LICENSURE EXAMINATION FOR AGRICULTURIST 2025
LECTURE NOTES FOR ANIMAL SCIENCE

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Note: This review material is a compilation of key LEA-related information that has been AI-enhanced for better readability. It may not fully cover the entire TOS. You still need to find and review necessary lecture materials from your college classes, GE, online references, YouTube videos, etc. If you found any erroneous information, please let me know by messaging me at felixvaldez2698@gmail.com I hope this will be helpful to you, #FutureAgriculturists! #FutureSG13+

INTRODUCTION

Number of Items in LEA - ANSC - 8/100

- **Economic Importance of Animals & By-Products:** Provide food (meat, milk, eggs), fertilizer, transport, clothing, decoration, amusement, animal feed, income/employment, and draft power for farming.

- Domestication began ~10,000 years ago in the **Neolithic period** when humans selectively bred animals for food, labor, and companionship. Key species include:
  - **Dogs** (~15,000 years ago, Asia) first animal domesticated
  - **Sheep** (~10,000 years ago, Middle East) **first domesticated FARM animal**
  - **Goats** (~10,000 years ago, Near East & Fertile Crescent)
  - **Pigs** (~9,000 years ago, Eurasia)
  - **Horses** (~5,500 years ago, Central Asia)
  - **Chickens** (~8,000 years ago, Southeast Asia)
  - **Ducks** (~4,000 years ago, China)
  - **Buffalo** (~5,000 years ago, South Asia)
- As of 2024, the world population is **8.02 billion**, with **26.5 billion chickens, 1.57 billion cattle, and 778 million pigs** globally (2023 data).
- The **Philippines has 119.1 million people**, and the most consumed meat is **chicken**, followed by **pork and beef**.

Chicken Inventory by Region (2023)

- **Western Visayas** – Top region for **Native or Improved Chicken** (in birds)
- **Central Luzon** – Top region for **Broiler Chicken** (in birds)
- **CALABARZON** – Top region for **Layer Chicken** (in birds)

Additional Chicken Inventory Information

1. **Highest chicken producer (liveweight)** – *Bulacan* (194.57 thousand MT)
2. **Total chicken population**– *202.82 million birds*
3. **Classification that dominates broiler inventory**:
   - Broiler – *98% Commercial (70.4 million birds)*
   - Layer – *95.8% Commercial (45.2 million birds)*
   - Native/Improved – *98.7% Smallhold (87.2 million birds)*

Province with the highest beef production – *Bukidnon*

Swine Inventory

1. **Total swine inventory (2023)** – *9,765,636 million heads*
2. **Province with the highest pig production (in MT)** – *Batangas (155.05 thousand MT)*
3. **Region with the highest pig inventory (2023)** – *CALABARZON (1,379,940 million heads)*
4. **Classification with the highest number of swine heads**:
   - *Commercial – 2,676,789 heads*
   - *Semi-commercial – 257,657 heads*
   - *Smallhold – 6,831,190 heads*

Itik Pinas Breeds

- **IP Itim –** Highest peak egg production (99%) and longest peak production 12-week.
- **IP Khaki –** Heaviest (1.27 kg) as RTL Pullet
- **IP Kayumanggi –** Earliest layer (20 wks), most eggs (266/yr), and lowest feed intake (140g/day).

Philippine Native Chicken

- **Bolinao** – Pangasinan
- **Paroakan** – Palawan
- **Banaba** – Batangas
- **Darag** – Iloilo (developed in West Visayas State University)
- **Camarines** – Camarines
- **CARAGA Black** – CARAGA Region (developed in CARAGA State University)
- **ZamPen** – Zamboanga Peninsula (developed in Western Mindanao State University
- **Boholano** – Bohol

Relevant Laws in Animal Science

- **RA 12215 - Philippine Agriculturists Act of 2025:** ensures that only registered agriculturists handle key roles in livestock and poultry production, health, and research.
- **RA 8485 – The Animal Welfare Act of 1998**: Protects and promotes the welfare of all animals in the Philippines.
- **RA 9296 – The Meat Inspection Code of the Philippines of 2004**: Establishes guidelines for the inspection and regulation of meat and meat products.

- **RA 7884 - National Dairy Development Act of 1995**: Creates the National Dairy Authority to accelerate the development of the dairy industry.
- **RA 1556 - Livestock and Poultry Feeds Act of 1956**: Regulates and controls the manufacture, importation, labeling, advertising, and sale of livestock and poultry feeds.

Philippine Native Pig Breeds & Their Provinces of Origin

- **Markaduke** – Marinduque
- **Quezon Black** – Quezon
- **ISUbela** – Isabela
- **Benguet** – Benguet
- **Yookah** – Kalinga
- **Sinirangan** – Eastern Samar

Wild Boar Species in the Philippines

Species	Location	Common Name
Sus cebifrons	Cebu	Visayan Warty Pig
Sus ahoenobarbus	Palawan	Palawan Bearded Pig
Sus oliveri	Mindoro	Mindoro Warty Pig
Sus philippensis philipensis	Greater Luzon	Philippine Warty Pig subsp.
Sus philippensis mindanensis	Greater Mindanao	Philippine Warty Pig subsp.

Milk Production and Consumption

- **Average Milk Intake in the Philippines (2021)** – *16 kg per capita* (USDA, 2022)
- **Global Milk Consumption** – *Belarus had the highest per capita fluid milk consumption in 2022*
- **Top Milk Producers and Exporters:**
  - *India – Top producer of milk*
  - *China – Top importer of milk*
  - *New Zealand – Top exporter of milk*
- **Philippine Milk Imports** – *99% of milk is imported, mainly from the USA, New Zealand, and Belgium*

ANATOMY AND PHYSIOLOGY

Number of Items in LEA - ANSC - 12/100

- **Anatomy**: The study of the form and structure of farm animals.
- **Physiology**: The study of the functions of the parts or organ systems of the body.

Homeostasis and Feedback

- **Homeostasis**: The body's ability to maintain a stable internal environment despite external changes.
- **Feedback Mechanisms:**
  - Positive Feedback: Amplifies changes (e.g., labor contractions).
  - Negative Feedback: Restores balance (e.g., body temperature regulation).
    -

Major Organ Systems

- **Nervous System:** Brain, spinal cord, nerves. Sends and receives signals to control body functions.
- **Respiratory System:** Lungs, trachea, bronchi, diaphragm. Facilitates gas exchange (oxygen in, carbon dioxide out).
- **Skeletal System:** Bones, joints, cartilage. Provides support, movement, and protection.
- **Digestive System:** Mouth, esophagus, stomach, intestines, liver. Breaks down food, absorbs nutrients, eliminates waste.
- **Circulatory System:** Heart, blood, blood vessels. Transports oxygen, nutrients, and hormones.
- **Excretory/Urinary System:** Kidneys, ureters, bladder, urethra. Removes waste, maintains fluid balance.
- **Reproductive System:** Testes (male), ovaries (female), uterus. Produces gametes, supports reproduction.
- **Lymphatic System:** Lymph nodes, lymphatic vessels, spleen. Maintains immunity, fluid balance.
- **Muscular System:** Skeletal, smooth, cardiac muscles. Facilitates movement, maintains posture.
- **Integumentary System:** Skin, hair, hooves. Protects against environmental damage.
- **Endocrine System:** Pituitary, thyroid, adrenal, pancreas, gonads. Produces hormones to regulate body functions.
- **Immune System:** White blood cells, lymph nodes, antibodies. Protects against diseases.
- **Olfactory System (Smell):** Nasal cavity, olfactory
- receptors. Detects odors and pheromones.
- **Visual System (Sight):** Eyes, optic nerve. Processes visual information.
- **Gustatory System (Taste):** Tongue, taste buds. Detects flavors.

