable to measure serum electrolyte concentrations regularly to prevent this effect from occurring.
- **Insulin** should be provided to reverse the metabolic changes that have resulted in the crisis. Since the administration of insulin may also have marked consequences

for electrolyte status, it is best to administer it gradually as an infusion of soluble insulin. The insulin solution like regular insulin. Blood glucose concentration should be measured regularly. Alternatively, intermittent injections of insulin may be used at hourly intervals while also measuring the blood glucose concentration.

- It is important that insulin is not administered too quickly because it causes both potassium and phosphate to move intracellularly with glucose. This can result in rebound hypoglycaemia, hypokalaemia, hypophosphataemia and hypomagnesaemia because the total body levels of these cations will probably have been reduced by the enforced osmotic diuresis). Severe hypophosphataemia may result in the development of haemolytic anaemia. Potassium may need to be supplemented from the outset and the rate at which insulin is administered should be reduced if the animal is hypokalaemic on presentation. Other electrolytes should only be supplemented after their serum levels have been measured.

- **Infections** occur frequently, either as a cause or effect of DKA. Broad spectrum bactericidal antibiotics are generally recommended in all cases.\

- **Bicarbonate** therapy is recommended to treat the metabolic acidosis encountered in DKA. Opinions differ as to the use of this drug and many claim that restoration of renal function will result in stabilisation of the acidosis. In any case, bicarbonate should be used with care as it may cause rebound metabolic alkalosis, paradoxical cerebral acidosis and tissue hypoxia due to a left shift of the haemoglobin-oxygen dissociation curve. Paradoxical cerebral acidosis occurs because only carbon dioxide (not bicarbonate) is able to cross the blood brain barrier.

If the animal had previously been receiving insulin therapy, the cause of the instability should be identified and managed.

Monitoring Canine Diabetes at Home-

Developing a routine of feeding and medicating is an essential part of caring for a diabetic dog. By timing the influx of nutrients to coincide with the increased insulin levels, you will reduce the risk of blood sugar levels spiking, or dropping off dramatically. A high-fibre, low-fat, dry dog food is generally recommended . Be sure to minimize or eliminate sugary treats between meals to help prevent an increase in sugar levels when there's less insulin present. Daily exercise is an important part of any dog's life, and it's even more important to a diabetic dog. Exercise helps keep weight at a healthy level, and reduces blood sugar. As with feeding and medicating, sticking to a schedule will prevent sudden changes (a drop, in the case of exercise) in blood sugar levels. Maintaining a daily log may be useful to you for keeping track of diet, exercise, behavior patterns (confusion, weakness, lethargy, etc.), and physical attributes (swelling, skin and fur condition, weight gain or loss, etc.), and associating them with your diabetes management program.

What Happens if Diabetes Goes Untreated?

Though diabetes can be managed, make no mistake, this is a very serious disease. Other health problems may follow as a result of diabetes including severe dehydration, blindness due to cataracts, and muscle breakdown.

In the long term, untreated diabetes will likely be fatal.

Diet

The diet fed to diabetic animals should be **consistent** and, at least initially, it should have a good caloric density to allow animals to regain weight. If the animal is obese at presentation, a program of controlled weight loss should be instituted so that insulin resistance is also minimised. The diet should be **low in simple carbohydrates** which may induce the secretion of glucagon and other hormones antagonistic to insulin. A **constant feeding schedule** should be maintained, with the animal usually being fed twice per day at the same times.

It has been shown that a higher dietary **fibre** content can help to achieve better stabilisation in cases of diabetes mellitus because this substrate forms a viscous gel in the intestine that slows the absorption of glucose. This effect is greatest with soluble fibre but soluble/insoluble fibre mixes are often suitable.

Management of a diabetic dog

All diabetic patients need proper aftercare and medication to keep their blood sugar levels at the optimum level.

