Lecture 10

INTRODUCTION TO ANIMAL PHYSIOLOGY

The most important livestock products originate from physiological processes. These include meat, milk and eggs. For an animal to be productive, it must first be alive and healthy. The various physiological systems ensuring normal functioning of an animal include the Respiratory, Circulatory, Nervous, Endocrine, Reproductive, Digestive and Excretory Systems.

Animal physiology and meat production

- Growth
- Muscle development
- Fat deposition

Connective tissue development is influenced by factors such as:

- Species
- Sex
- Nutrition
- Age

Growth is a characteristic of living things and can be defined as an increase in body size or mass of part or all of the body over a specific period of time. Growth results from any or all of the following processes:

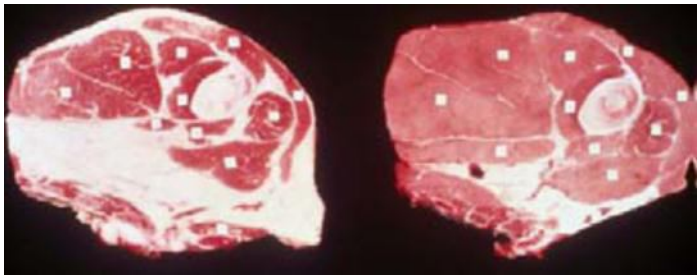
- Increase in body weight till mature size is reached
- Increase in cell number and size accompanied by protein deposition
- Increase in structural tissues and organs. Structural tissues include Bone, Muscle and other connective tissues such as fat, tendons, etc.

Development often accompanies growth as cells and tissues become differentiated, increasing in complexity. Development involves the directive coordination of all diverse processes until maturity is reached. It involves:

- Growth
- Cellular differentiation
- Changes in body shape and form

Meat is derived principally from muscle, fat and connective tissue. The major component of muscle is protein, formed in the cells of the body in processes involving formation of messenger-RNA in the nucleus (Transcription) and protein synthesis in the cytoplasm (Translation).

Meat



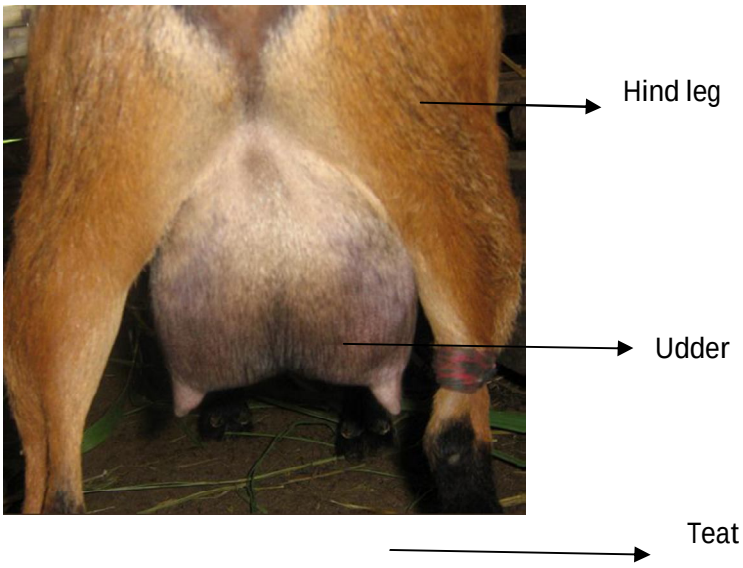
Animal physiology and milk production

Mammary gland development and growth
Udder size and milk production
Influencing factors

- Stage of lactation
- Parity
- Feeding frequency
- Milking frequency

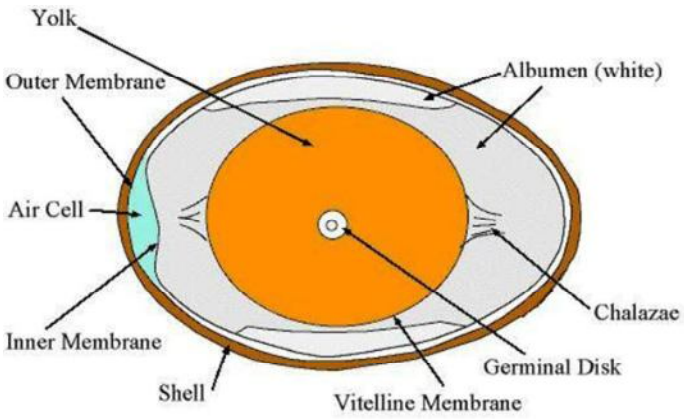
Female mammals produce milk after parturition for nurture of their young. Milk is produced in the mammary gland known as the **udder** in Cattle, Sheep and Goats.