Major Hormones in Livestock and Poultry

Hormone	Origin	Function
Insulin	Pancreas	Regulates blood sugar
Glucagon	Pancreas	Raises blood sugar
Estrogen	Ovaries	Regulates female reproduction
Testosterone	Testes	Develops male characteristics
Cortisol	Adrenal gland	Manages stress
Adrenaline	Adrenal gland	Fight-or-flight response
Thyroxine	Thyroid gland	Regulates metabolism
Prolactin	Pituitary gland	Stimulates milk production
Oxytocin	Pituitary gland	Stimulates uterine contractions and milk ejection

- **Monogastric Animals**: Have a single-chambered stomach.
  - **Pig**: Typical monogastric; digests carbohydrates, proteins, and fats in a straightforward manner.
  - **Chicken**: Has modified stomach; Additional structures like the crop (food storage) and gizzard (mechanical digestion by grinding food with ingested grit).
  - **Horse**: Monogastric, but with a large cecum for fermenting fibrous material, akin to a pseudo-ruminant.
  - **True Stomach**: In monogastrics, it's the **stomach** itself, where acidic digestion takes place.
- **Ruminant Animals:** Ruminant stomachs have four compartments: the rumen, the reticulum, the omasum and the abomasum.
  - Rumen microbes ferment feed and produce volatile fatty acids, which is the cow's main energy source.
  - The true stomach is **abomasum**

Enzymes in Digestion

Digestive Glands	Enzymes	Substrate (nutrient)	Products of digestion
Salivary glands	Ptyalin (Salivary amylase)	Starch	Maltose
Gastric glands	Pepsin	Proteins	Peptones
	Rennin (in infants)	Milk protein or caseinogen	Curdles milk to produce casein protein
Pancreas	Pancreatic amylase	Starch	Maltose
	Trypsin	Proteins and peptones	Peptides and amino acids
	Chymotrypsin	Protein	Proteoses, Peptones, Polypeptide, tri and dipepetides
	Pancreatic lipase	Emulsified fats	Fatty acids and Glycerol
Intestinal glands	Maltase	Maltose	Glucose and Glucose
	Lactase	Lactose	Glucose and Galactose
	Sucrase	Sucrose	Glucose and Fructose
	Lipase	Fats	Fatty acids and Glycerol

- Break down macromolecules (e.g., amylase for starch, protease for protein, lipase for fats).

Estrous Cycle in Pigs:

- **Definition**: The estrous cycle refers to recurring physiological changes in female pigs that prepare them for reproduction. **Duration**: Lasts ~21 days.

Phases:

- **Proestrus** (~3-4 days): Increasing **estrogen** levels as follicles mature; sow shows restlessness but isn't receptive.
- **Estrus (Heat)** (~2-3 days): **Estrogen** peaks, triggering ovulation; sow is receptive and exhibits the standing reflex. **Insemination** is ideal here.
- **Metestrus** (~2-3 days): **Estrogen** decreases, **progesterone** rises as the corpus luteum starts hormone production; and ovulation occurs.
- **Diestrus** (~12-14 days): High **progesterone** maintains pregnancy. If no fertilization, the corpus luteum regresses, restarting the cycle.

Hormonal Overview:

- **Estrogen**: Peaks during proestrus and estrus for reproductive readiness.
- **Progesterone**: Maintains pregnancy or declines if fertilization doesn't occur.
- **Luteinizing Hormone (LH)**: Triggers ovulation.
- **Follicle-Stimulating Hormone (FSH)**: Stimulates follicle development.

Major Digestive Organs

- **Mouth/Beak/Tongue**: Ingestion, mechanical digestion, and food manipulation.
- **Salivary Glands**: Produce saliva containing enzymes (e.g., amylase) to initiate carbohydrate breakdown.
- **Esophagus**: Transports food from the mouth to the stomach or crop through peristalsis (muscular contractions).
- **Pharynx**: Directs food to the esophagus and prevents it from entering the respiratory tract.
- **Larynx**: Ensures proper airflow into the trachea during respiration and closes when swallowing to protect the airway.
- **Crop (chickens)**: Temporary storage and softening of food.
- **Proventriculus (chickens)**: Glandular stomach where enzymatic digestion begins before the gizzard.
- **Rumen**: Fermentation chamber housing microbes to digest fibrous material.
- **Reticulum**: Traps larger particles and aids in regurgitation (cud-chewing).
- **Omasum**: Absorbs water and nutrients; filters particles.

- **Abomasum (ruminants)**: True stomach for acidic and enzymatic digestion.
- **Stomach (monogastrics)**: Acidic digestion with pepsin breaking down proteins.
- **Gizzard (chickens)**: Grinds food into smaller particles with the aid of ingested grit.
- **Liver**: Produces bile for fat emulsification and processes nutrients absorbed from the intestine.
- **Gallbladder**: Stores bile for release into the small intestine.
- **Pancreas**: Releases digestive enzymes (e.g., lipase, protease) and bicarbonate to neutralize stomach acid.
- **Small Intestine (duodenum, jejunum, ileum)**: Major site for enzymatic digestion and nutrient absorption.
- **Cecum**: Site of microbial fermentation, especially for fibrous material.
- **Colon**: Absorbs water and forms solid waste (feces).
- **Rectum/Anus**: Final stages for excretion of waste.
- **Vent (birds)**: Common exit for digestive and excretory waste.

Urine Formation:

1. **Filtration**: Blood is filtered in the **glomerulus**, forming filtrate that enters the Bowman's capsule.
2. **Reabsorption**: Essential nutrients (e.g., glucose, water) are absorbed back into the blood in the renal tubules.
3. **Secretion**: Waste products (e.g., hydrogen ions, potassium) are added to the filtrate.
4. **Excretion**: The final urine is transported to the bladder and eliminated.

Key Hormones:

- **Aldosterone**: Increases sodium and water reabsorption.
- **ADH**: Promotes water reabsorption in the collecting ducts.

Vasoconstriction and Vasodilation:

- **Vasoconstriction**: Narrowing of blood vessels; reduces blood flow. Hormone: **Norepinephrine**.
- **Vasodilation**: Widening of blood vessels; increases blood flow. Hormone: **Nitric oxide** (via signaling pathways).