1. Always give insulin shots to diabetic dog in time

2. Feed your dog regularly

3. Always feed your dog the right and fibre enriched diet

4. Exercise regularly with your dog

5. Have a regular schedule for check-ups of the blood-sugar levels in your dog

6. Always consult veterinarian if ssuspect anything abnormal

As there is no permanent cure for diabetes, one must take care to provide the right care for the diabetic dog.

COMMUNICATION APPROACHES FOR RURAL WOMEN

Sumanpreet Kaur and Jaswinder Singh

Department of Veterinary and Animal Husbandry Extension Education

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141004

Rural communication is an interactive process in which information, knowledge and skills, relevant for development are exchanged between farmers, extension/advisory services, information providers and research either personally or through media such as radio, print and more recently the new "Information and Communication Technologies" (ICTs). In this process all actors may be innovators, intermediaries and receivers of information and knowledge. The aim is to put rural people in a position to have the necessary information for informed decision-making and the relevant skills to improve their livelihoods. Communication in this context is therefore a non-linear process with the content of data or information.

Why a Focus on Women?

The role of women in agriculture and in rural development is increasingly recognized both at international and national level. There is a growing awareness of the need to reach women farmers and to fully involve them in development programmes. However, extension services still face difficulties in effectively communicating and working with women. Among the reasons for this is the lack of adequate training material addressing the issue of working with rural women. Attempts to transfer skills from research stations to community were first attributed to poor farming practices (FAO 2009), it has been realized the problem is with the technology and the priorities and processes which generate it (Chambers *et al,* 1989). Moreover rural farming communities' participation can contribute to the better understanding of agricultural needs.

Awareness of the need for specific training material on the issue is the first step. However, while much existing literature on extension mentions the need for such information on how to work with rural women, very rarely are any specific examples or information given on how this can be done.

Objective

The overall objective is to assist field extension workers in working more effectively with women farmers. In particular, aim is to provide training materials and information that could enhance field workers capabilities to:

- identify needs, priorities, constraints and opportunities heed by rural women;
- ensure that extension packages meet specific gender requirements;
- contact and communicate effectively with rural women.

EXTENSION NEEDS RELATED TO FARM WOMEN

Randhawa and Chandra (1993) identified some key issues related to farm women.

These are:

1) The Extension Service should be gender sensitive so that farm women have full and appropriate areas to meetings, demonstrations, field days, and other activities that can increase their farm production and income

2) Informal communication networks and channels are frequently gender specific. Therefore, extension personnel need to learn how to use these traditional networks more effectively to disseminate improved technology to women farmers

3) In some cases, it may be necessary to organize women into functional groups to increase their access to credit, inputs, and even marketing services

4) Extension system will be required to extension training materials that are gender-sensitive and appropriate for farm women

5) More attention need to be given to the employment of women in all aspects agricultural extension services

6) Mainly two types of training may be organized for farm women for effective and efficient utilization of their potentiality. These are: training in latest advances in agriculture and training in leadership to motivate them to play an effective role as change agent

WOMEN'S COMMUNICATION NEEDS

Participatory audience research is an essential prerequisite for the planning of successful communication strategies, the selection of appropriate media and the design of creative messages. In developing countries, the communication requirements of women in rural areas are different from those of women and men in urban centres and developed countries. Rural women do not have equal access to information, for reasons such as their restricted mobility outside the home, lack of education and, in some cases, men's control over information and media. Development communicators may need to "repackage" information in forms that are comprehensible to illiterate women, adapting it to their understanding and perception of messages.Special attention should be paid to selecting the communication channels that are most appropriate for women and to producing materials in local languages. Because women are involved in many aspects of rural life, their traditional knowledge systems are complex and holistic. Consequently, communication programmes must deal with the various economic and social issues affecting women, including agriculture, habitat, health, nutrition, family planning, population growth, the environment and education and illiteracy.