Mammary gland (Udder) of a Goat



Animal physiology and egg production

The chicken egg is one of the most complete foods available to man. It is well packaged (in a shell) and contains protein, fat, minerals and other nutrients in proportions needed. A good understanding of the physiology of chicken egg production helps the farmer to maximise profit.



Structure of chicken egg

Animal physiology and artificial insemination

Definition and utility

Artificial insemination, or AI for short, is the introduction of spermatozoa into the female reproductive tract around the time of oestrus for the purpose of achieving conception. AI is one of the most powerful tools developed in the twentieth century for the genetic improvement of livestock. It enables the application of high selection pressure on the male side thereby substantially increasing the rate of genetic progress per year.

Artificial insemination involves the following processes:

Semen collection → Semen evaluation → Semen processing → Semen storage → Insemination

Semen preservation and storage

- Fresh, diluted semen
- Ambient storage, 25-30oC
- Chilled storage, 5oC
- Deep-frozen storage, -196oC

Artificial vagina for bull semen collection

Animal physiology and embryo transfer

Definition and utility

Embryo transfer (ET) is an applied reproductive physiology procedure for obtaining several offspring from a highly valued dam using other females as surrogate dams. It is a technique that enables high selection pressure to be applied on the female side.

The processes involved in ET are:

Super ovulation → Mating or AI → Embryo recovery → Embryo transfer

- Super-ovulation, mating or AI
- Embryo recovery, embryo transfer

Animal physiology and controlled breeding

Definition and utility

Controlled breeding is the manipulation of the female reproductive cycle to suit Management objectives. It involves the following processes:

- Separation of sexes, oestrus detection, oestrus synchronization, AI, ET, Pregnancy diagnosis

Animal physiology and artificial insemination

Definition and utility

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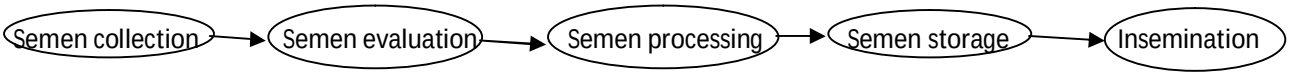
livestock. It enables the application of high selection pressure on the male side thereby substantially increasing the rate of genetic progress per year.
Insemination involves the following processes:



- Semen preservation and storage
  - Fresh, diluted semen
  - Ambient storage, 25-30oC
  - Chilled storage, 5oC
  - Deep-frozen storage, -196oC

Equipment used for Artificial insemination

Cattle artificial vagina (AV)

Rubber liner for cattle AV

Cone for cattle AV

Ram/Buck AV

MARKING HARNESSES

Introduction

Oestrus or “heat” is a period during the reproductive cycle when female animals become sexually receptive, signalling they are ready for mating. In most cases, this can also be referred to as “standing heat” because the female will stand to be mated by the male. Oestrus is caused by oestrogen being produced within developing follicles in the ovary, and ovulation usually occurs after the initial signs of oestrus are detected.

Duration of oestrus and the time of ovulation in relationship to the onset of oestrus vary with the species. If behavioural or physical signs are not obvious, oestrus may even pass unnoticed. Successful recognition of the signs of oestrus for mating, just prior to the time of ovulation, can result in increased conception rates for the herd or flock.

Detection Aids

Apart from personal observations and sound record keeping, there are various methods used to detect oestrus in the herd. Marker animals can be used for oestrus detection and there are different marking devices that can also be used. Marker animals are usually males that have been altered in some way, so they cannot mate, but they still have the desire to mate, resulting in a visual mark from the marking device left on the female in oestrus.

Teaser animals are another detection aid, involving surgical alteration of the male, causing them to be sterile. The most common surgical method is a vasectomy, involving the removal of a section of the vas deferens thereby preventing sperm passage. Others include: pressure-sensitive heat-mount detectors such as KaMar® heat detectors and Chin-ball marking harness in bulls. In sheep, a marking harness can be fitted on the vasectomized or aproned ram. The harness is similar to the chin-ball marker used for cattle. It has a coloured crayon that is situated over the sternum of the ram so that it will mark the ewes' rump as it attempts to breed.