Role of Light in Egg Laying (Chickens):

- Mechanism:
  - Light Detection: Chickens perceive light through the iris and photoreceptors in the hypothalamus.
  - Pineal Gland Activation: Receives signals from light exposure to regulate biological rhythms.
- Hypothalamus Response:
  Releases Gonadotropin-Releasing Hormone (GnRH) when exposed to sufficient light, signaling the start of reproductive processes. Hormonal Influence:
  - GnRH: Stimulates the pituitary gland to release Luteinizing Hormone (LH) and Follicle-Stimulating Hormone (FSH).
  - LH and FSH: Trigger ovulation and egg production.
- Light Hours Needed:
  - Cardinal rule: for egg production, never increase light during the growing period (11-12 hours during 4-18 weeks old) and never decrease light during the laying stage (12-16 hours >18 weeks old). Insufficient light can lead to decreased egg laying.

Egg Formation in Chickens

1. **Ovary (15-30 min):** Produces yolk.
2. **Infundibulum (15-18 min):** Fertilization occurs.
3. **Magnum (3 hrs):** Adds egg white (albumen).
4. **Isthmus (1-2 hrs):** Adds shell membranes.
5. **Uterus/Shell Gland (18-20 hrs):** Forms the shell.
6. **Cloaca (a few minutes):** Egg is laid.

Muscular System Parts:

- **Skeletal Muscle**: Voluntary movement; attached to bones.
- **Smooth Muscle**: Involuntary, found in internal organs.
- **Cardiac Muscle**: Heart muscle; rhythmic contractions.

Types of Bones in Livestock and Poultry

- **Long Bones**: Femur (largest bone).
- **Short Bones**: Carpal bones.
- **Flat Bones**: Ribs, scapula.
- **Irregular Bones**: Vertebrae.
- **Smallest Bone**: Ear ossicles.
- **Softest Bone**: Cartilage-based bones.
- **Pneumatic Bone**: Bird's hollow bones for flight.

Chicken Response to Stress:

- **Stress Response**: Chickens react to stress (like heat, lack of food, or overcrowding) by activating their nervous and hormonal systems.
- **Adrenaline**: Increases heart rate and breathing to handle stress but takes energy away from growth and egg-laying.
- **Cortisol (Corticosterone in birds)**: High levels reduce egg production, slow growth, and weaken immunity.
- **Production Impact**: Stress lowers feed intake, reduces body weight, and results in fewer and poorer-quality eggs

GENETICS AND ANIMAL BREEDING

Number of Items in LEA - ANSC - 10/100

People Behind Animal Breeding

- **Gregor Mendel (1866)** – Known as the **"Father of Genetics"** for discovering the basic principles of inheritance through pea plant experiments.
- **Robert Bakewell (1870)** – Pioneered selective breeding in horses, sheep, and cattle, focusing on meat production and carcass quality.
- **William Bateson (1902)** – First to demonstrate Mendelian inheritance in animals.
- **Hardy & Weinberg (1908)** – Developed the **Hardy-Weinberg Theorem**, explaining genetic equilibrium in populations.
- **Ronald Fisher (1918)** – Applied **ANOVA (Analysis of Variance)** to study genetic correlations among relatives.
- **Sewall Wright (1921)** – Introduced **mating systems** and the **path coefficient** method in genetic studies.
- **L.N. Hazel (1943)** – Developed the **Selection Index**, a tool for genetic improvement in animal breeding.
- **Jay Lush (1945)** – **Father of animal breeding** and genetics; Applied **population genetics** principles to enhance animal breeding strategies.
- **Malecot (1948)** – Used **mathematical probability** to analyze genetic relationships.
- **Wilhelm Ludvig Johansen** – Coined the term **"gene"** and distinguished **genotype** from **phenotype** (Pearson, 2012).
- **James Watson & Francis Crick (1953)** – Proposed the **double-helix structure of DNA**, building on Rosalind Franklin and Maurice Wilkins' work.

Genetics Terminology

- **DNA (Deoxyribonucleic Acid)** – The primary genetic material in all living cells, composed of nucleotide chains (phosphate, sugar, and base), storing genetic information.
    - In DNA, nucleotides consist of phosphate, sugar, and four nitrogenous bases: **purines** (adenine and guanine) and **pyrimidines** (thymine and cytosine), with specific base pairing—adenine pairs with thymine (**A-T**) and guanine pairs with cytosine (**G-C**); in RNA, thymine is replaced by uracil (**A-U**).
- **Chromosome** – Threadlike structures in the cell nucleus that carry genetic information.
- **Gene** – A segment of DNA that determines the base sequence of nucleotides in messenger RNA (mRNA), coding for specific biological functions.**Autosomes** – Chromosomes that influence all traits except sex determination.
- **Sex Chromosomes** – Chromosomes responsible for sex determination, represented by **X and Y**.

Genetics and Environmental Influence on Traits

- **Phenotype (P)** – The observable characteristics (appearance or performance) of an individual.
    - **Formula: P = G + E + (G × E) (MEMORIZE THIS!!!!**
- **Genotype (G)** – The genetic makeup of an individual, determining inherited traits.
- **Gene Action** – The way genes influence traits, which can be:
    - **Additive** – The combined effect of multiple genes contributes to a trait.
        - *Example:* The number of piglets born in a litter is influenced by multiple genes.
    - **Dominance** – One allele masks the expression of another.
        - *Example:* In chickens, the allele for black feathers is dominant over the allele for white feathers.
    - **Epistasis** – One gene influences the expression of another gene.
        - *Example:* A cow's milk production depends on both the gene for udder size and the gene for milk production efficiency.
- **Environment (E)** – Non-genetic factors that influence phenotype, such as nutrition, physical environment, and management.
- **Genotype × Environment Interaction (G × E)** – Certain genotypes perform better in specific environments compared to others.

Heterosis, Heritability, and Dominance

- **Heterosis (Hybrid Vigor)** – The improved size, growth rate, fertility, and yield of hybrid organisms compared to their parents.
- **Heritability and Selection Response** – Traits with low heritability respond slowly to selection because their variation is largely influenced by environmental factors rather than genetics.
- **Heterosis and Lowly Heritable Traits** – Crossbreeding can enhance traits with low heritability by maximizing genetic diversity and hybrid vigor.

- **Forms of Dominance** – The way alleles interact to influence phenotype:
  - **Lack of Dominance** – Both alleles are expressed equally. *Example:* Coat color in **Shorthorn cattle** (red × white = roan).
  - **Partial Dominance** – One allele is not completely dominant, leading to an intermediate phenotype. *Example:* **Compressed gene** in **Hereford cattle**.
  - **Overdominance** – The heterozygote has a superior advantage over either homozygote. *Example:* **Sickle cell anemia** in African populations provides resistance to malaria

Mechanics of Inheritance in Animal Breeding

- **Gametogenesis** – The process of producing reproductive cells:
  - **Spermatogenesis** – Occurs in males, producing sperm cells.
  - **Oogenesis** – Occurs in females, producing egg cells.
- **Fertilization** – The fusion of sperm and egg to form a **zygote** or embryo.

Cell Division in Inheritance

- **Mitosis** produces genetically identical diploid (2n) cells for growth, repair, and asexual reproduction (e.g., skin, muscle, liver, and blood cells).
- **Meiosis** generates haploid (n) gametes, promoting genetic diversity through crossing over and independent assortment (e.g., sperm and egg cells from testes and ovaries).