PARTICIPATORY RURAL COMMUNICATION APPRAISAL

INVOLVING RURAL WOMEN IN DEVELOPMENT: PRCA has been used effectively to promote the involvement of rural women in decisions that affect their livelihood. Perceptions and local knowledge play a key role in development, hence the need for a communication approach that ensures the problems to be resolved are perceived in the same way by the distinct groups concerned (women, men, elders, youth) as well as by the development agents working with them. Unearthing women's perceptions and local knowledge can be

difficult, however, because rural women often hide their true feelings and information from outsiders. To overcome this, PRCA uses visual methods and group facilitation techniques for generating, analysing and presenting information that helps to reveal the "visions and voices" of women. Through PRCA, development efforts can be firmly rooted in women's realities and thus be more responsive to their needs, aspirations, abilities and knowledge.

Communication approaches

Mixed Groups: When speaking to a mixed group, extension workers must take special care to address women as well as men. This includes covering issues and problems relevant to both, as well as referring to both men and women during the talk. In strongly male dominated societies, women invited to a mixed group meeting often tend to sit at the back. In this case, the extension worker should ensure they are able to hear properly and can see whatever might be shown. When cultural reasons would make women uncomfortable to sit at the front, the extension officer should try to find other ways to ensure their participation. Examples could include asking them to sit on the side, or the extension officer could walk around the audience while talking.

Group Discussions: Whether to hold discussions with women-only groups or with mixed groups will depend on the community situation.

When mixed group discussion is acceptable, it can be very beneficial for both men and women. Extension workers will need to help create the conditions for the participation of rural women in mixed groups.

The meetings must, for instance, be held in locations that are accessible to women and at times that do not conflict with their farm domestic tasks. During the meeting they should ensure that the women are seated where they can participate fully. Extension workers may have to encourage and provide opportunities for women to speak up and try to avoid allowing the discussion to become male dominated. Another way to encourage greater participation of women is to break the large group into small groups, either groups of all men and all women or smaller mixed groups. The small groups may then come together to present the results of their discussions in the larger group.

Media and Materials: When developing extension materials for rural women, extension workers should keep in consideration their usually lower level of literacy. The same principles that would be used in developing media for illiterate male farmers would then apply. When literacy levels are low, printed material is normally of limited use and visual representations of the concepts explained, such as drawings, photographs or objects, are preferred. However, when using visual representations, it is important that the materials are pre-tested with the target audience, since picture recognition varies not only with literacy but also with culture. It is very common for pictures to be misunderstood, even to the extent of the opposite message being received from that intended.

Radio is frequently used in rural areas and can be a good means to bring information to rural women. It has proved to be very helpful in reaching women who have little opportunity to participate in other extension activities. Programmes should be broadcast at times when it is possible for women to listen to them, and the content of the programmes should be relevant to women's agricultural tasks.

In some places, radios are owned by men, and women may not have easy access to them. If this is the case, the extension worker may be able to improve women's access to the radio. Examples of ideas used in the past are:

- Discussing the problem at a community meeting, to identify ways around the problem;
- Finding out if the programmes are broadcast at times when women can gather around a radio as a group, (e.g. when they are engaged in routine household tasks such as food processing or washing clothes) so that one radio would be enough to reach several women. (If not, the extension worker may be able to bring this issue up with the broadcasters and investigate if it is possible to change the time of broadcasting);
- Taping the programme and playing it back on a cassette recorder at a time when women are gathered together for carrying out some daily routine tasks;
- Suggesting women's groups save sufficient funds to buy a radio for their group.

A general principle to keep in mind while choosing media to communicate with rural women is that media are more effective when the audience feel part of it. Many audiovisual communications assume that farmers are male and are often directed to a male audience. Use of such media can be ineffective with women since they do not feel any direct involvement. This can also happen if the media was developed using women as the main characters who look different from those in the local area (from an urban area or from a different area). If local women cannot identify with them, they may not be receptive to the message.

Traditional Media: One type of communication which is often very effective with rural women is traditional media, such as songs, dances and drama. These approaches have been used successfully to involve women farmers in expressing their problems and needs in a number of areas. Traditional media, such as songs with accompanying actions, are popular. For example in Southern India, songs have successfully been used to communicate extension messages addressed to rural women in nutrition, health and post-harvest operations.