Genetic Variation in Animal Breeding

- Genetic variation is essential for improving animal traits, enhancing adaptability, and reducing the risks of inbreeding. It arises from different mechanisms, including **crossing over, mutations, and genetic recombination**.

1. Crossing Over

- **Occurs during Prophase I of meiosis**, where homologous chromosomes exchange genetic material.
- **Enhances genetic diversity** by shuffling alleles, leading to unique combinations in offspring.

2. Mutations

- **Random changes in the DNA sequence** that can introduce new genetic variations. **Can be beneficial, neutral, or harmful**, depending on how they affect an organism. Types of Mutations:

1. **Point Mutation** – A single nucleotide is altered (e.g., sickle cell mutation in cattle).
2. **Insertion** – Extra nucleotide bases are added, potentially disrupting gene function.
3. **Deletion** – A section of DNA is removed, possibly leading to loss of function.
4. **Duplication** – A gene segment is copied, sometimes leading to enhanced traits.
5. **Inversion** – A segment of a chromosome flips and reattaches, altering gene expression.
6. **Translocation** – A chromosome segment moves to a different chromosome, causing genetic shifts

Difference Between Mendelian and Non-Mendelian Inheritance

Mendelian Inheritance

- **Follows Gregor Mendel's laws of inheritance.**
- **Applies to traits controlled by a single gene with clear dominant and recessive alleles.**

1. **Law of Segregation** – Each parent passes only one allele for a given trait to their offspring. *Example:* A cow with black fur and a cow with white fur will produce offspring with either black or white fur, not a mix.
2. **Law of Independent Assortment** – Different traits are inherited separately from each other. *Example:* A farm animal's fur color does not determine its horn shape.
3. **Law of Dominance** – A dominant allele will always be expressed over a recessive one. *Example:* If a chicken carries a dominant feather pattern trait, it will be expressed even if a recessive version is present.

Non-Mendelian Inheritance

- **Does not follow Mendel's principles strictly.** Traits may be influenced by multiple genes, linked genes, or interactions between genes and the environment.

1. **Linkage** – Genes located close together on the same chromosome tend to be inherited together. *Example:* Coat color and ear shape in some farm animals may be inherited as a unit unless recombination separates them.
2. **Recombination** – Crossing over during meiosis can break gene linkage, leading to genetic diversity.
3. **Sex-Linked Inheritance** – Traits are carried on sex chromosomes (X and Y). *Example:* X-linked traits, like certain coat colors in cattle, are more commonly expressed in males, since they have only one X chromosome.

Sex Determination in Animals

Chickens (ZZ:ZW System): The **hen (ZW) is heterogametic**, producing both **Z and W gametes**, while the **rooster (ZZ) is homogametic**, producing only **Z gametes**. Chicks with **ZZ** are male, while those with **ZW** are female.

- **Pigs (XX:XY System):** The **boar (XY) is heterogametic**, producing both **X and Y gametes**, while the **sow (XX) is homogametic**, producing only **X gametes**. Piglets with **XX** are female, while those with **XY** are male.

Genetic Composition in Animal Breeding

Fundamentals of Genetic Variation

- **Gene Pool:** The total set of genes available in a population for inheritance, shaping future traits.
    - *Example:* A herd of dairy cows carries genes for high milk yield, disease resistance, and body size.
- **Population:** A group of animals sharing a gene pool, with genetic variation influencing breeding outcomes.
    - *Example:* A flock of native chickens in a farm, where each bird contributes to the genetic diversity.
- **Gene Frequencies:** The proportion of different gene variants (alleles) in a population, determining how common a trait is.
    - *Example:* If 70% of a pig population carries the allele for fast growth, that allele has a high frequency.
- **Hardy-Weinberg Equilibrium:** Gene frequencies remain stable if no selection, mutation, or migration occurs.
    - *Example:* If a closed population of goats is left to breed randomly with no outside influence, their gene frequencies should remain constant over generations.

Forces Affecting Gene Frequencies

- **Selection:** Farmers breed animals with desirable traits, increasing their frequency over generations.
- **Genetic Drift:** In small herds or flocks, random changes in gene frequencies occur due to chance.
- **Mutation:** Spontaneous gene changes introduce new traits, which can be inherited if they affect reproductive cells.
- **Migration:** Introducing new animals into a herd or flock brings fresh genetic material, influencing diversity.

Mating Strategies and Their Effects

- **Non-Random Mating:** Mating choices are influenced by specific traits rather than being completely random.
- **Assortative Mating:** Similar animals (e.g., large pigs with large pigs) mate, increasing uniformity and homozygosity.
- **Disassortative Mating:** Different-looking animals (e.g., crossing different breeds) mate, promoting genetic diversity.
- **Inbreeding:** Mating of closely related animals, increasing homozygosity but also the risk of genetic disorders.

Breeding Techniques: Inbreeding to Crossbreeding

Inbreeding: Mating closely related animals to increase homozygosity and maintain purebred traits.

- **Pros:** Produces **consistent traits**, strengthens desirable genes (e.g., high milk yield in dairy cattle).
- **Cons:** Reduces **fertility, growth rate, and vigor**; increases genetic disorders (**inbreeding depression**).
- **Types:**
    - **Close Breeding:** Very close relatives (e.g., brother-sister, sire-daughter).
    - **Line Breeding:** Less related animals (e.g., half-siblings, cousins) to preserve elite bloodlines.

Crossbreeding: Mating animals from different breeds to improve performance through Hybrid Vigor (Heterosis).

- **Types:**
    - **Single Cross:** 2 breeds (e.g., Merino × Rambouillet).
    - **Three-Way Cross:** Crossbred × third breed (e.g., Hypor × Hampshire × Landrace).
    - **Four-Way Cross:** 2 single crosses mated (e.g., RIR × WL × NH × Vantress).
    - **Crisscrossing:** Alternate backcrossing with parent breeds (e.g., Brahman × Red Sindhi × Brahman).
    - **Backcrossing:** Repeated crossing to a common ancestor (e.g., Red Sindhi × Brahman → F1 × Brahman → F2 × Brahman).

Multiple Ovulation and Embryo Transfer (MOET)

- It involves stimulating a superior donor cow to produce multiple eggs, artificially inseminating her, collecting and evaluating the fertilized embryos, and transferring them into synchronized recipient cows to carry the pregnancies
- **Superovulation** – Inducing the donor cow to release multiple eggs.
- **Estrus Synchronization** – Aligning the reproductive cycles of donor and recipient cows.
- **Artificial Insemination (AI)** – Using semen from superior bulls instead of natural mating.
- **Flushing** – Collecting embryos from the donor cow's uterus.
- **Embryo Transfer (ET)** – Implanting embryos into recipient cows.
- **Cryopreservation** – Freezing embryos for future use.

Poultry Classifications

- **Variety**: A subdivision within a breed, differing in color or feather pattern (e.g., Rhode Island Red with Single or Rose Comb).
- **Strain**: A genetically distinct line within a breed, selectively bred for specific traits (e.g., fast-growing broilers like Cobb or Ross).
- **Breed**: A group of birds with shared physical traits and genetic uniformity, recognized by poultry organizations (e.g., Leghorn, Plymouth Rock).
- **Type**: Classification based on purpose, such as **meat-type** (broilers) or **egg-type** (layers).

Common Breeding Disorders in Livestock and Poultry

- **Hernia** – A protrusion of internal organs due to weak body walls, commonly seen as **scrotal** or **umbilical hernias** in pigs and cattle.
- **Monorchidism** – A condition where only **one testicle** descends, potentially reducing fertility in pigs, cattle, and horses.
- **Cryptorchidism** – One or both **testicles fail to descend**, affecting fertility (common in pigs and cattle).
- **Dystocia** – **Difficult birth** due to large fetus size, poor positioning, or maternal factors, often requiring veterinary assistance.
- **Mummification** – A **dead fetus is retained in the uterus**, dehydrating and shrinking instead of being expelled, common in pigs and cattle.
- **Anestrus** – Failure of females to show **heat cycles**, leading to infertility (common in cattle).
- **Silent Heat** – Female **ovulates but does not show visible signs of estrus**, making detection difficult (seen in dairy cows and goats).
- **Milk Fever (Hypocalcemia)** – **Calcium deficiency** in high-producing dairy cows post-calving, leading to weakness or paralysis.

Selection Methods and Principles in Animal Breeding

Basis of Selection

- **Individual Selection** – Selection based solely on **individual merit or performance** (phenotypic selection).
  - Limited for sex-limited traits (e.g., **milk production, egg production, maternal abilities**).
- **Pedigree Selection** – Selection based on the **performance records of immediate relatives** (parents, grandparents).
  - Useful for traits not yet expressed (e.g., male fertility traits before progeny testing).
  - **Sib Selection** – Selection based on sibling performance, excluding individual records.
  - **Half-Sib (HS):** Based on **half-sibling** performance (same sire or dam).
  - **Full-Sib (FS):** Based on **full sibling** performance (same sire and dam).
  - **Parental Half-Sib (PHS):** Based on **extended family** (e.g., cousins, uncles/aunts).
  - **Maternal Half-Sib (MHS):** Based on **maternal half-sibling** performance.
- **Progeny Testing** – Selection based on **offspring performance**, crucial for sex-limited traits (e.g., milk yield, carcass traits).
  - Accuracy depends on **number of offspring, heritability, and environmental consistency**.

Methods of Selection

- **Tandem Method** – Focuses on improving **one trait at a time** before moving to the next.
  - **Advantage:** Targeted trait improvement.
  - **Disadvantage: Neglects other important traits**, slowing genetic progress.
- **Independent Culling Level** – Individuals must **meet minimum standards** for multiple traits.
  - **Advantage:** Ensures **undesirable traits are not passed on**.
  - **Disadvantage: Overemphasis on thresholds** may eliminate animals with strong overall potential.
- **Selection Index** – **Combines multiple traits** into a single index, assigning economic values.
  - **Advantage:** Improves **multiple traits simultaneously** for balanced genetic gain.
  - **Disadvantage:** Requires **accurate economic weight estimation** for each trait.

Artificial Insemination (AI) Process in Pigs

- Boar Selection & Semen Collection: Choose a healthy boar, collect semen using the gloved-hand technique or artificial vagina, and evaluate sperm quality.
- Semen Processing & Storage: Dilute semen with an extender, store at 15-18°C, and maintain at least 70% sperm viability for use within 3-5 days.
- Detection of Estrus (Heat): Identify standing reflex, swollen vulva, mucus discharge, and inseminate 12-24 hours after estrus onset.
- Insemination Procedure: Clean the vulva, insert a catheter at a 45° angle, and allow semen to flow slowly for 5-10 minutes.
- Post-Insemination Care & Pregnancy Detection: Keep the sow/gilt calm, monitor for non-return to estrus after 18-21 days, and confirm pregnancy via ultrasound, manual palpation, or progesterone testing.

Central Dogma: The flow of genetic information from DNA to RNA to proteins occurs in the **nucleus and cytoplasm**, directing biological functions. *Example*: The **Casein (CSN2) gene** controls milk production in mammals by following the **Central Dogma**, where **transcription** in the **nucleus** copies DNA into mRNA, **translocation** moves mRNA to the **cytoplasm**, and **translation** by ribosomes creates casein, the main milk protein.

ANIMAL NUTRITION

Number of Items in LEA - ANSC - 10/100

Animal Nutrition and Metabolism

- **Metabolism in Nutrition:** Converts nutrients into energy and essential molecules for growth, homeostasis, and overall physiological functions.
- **Types of Metabolism:**
  - **Catabolism:** Breakdown of complex molecules to release energy. I.e., glycogenolysis, which is the breakdown of glycogen into glucose for energy.
  - **Anabolism:** Synthesis of complex molecules for tissue growth and repair i.e. Glycogenesis – Formation of glycogen from glucose for storage.

Processes in Animal Nutrition

- **Ingestion:** Intake of food into the body.
- **Digestion:** Breakdown of food through physical, enzymatic, or microbial processes.
- **Absorption:** Transport of digested nutrients into body cells for utilization.
- **Metabolism:** Utilization of absorbed nutrients for energy, growth, and maintenance.
- **Removal:** Elimination of undigested materials and metabolic waste.

Digestion Process

- **Physical Digestion:** Food is mixed and moved through the gastrointestinal tract via peristalsis, regulated by sphincters to prevent backflow.
- **Chemical Digestion:** Breakdown of food using water, acid, bicarbonate, and enzymes.
  - Starts in the mouth with carbohydrate digestion.
  - Continues in the stomach with protein breakdown using acid and water.
  - Proceeds in the small intestine with enzymatic cleavage from pancreatic and intestinal enzymes.

Important Terminologies

- **Feedstuff:** Nutritious materials used in animal diets (e.g., corn, DL-methionine, vitamins).
- **Nutrients:** Essential components in feed (carbohydrates, fats, proteins, vitamins, minerals, water).
- **Ration:** The total amount of feed given to an animal in 24 hours, balanced for nutrients.
- **Diet:** The type of food consumed by an animal, whether balanced or unbalanced.
- **Food/Feed:** Natural materials sourced from plants, animals, or by-products for nutrition.
- **Digestion:** The mechanical, enzymatic, and microbial breakdown of food.
- **Absorption:** The movement of digested nutrients into body tissues for use
- **Forage**: Natural plants like grasses and legumes harvested for livestock. Example: *Napier grass, Guinea grass*.
- **Fodder**: General term for feed given to livestock. Example: *corn silage, alfalfa hay*.
- **Silage**: Forage preserved by fermentation at high moisture levels. Example: *corn silage, grass silage*.
- **Straw**: Dry stalks of cereal plants after grain harvest. Example: *rice straw*.
- **Hay**: Dried forage used for feed. Example: *alfalfa hay, grass hay*.

Essential Nutrients in Animal Nutrition

1. Carbohydrates

- **Function:** Primary energy source for animals.
- **Enzymes:** Amylase (starch digestion), Maltase (maltose breakdown), Sucrase (sucrose breakdown), Lactase (lactose digestion).
- **Final Absorption Form:** Monosaccharides (glucose, fructose, galactose).
- **Common Feed Sources:** Corn, rice bran, cassava, molasses.