Demonstrations: If men and women work with different crops or livestock or handle different tasks, demonstrations aimed at mixed groups or at women alone need to cover aspects relevant to the work of women. When the tasks are well defined and there is a clear gender separation, it might be better to hold separate demonstrations for women.

To be useful for women, demonstrations should contain information relevant to women and be held in a context with which they are familiar. If they are used to farming small intercropped plots of food crops, a demonstration held on a big farm, showing single cropped cash crops will be of very little interest or use to them. When selecting the sites for demonstrations aimed at women farmers, it is a normally a good practice to include a typical local farm under a woman's management, which reflects cropping patterns and problems faced by most of the local women farmers.

If demonstration plots are used, these should be located near to where women carry out their work. A good location is along a path well-travelled by women, las in the Small Plot Adoption Technique (SPAT) used in Nigeria (see Module 3).

Excursions and Tours: Experience shows that it can be particularly stimulating for women farmers to meet and discuss common problems with other women farmers and to learn from each other experiences. For rural women who have little opportunity to travel, the enjoyment of going on a tour also stimulates participation and enthusiasm for extension activities. Nearby communities will, however, often be more suitable due to the practical obstacles of time and travel which would normally limit women's participation.

Field Days: Since field days are all day events, arrangements for child care are needed to enable women to give their full attention to demonstrations. When cultural reasons prevent women from taking part in activities outside the community, the possibility of having a local leader, or a person trusted by the community, to accompany the group can be considered.

Women in Mixed Groups: Ask participants to discuss, in small groups, how women's participation in a mixed group can be enhanced. Aspects to be analysed include all mixed group extension activities. Invite one group to present the results of their discussion to the class and develop the topic from their presentations.Ask participants to analyse, in small groups, one of the following topics. At the end of the small group activity, invite the groups to present the results of their discussion to the class.

1) Traditional media -Ask them to analyse traditional media in their areas and to discuss the possible uses of these media for extension.

2) Constraints on use of other media - Ask them to list extension media with which they are familiar and to discuss the following questions:

    - What restrictions might there be to women's access to these media in their areas?
    - How could the restrictions be overcome?

3) Full day extension activities -Ask them to mention any particular constraints they noticed in their area, which prevent women from participating in filed days, tours and training courses. Hold a general discussion on the issues that emerge, and help participants explore possible ways to overcome them.

4) Constraints on use of other extension activities - Ask them to list extension methods with which they are familiar and to discuss the following questions:

    - What restrictions might there be to women's participation in these extension activities in their areas?
    - How could the restrictions be overcome?

Television: With increasing urbanization, television can be an important means to reach women audiences who have come to the city from rural areas.

Audio-visual media: Low-cost audio and visual media, such as video, slide sets, filmstrips, audiocassettes and flipcharts, are valuable tools to motivate and assist in training groups. These technologies have been improving and developing over the years, and equipment is now cheaper, lighter, battery-operated and portable, thus making it suitable for use with women in rural areas. Audiovisual media can be used with women effectively at convenient

times and places: women farmers do not have the time or money to travel to training centres and, for cultural reasons, often cannot attend training sessions with men.Audiovisual training materials can be brought to women in their villages and shown to them in the hours in which they are free from their tasks of caring for the home, producing food or earning income. When this is not possible, special arrangements can be made to enable women to attend training sessions with men.

Video can also be extensively and increasingly used to improve rural extension and training.

"What I hear I forget.

What I see I remember.

What I do I learn."

Rapid developments in small-format video technology have meant that the means of production of video programmes can be put in the hands of the communities themselves, enabling rural women, with some basic training, to articulate their own needs and tell their own stories. Participatory video is an approach that develops participants' abilities by teaching them to use video equipment to record problems around them as well as to identify solutions. The use of participatory video offers a valuable tool to those working for local empowerment and social change. Communication skills are linked to leadership skills, and experience has shown that women who acquire communication and facilitation skills through their work with participatory video become stronger leaders and organizers.The benefits of participatory video go well beyond the actual tapes and access to the technology. When women learn to make a meaningful and compelling video programme, when they master a new tool, or when they facilitate a lively group discussion after viewing a video programme, they develop communication skills that increase their standing in the community and in their organizations.

In Ahmedabad, India, the Self-Employed Women's Association (SEWA) has been training poor and illiterate women in the production and use of video as a tool for empowerment. As a means of documenting the issues affecting women and highlighting their concerns, video is an integral component of SEWA's activities. Video programmes produced by rural women associated with the group have been used for income generation, occupational health, wage negotiations, legal interventions, teaching new skills and advocating policy change.Video is an important tool for enlightening decision-makers on the concerns of rural women and the critical problems they face. Experience has confirmed that video boosts self-confidence and encourages self-development. Rural women are seldom asked for their opinions or knowledge on a particular subject. Yet, when they see themselves demonstrating a technique or expressing an opinion on a video monitor, and realize that influential people will see and hear what they have to say, they become more confident and assertive about sharing their views and knowledge with others.

TRADITIONAL MEDIA

For generations, rural populations living in isolated villages without access to modern means of communication have relied on the spoken word and traditional forms of communication as a means of sharing knowledge and information and providing

entertainment.For illiterate rural women in particular, occasions for information exchange have consisted solely in local festivities, family gatherings, traditional and religious associations, interaction with itinerant merchants and encounters at marketplaces or water wells. However, women have made use of the oral tradition to ensure their own as well as their families' survival and, as a result, have developed a rich communication environment. They have lived creative lives, transmitting culture, knowledge, customs and history through traditional forms of communication such as poetry, proverbs, songs, stories, dances and plays. Within their communities, women are active participants in social communication networks. They use indigenous communication methods for information exchange, knowledge sharing and the dissemination of strategies for mutual assistance and survival.Traditional forms of communication can also be integrated with other media such as radio, television, video and audiocassettes.

MULTIMEDIA

Communication programmes should make use of all media infrastructures and channels available in a country, both modern and traditional, in an orchestrated and mutually reinforcing fashion. The combination of several media approaches and tools with interpersonal channels multiplies the impact of communication campaigns, which are being used increasingly to support clearly defined development priorities. Multichannel communication approaches can also help in identifying appropriate agricultural technologies for women as well as in disseminating the required knowledge and skills. Audiovisual materials such as slides and video can assist extension workers. Women trainees, even if they are illiterate, can see and discuss innovations before putting them into practice.

IMPROVING WOMEN'S ACCESS TO NEW TECHNOLOGIES

With the advent of the global information society, new communication technologies are increasingly being adopted as effective tools for reaching rural audiences. Yet the benefits of the information revolution are still much debated, particularly in the case of the developing countries. There is serious concern that the gap between the information "haves and have-nots" will continue to grow. The situation is even more serious for remote rural communities where basic communications infrastructure, such as newspapers, television, radio and telephones, is lacking. If the benefits of new technologies are to reach rural areas in developing countries, it is essential not only to increase rural populations' access to these technologies, but also to disseminate information in local languages and ensure that it is relevant to local development needs. Included in this challenge is the task of making the new communication technologies available to rural women and providing the skills and tools necessary for them to express their opinions and produce their own information.

However, through the Internet and electronic mail, it is possible to connect with local intermediary organizations, such as extension services, health centers, training institutions, local NGOs, farmers' associations and women's organizations which, in turn, can share information with rural people through traditional communication channels. International development agencies and national development partners are already experimenting with new information technologies and electronic communication networks for rural development, concentrating on how to make them more accessible to rural populations and thus bridging the "last mile of connectivity".

Experience gained so far confirms that new information technologies can be successfully applied in rural areas of developing countries provided that:

- They are adapted to conditions in rural areas;
- There is full user participation, in terms of identifying information needs;
- Local staff are trained in their use; and
- They can be complemented by traditional media for the benefit of rural audiences that are unable to access them.