2. Fats (Lipids)

- **Function:** Energy storage, insulation, cell membrane integrity, hormone production.
- **Types:**
  - **Saturated Fats:** Solid at room temp (e.g., tallow, lard).
  - **Unsaturated Fats:** Liquid at room temp (e.g., vegetable oils, fish oil).
- **Enzymes:** Lipase (breaks down triglycerides).
- **Final Absorption Form:** Fatty acids and glycerol.

- **Common Feed Sources:** Copra meal, soybean oil, fish oil, rice bran oil.

3. Proteins

- **Function:** Growth, repair, enzyme and hormone synthesis.
- **Enzymes:** Pepsin (stomach), Trypsin & Chymotrypsin (pancreas).
- **Final Absorption Form:** Amino acids.
- **Common Feed Sources:** Soybean meal, fish meal, copra meal, peanut meal.

4. Minerals

- **Function:** Bone formation, nerve function, metabolic regulation.
- **Types:**
  - **Macro Minerals:** Calcium, phosphorus, potassium, sodium, sulfur, magnesium, chlorine.
  - **Micro Minerals:** Iron, copper, zinc, selenium, iodine, manganese.
- **Common Feed Sources:** Limestone (calcium), dicalcium phosphate (phosphorus), salt (sodium & chlorine), mineral premixes.

5. Vitamins

- **Function:** Regulate metabolism, support immune function, aid growth and reproduction.
- **Types:**
  - **Fat-Soluble:** A, D, E, K.
  - **Water-Soluble:** B-complex, C.
- **Common Feed Sources:** Green forages (Vit A), fish meal (Vit D), vegetable oils (Vit E), yeast (B vitamins).

6. Water

- **Function:** Regulates body temperature, aids digestion, and transports nutrients and waste.
- **Common Feed Sources:** Freshwater, forage, silage.

Carbohydrates in Animal Nutrition

Types of Carbohydrates

- **Monosaccharides:** Single sugar units (e.g., Glucose, Fructose, Galactose).
- **Disaccharides:** Two monosaccharides linked (e.g., Sucrose - sugarcane, Lactose - milk, Maltose - grains).
- **Polysaccharides:** Long chains of sugars (e.g., Starch - plants, Glycogen - animals, Cellulose - plant fiber).

Common Feed Sources

- **Cereal Grains:** Corn, rice bran, wheat, sorghum.
- **Root Crops:** Cassava, sweet potato.
- **By-products:** Molasses, copra meal.

Carbohydrate Digestion

- **Monogastrics (Pigs, Chickens):** Digestion starts in the mouth (**salivary amylase**), continues in the small intestine (**pancreatic amylase, maltase, sucrase, lactase**), breaking starch into glucose for absorption.
- **Ruminants (Cattle, Goats, Sheep):** Rumen microbes ferment carbs into **volatile fatty acids (VFAs)**: **Acetate** (fat synthesis), **Propionate** (glucose production), **Butyrate** (energy). VFAs are absorbed directly for metabolism.

Rumination Process

Rumination is the process where ruminants (e.g., cattle, goats) regurgitate, rechew, and reswallow partially digested feed to enhance digestion. It allows better nutrient absorption by breaking down fibrous plant material with the help of microbes in the rumen.

Key Terms & Processes

- **Bolus:** Partially chewed feed formed into a ball before swallowing.
- **Regurgitation:** Bringing back cud (partially digested feed) from the rumen to the mouth.
- **Remastication:** Rechewing regurgitated cud for finer breakdown.
- **Reinsalivation:** Adding more saliva to aid digestion and buffer rumen pH.
- **Redeglutition:** Reswallowing the cud for further digestion.
- **Esophageal Groove:** A muscular fold in young ruminants that directs milk straight to the abomasum, bypassing fermentation in the rumen.

Rumen & Related Disorders

- **Hardware Disease:** Ingestion of sharp metal objects causing damage to the reticulum and internal organs.
- **Ruminal Acidosis:** Excess grain intake leads to excessive acid production, disrupting microbial balance.
- **Ruminal Tympany (Bloating):** Gas buildup in the rumen due to impaired gas release, common in lush legume diets.

Roles of Microbes in Ruminants:

- Key **bacteria** include cellulolytic (fiber-digesting), amylolytic (starch-digesting), and proteolytic (protein-digesting) types
- **Protozoa** aid protein digestion and stabilize microbial populations.
- **Fungi** help break down lignin and fibrous plant walls, and archaea produce methane during fermentation.
- These microbes contribute to the production of volatile fatty acids (VFAs), primarily acetate, propionate, and

butyrate, which serve as the main energy source for ruminants.

- **Overpopulation of certain microbes (e.g., lactic acid bacteria):** Excessive carbohydrate intake can cause an overgrowth of lactic acid bacteria, leading to rapid lactic acid production and a decrease in rumen pH, resulting in **ruminal acidosis** and reduced fermentation efficiency.

Roles of Key Organs in Fat Digestion and Absorption

- **Pancreas**: Produces lipase to break down fats into fatty acids and monoglycerides, aiding absorption; regulates blood sugar through insulin and glucagon.
- **Spleen**: Filters blood, removes damaged cells, and supports immune function, indirectly supporting nutrient transport and digestion.
- **Liver**: Produces bile to emulsify fats, aiding in their digestion and absorption, and stores nutrients and fat-soluble vitamins.
- **Gallbladder**: Stores and concentrates bile, releasing it into the small intestine to emulsify fats and enhance digestion and absorption.

Proximate Analysis of Animal Feed

- **Moisture Content**: Determined using an oven drying method or moisture analyzer, where the sample is heated until it reaches a constant weight.
- **Crude Protein (CP)**: Measured using the Kjeldahl method, which quantifies nitrogen content, and then multiplies by a factor of 6.25 to estimate protein content.
- **Crude Fat (Ether Extract)**: Assessed using the Soxhlet extraction method, where the feed is extracted with an organic solvent (usually ether) to isolate fats.
- **Crude Fiber**: Measured by the acid-alkali method, where the sample is treated with an acid and alkali to remove solubles, and the remaining residue is weighed.
- **Ash Content**: Determined by ashing, where the sample is burned at high temperatures in a furnace to leave behind only inorganic minerals.
- **Nitrogen-Free Extract (NFE)**: Calculated by subtracting the sum of moisture, crude protein, crude fat, crude fiber, and ash from the total weight of the sample. It represents available carbohydrates like sugars and starches.

Limiting Amino Acids: Amino acids that are in short supply, limiting protein synthesis and affecting growth or production. Key limiting amino acids are: **Lysine** **Methionine** **Threonine** **Tryptophan** and **Valine**

Common Mineral Deficiencies

- **Calcium**: Deficiency causes **Rickets** (young animals) and **Osteomalacia** (adults), leading to weak bones, poor growth, and bone deformities.
- **Phosphorus**: Deficiency results in **Rickets** (young animals), **Osteomalacia**, and poor bone development, causing weakness, bone pain, and poor growth.
- **Iron**: Deficiency leads to **Anemia**, characterized by reduced red blood cells, causing fatigue, weakness, and poor growth.