WOMEN'S ACCESS TO THE INTERNET

Exclusivity in access to the Internet has led many to brand it as yet another technology that is available only to the wealthy and powerful élite in developing countries. The true picture is more complex, however, and despite its limited access, the Internet is making an impact.One consistent criticism centres on men's predominant use of the Internet. Access to information means access to power, and most societies continue to exclude women from both. Estimates suggest that the global Internet gender ratio has remained static for a number of years, with about 63 percent of users being men and 37 percent women. Less optimistic is the claim, made by the Association for Progressive Communications, that "male domination of computer networks" is as high as 95 percent. Technology per se does not solve economic problems, but availability of ICT will have a significant impact on rural development in developing countries.Digital ICTs such as Internet and mobile phone may spur development and empower communities in rural areas Joseph *et al* (2006,2007, 2009)

ELECTRONIC NETWORKING FOR WOMEN'S EMPOWERMENT

Today, the Internet's World Wide Web and electronic mail systems comprise a global "people's network" for communicating and sharing information. Women's groups and associations in developing countries are exploring the challenges and possibilities unfolded by Internet applications and are beginning to invest in the use of these tools for promoting their interests. For example, in societies that have a long tradition of women traders, new information technology offers women improved scope for business ventures as well as the opportunity to collect and disseminate information within and beyond their national boundaries. In Ghana, communication centers with fax, telephone, copy machine and computer services have been operating since 1992. These centers are owned almost exclusively by women and serve many women clients.

Communication through e-mail networks helps reduce the isolation of women and offers opportunities to overcome many of the constraints that limit their capacity to address national and local development issues. Communicating with the international community as well as with each other, rural women's groups can gain access to information about best practices, appropriate technologies, ideas and problems of other groups with similar interests. Despite the greater access that women's groups and associations now have to new information technologies, they are still underrepresented on most networks. Entering the new electronic frontier of cyberspace remains a challenge to most women of the world, not to mention rural

women.

The problems faced by women users include:

- The cost of access and lack of infrastructure, especially in the poorest areas;
- A lack of education in regions where women have limited access to schooling;
- Insufficient women's training programmes covering the basic skills needed to master computer technology;
- Language barriers - most of the networks are in English or French, which means that women's groups that act as information brokers for rural communities need to translate information into local languages.

RURAL TELECENTRES

Rural community telecentres are part of another approach being used by development agencies and their partners to extend access to the Internet, bringing it closer to rural communities and the intermediary organizations that provide services to these communities. Telecentres are shared information and communication facilities that provide communities with telephone, fax and Internet services as well as access to equipment such as cassette and video players, photocopiers and computers.

Telecentres can be used by training institutes to obtain distance learning materials for supplementing courses offered locally for girls. They can also be used by communities to share information with other communities. For example, locally developed solutions for agricultural problems can be announced and shared with other communities with similar problems and agro-ecological conditions. Furthermore, linking telecentre facilities with other media can increase the local impact of such centers, exchanging information with rural people who cannot access their services. If local radio stations broadcast information collected on the Internet, for instance, rural women who are unable to use the services of a telecentre may still benefit from the information made available through this electronic channel.

Communication through e-mail networks helps reduce the isolation of women and offers opportunities to overcome many of the constraints that limit women's capacity to address national and local development issues

Challenges to Rural Women Communication

The situation concerning communication in rural areas of developing countries is characterized by:

1. A dearth of information (absence of providers and of local communication content);
2. Conflicting messages (difficult to know what is relevant/correct information);
3. A fragmented market for information with many individual clients or client groups;
4. Relatively few clients scattered over a large area;
5. Structural transformations leading to constantly changing channels and content

and a lack of the necessary skills for communication; and

6. A lack of well-developed ICT infrastructure and low levels of ICT skills

References

FAO (2009, Nov 18), "New Approaches to participation in fisheries research", [Online]. Available: http://www.fao.org/docrep/007/y1127e/y1127e04.htm

M. K. Joseph and T. N. Andrew, 2006. "An Overview of Information and Communication Technology (ICT) Initiatives in Rural Africa Towards Empowerment", IST-Africa 2006 Conference Proceedings, Paul Cunningham and Miriam Cunningham (Eds). IIMC International Information Management Corporation, South Africa, 2006, ISBN: 1-905824-01-7

M. K. Joseph and T. N. Andrew, 2007, "Convergence opportunities and factors influencing the use of internet and telephony by rural women in South Africa and India towards empowerment"; IF1P - International Federation for Information Processing, Volume 241, Home Informatics and Telematics: ICT for the Next Billion, eds. Venkatesh, A., Gonsalves, T.. Monk, A., Buckner, K., (Boston: Springer), pp. 1–20. ISBN: 978-0-387-73696-9 (Proceedings of IFIP TC 9, WG 9.3 HOIT 2007, IIT, Chennai, India; [Online]. Available: http://www.springerlink.com/content/13p24x38727105q4/

M. K. Joseph and T. N. Andrew, 2009. "Information and Communication Technology policy imperatives for rural women empowerment : focus on South Africa", Proceedings of IEEE Africon 09, Kenya, Sep 2009, IEEE ISBN 978-1-4244-3919-5

R.Chambers, A. Pacey and L.A. Thrupp (1989). "Farmer First: Farmer Innovation and Agricultural Research". Intermediate Technology Publications, London.

Randhawa, A., & Chandra, S. (1993). Changing role of home science scientists in transferring farm technologies to farm women in agriculture. In *national seminar on 'Women in agriculture-development issues' at NAARM*.

NEW GUIDELINES FOR VET ALUMNUS

Dear authors from December 2018 onward , Vet Alumnus – the official organ of Alumni Association, College of Veterinary Science, GADVASU, Ludhiana will be published on the pattern of research journal" Vet Alumnus will be published biannual i.e. June and December of every year.

Types of paper :

Papers on original research , short research notes ,descriptions of new material or improved techniques, with supporting data. critical research review, clinical reports, technical articles, conference report, book review etc will be considered for publication.

Guideline for authors

Manuscript:

- THE TITLE should be short, specific and informative, written in capital letter
- The BYLINE should contain names and initials of the authors, affiliation / the place where research was conducted.
- The ABSTRACT: should be precise not more than 250 words and must comprise of objective, methodology and conclusion .
- Include 3-5 Key words, written in alphabetical order.
- Body of article must comprise of brief INTRODUCTION, METHODOLOGY, RESULTS and DISCUSSION.
- All figures/table must be well labled, titled and quoted at appropriate place in the text.
- REFERENCES: List all the references in alphabetical order, giving all authors with initials after respective surname, year of publication, full title of paper, name of journal in full (italic), volume, preferably the issue within parentheses and complete page range.
- Example: Leishangthem, G. D., Singh, N. K., Singh, N. D., Filia, G., & Singh, A. (2018). Cell free mitochondrial DNA in serum and milk associated with bovine mastitis: a pilot study. *Veterinary research communications* 25(2): 1-8.
- Papers should be TYPE WRITIEN, and double spaced throughout (including references and tables) on A4 size with a 5 cm margin at the top, bottom and left and right hand side. Article (including illustrations) should be sent in electronic form after a thorough check up of typographical mistakes.
- Well written and structured article as per above guidelines can be submitted to Chief Editor Dr VK Gandotra on emai:vetalumnusldh@gmail.com
- Authors shall be sole responsible for the content of the article.
- The published vet alumnus shall be made available on www.gadvasu.in and all the articles will have open access.

Printed and Published for and on behalf of the Alumni Association of the College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana for private circulation and printed at SOMALIA PRINTERS, Ludhiana, Tel: 093169-14892, 82830-44892, Email: somaliaprinters@gmail.com, sharmark.25471@gmail.com.