Essential Amino Acids (PVT TIM HALL)	Non-Essential Amino Acids (Almost All Girls Go Crazy After Getting Taken Prom Shopping)
P: Phenylalanine	**A**: Alanine
V: Valine	**A**: Asparagine
T: Threonine	**G**: Glutamate
T: Tryptophan	**G**: Glutamine
I: Isoleucine	**C**: Cysteine
M: Methionine	**A**: Aspartate
H: Histidine	**G**: Glycine
A: Arginine	**T**: Tyrosine
L: Leucine	**P**: Proline
	S: Serine

Classifications of Vitamins

- **Fat-Soluble Vitamins** (Vitamins: A, D, E, K):
  - Absorption: Requires fat and bile; stored in liver and fat tissue.
- **Water-Soluble Vitamins** (B-complex, C):
  - Absorption: Absorbed directly into bloodstream; excreted in urine.

Common Vitamin Deficiencies

- **Vitamin A (Retinol, Retinal, Retinoic acid):** Deficiency: Night-blindness, keratomalacia; affects vision and skin health.
- **Vitamin D (Ergocalciferol [D2], Cholecalciferol [D3]): Deficiency:** Rickets (young) and Osteomalacia (adults), causing poor bone mineralization and deformities.
- Vitamin E (Tocopherol): Deficiency: Mild hemolytic anemia in newborns, muscle degeneration, reproductive issues, immune dysfunction.
- **Vitamin K (Phylloquinone [K1], Menaquinones [K2]): Deficiency:** Bleeding diathesis, affecting blood clotting.
- **Vitamin B1 (Thiamine):** Deficiency: Beriberi, nervous system and heart abnormalities, ataxia, edema.

- **Vitamin B2 (Riboflavin):** Deficiency: Ariboflavinosis, dermatitis, mouth sores, eye lesions.
- **Vitamin B3 (Niacin, Niacinamide):** Deficiency: Pellagra, dermatitis, diarrhea, dementia, death if untreated.
- **Vitamin B5 (Pantothenic acid):** Deficiency: Paresthesia, poor growth, digestive issues.
- **Vitamin B6 (Pyridoxine, Pyridoxamine, Pyridoxal):** Deficiency: Anemia, peripheral neuropathy, poor growth.
- **Vitamin B7 (Biotin): Deficiency:** Dermatitis, hair loss, poor feathering, hoof problems.
- **Vitamin B9 (Folic acid, Folinic acid):** Deficiency: Neural tube defects, poor growth, anemia.
- **Vitamin B12 (Cyanocobalamin):** Deficiency: Megaloblastic anemia, poor growth.
- **Vitamin C (Ascorbic acid)**: Deficiency: Scurvy, poor collagen synthesis, weak connective tissue, bleeding gums.

Types of Water in the Body

- **Intracellular Water**:
  Water inside cells, crucial for cell structure, metabolism, and nutrient transport.
- **Extracellular Water**:
  Water outside cells, including blood plasma and interstitial fluid, supports tissue hydration and waste removal.
- **Transcellular Water**:
  Small portion of extracellular water in specific compartments (e.g., cerebrospinal fluid), providing lubrication and protection.

Roughages vs. Concentrates in Animal Nutrition

- **Roughages**: High in fiber (typically >18% crude fiber), low in protein (around 8-12%). These provide bulk and stimulate rumen function.
  Example: Hay, silage, grass.
- **Concentrates**: Low in fiber (typically <18% crude fiber), higher in protein (around 20-30% in protein-rich concentrates). They provide easily digestible energy and nutrients.
  Example: Grains, oilseeds, protein meals.
- **Total Mixed Ration (TMR)**: A balanced mixture of roughages and concentrates, ensuring a proper nutrient blend with adequate fiber (around 18%) and protein (10-20%) for ruminants.
  Example: A mix of silage, grains, and protein meals fed to dairy cows.

Types of Feedstuffs and Additives in Animal Nutrition:

- **Feed Additives**: Substances added to improve the quality of feed, *e.g.*, vitamin and mineral premixes.
- **Antibiotics**: Used to prevent or treat bacterial infections, *e.g.*, Tylosin in poultry.
- **Drugs**: Medications given to treat specific health issues in animals, *e.g.*, Ivermectin for parasites.
- **Antioxidants**: Prevent the oxidation of fats and oils in feed, *e.g.*, BHA (Butylated hydroxyanisole).
- **Enzymes**: Break down complex compounds for better digestion, *e.g.*, Phytase to improve phosphorus absorption.
- **Flavoring Agents**: Added to enhance the taste and aroma of feed, *e.g.*, Anise oil.
- **Coloring Agents**: Used to alter the color of animal products, *e.g.*, Canthaxanthin for egg yolk color.
- **Mold Inhibitors**: Prevent mold growth and spoilage in feed, *e.g.*, Propionic acid in silage.
- **Toxin Binders**: Bind harmful toxins in feed to reduce their impact, *e.g.*, Zeolite for mycotoxins.
- **Probiotics**: Beneficial microorganisms that improve gut health, *e.g.*, Lactobacillus.
- **Prebiotics**:This are non-digestible fibers that promote the growth of beneficial gut bacteria, *e.g.*, Mannan oligosaccharides (MOS).

Common Toxic Substances in Feeds:

- **Cassava Tubers**: Hydrocyanic Acid
- **Camote**: Solanine
- **Ipil-Ipil**: Mimosine
- **Cotton Seed Meal**: Gossypol
- **Sorghum/Cassava Leaves:** Prussic Acid
- **Gabi**: Prussic Acid/Hydrocyanic Acid
- **Peanut**: Aflatoxin, Goitrogens
- **Soybean**: Trypsin Inhibitor, Phytate Acid, Phytoestrogen, Saponins
- **Molasses**: Oxalate
- **Fusarium**: Zearalenone
- **Penicillum**: Ochratoxin A
- **Aspergillus flavus**: Aflatoxin

SLAUGHTER OF ANIMALS AND MARKETING

Number of Items in LEA - ANSC - 8/100

Common Terminologies in Slaughter

- **Food Animals**: Domesticated animals slaughtered for human consumption, such as cattle, pigs, goats, poultry, and rabbits.

- **Controlling Authority**: National Meat Inspection Service (NMIS) is responsible for meat hygiene and inspection.
- **Meat Establishment**: Registered premises like slaughterhouses and processing plants where animals are slaughtered and processed.
- **Inspection**: Official check to ensure compliance with regulations, including hygiene, animal handling, and meat quality standards.
- **Deputized Meat Control Officer**: Veterinarian authorized by the NMIS to perform meat inspection duties.
- **Ante-Mortem Inspection**: Pre-slaughter inspection to ensure animal health and fitness for slaughter.
- **Post-Mortem Inspection**: Inspection of animals after slaughter to assess meat quality and safety.
- **Fresh Meat**: Meat that has only been refrigerated or packaged without further treatment for preservation.
- **Safe and Wholesome**: Meat deemed fit for human consumption after passing hygiene and safety inspections.
- **Hot Meat**: Meat from animals slaughtered illegally or outside authorized facilities.
- **Cold Slaughter**: Slaughter of animals already dead before processing, resulting in "botcha" meat.
- **Imitation**: Products made to resemble real meat but not from actual animal sources.
- **Adulterated**: Meat or carcasses contaminated with harmful substances or not fit for consumption.
- **Brand**: Approved mark or label placed on meat products by the controlling authority.
- **Grading**: Classification of meat based on quality and characteristics for trade.
- **Deboning**: Removal of bones from meat cuts or carcasses.
- **Contamination**: Transfer of harmful substances to meat, affecting its safety.
- **Cleaning**: Removal of dirt and undesirable matter from meat or equipment.
- **Disinfection**: Use of chemicals or agents to kill microorganisms on surfaces.
- **Potable Water**: Clean water suitable for drinking and meat processing, meeting WHO standards.
- **Downer**: Animal that cannot stand due to injury or illness, considered "suspect" for disease.
- **Reactor**: Animal that tests positive for a specific disease.
- **Rigor Mortis**: Muscle stiffness after death due to muscle contraction.
- **Pelt**: Skin and hair obtained from animals, such as sheep or goats.
- **Wool**: Protective fleece from sheep or hairy mammals, used for textiles.
- **Giblets**: Edible internal organs like the heart, liver, and gizzard of poultry.
- **Bung**: Cecum and part of the colon in livestock.
- **Wessand**: Esophagus and surrounding muscles in cattle or carabaos.
- **Tripe**: The first three stomach compartments (reticulum, rumen, omasum) of ruminants.
- **Offal**: Edible or non-edible animal parts such as organs and glands not classified as meat.
- **Primal Cuts**: Main sections of meat initially separated from a carcass.
- **Lean Cuts**: Meat with low fat content, like pork loin and ham.
- **Residues**: Harmful substances or drugs left in meat after treatment.
- **Edible By-Products**: Non-meat edible parts, such as liver or kidney.
- **Inedible By-Products**: Non-consumable parts, including hooves and feathers.
- **Emergency Slaughter**: Slaughter due to injury or risk of suffocation, not for regular processing.

Slaughter Procedure:

- **Slaughter**: Killing food animals according to approved meat inspection rules and regulations.
- **Abattoir or Slaughterhouse**: Premises for slaughtering animals, approved by the controlling authority.
    - **Dressing House**: Area for processing animal carcasses.

Classification of Slaughterhouses:

- **AAA (Internationally Eligible)**: Meets high standards for both domestic and international markets. (global)
- **AA (Nationally Eligible)**: Meets national standards for domestic markets. (selling who
- **A (Local Market Eligible)**: Meets basic standards for local markets. (selling within municipality only)

- **Fasting (Withdrawal of Feed)**:
- **Simple stomach animals**: Fasting for 12-24 hrs.
- **Ruminants**: Fasting for 24-48 hrs.
- **Advantages**: Longer shelf-life, low shrinkage, savings on feed, easier cleaning, thorough bleeding, and brightly colored carcass.
- **Ante-Mortem Inspection**:

- Visual inspection for illness, injury, or stress. Unfit animals are separated.
- **Stunning**: Methods to make the animal unconscious or immobile to reduce fear and pain:
- **Electric Stunning**: Animal is shocked to induce unconsciousness.
- **Captive Bolt Stunning**: Bolt fires into the brain.
- **Gas Stunning**: Exposing the animal to gases like carbon dioxide.
- **Bleeding (Sticking)**: Cutting the throat to sever major blood vessels, ensuring proper bleeding and meat quality.
- **Scalding and Plucking (Poultry)**:
- **Scalding**: Immersing poultry in hot water to loosen feathers.
- **Plucking**: Mechanical feather removal.
- **Scalding for Hogs**: Optimal water temperature is 60-71°C for 3-6 minutes.
- **Singeing**: Applying flame to burn off remaining hairs and kill surface microorganisms.
- **Dehiding**: Removal of skin or hide from animals after slaughter.
- **Scraping**: Removal of hairs or feathers after scalding with hands (poultry) or a knife (swine).
- **Removal of Head, Feet, Tail, Beak**: Removal of non-meat parts.
- **Evisceration**: Opening the body cavity to remove internal organs, which are inspected for abnormalities.
- **Post-Mortem Inspection**: Inspectors check carcasses and organs for disease or contamination. Safe carcasses are marked for consumption.
- **Shrouding**: Wrapping beef or carabeef carcasses in cheesecloth soaked in lukewarm water.
- **Chilling**: Carcasses are chilled to prevent bacterial growth, using cold rooms or refrigerated areas.
- **Aging**: Enhances flavor and tenderness through controlled aging of meat.
- **Fabrication and Cutting**: Further processing into various cuts of meat based on demand.
- **Retail Cuts**: Small meat cuts, ready for preparation. **Wholesale Cuts**: Larger cuts that need further processing before consumption.

Biochemical Changes After Animal Slaughter

- **Oxygen Depletion**: After slaughter, blood circulation stops, and muscles lose oxygen, affecting energy production.
- **Anaerobic Metabolism**: Without oxygen, **glycogen** in muscles breaks down into **lactic acid**, lowering the muscle **pH** (from 7.0 to 5.5).
- **Myofibrillar Changes**: The drop in pH causes **myofibrils** (muscle fibers) to stiffen, starting **rigor mortis**.
- **Rigor Mortis**: Muscle stiffening occurs as **actin** and **myosin** proteins lock together, making the meat rigid. If the carcass is chilled before rigor mortis sets in, the muscle fibers don't contract properly, leading to **PSE (Pale, Soft, and Exudative) meat**—which is undesirable for texture and color.
- **Post-Mortem pH Changes**: The muscle pH continues to drop until it stabilizes at around 5.0-5.5, affecting texture and color.
- **Meat Tenderization**: After rigor mortis, **enzymes** break down proteins, softening the meat over time.

Differences Between PSE, DFD, and RFN Meat

- **PSE (Pale, Soft, and Exudative)**: Occurs when the meat is **excessively pale**, **soft**, and **wet** due to **rapid post-mortem pH decline** from stress during slaughter. This results in meat that is **less firm** and **less flavorful**.
- **DFD (Dark, Firm, and Dry)**: Happens when meat is **dark**, **firm**, and **dry** due to **slow post-mortem pH decline**, usually caused by **long-term stress** before slaughter. It leads to meat that is **dryer** and has poor **water retention**.
- **RFN (Red, Firm, and Non-exudative)**: This is **desirable meat** that is **red**, **firm**, and **non-watery**, indicating **good meat quality** with balanced pH and proper moisture retention, making it the **ideal type of meat**.

Composition of Meat

- **Physical Composition**:
  - **Fat(5-30%)**: Found around organs, under skin, and between muscles. Most variable.
  - **Lean/Muscle(50-65%)**: Supports movement and body, main component of carcass. Most important.
  - **Bone(15-17%)**: Connective tissue that gives structure and protects organs.
- **Chemical Composition**:
  - **Water**: 65-75% of meat.
  - **Protein**: 15-20% of meat.
  - **Fat**: 2-12% of meat.
  - **Minerals (Ash)**: ~1%.
  - **Vitamins**: Water-soluble (abundant), fat-soluble (A, D, E, K), <1% carbs.

Types of Meat and Their Characteristics

- **Red Meat**: Meat that is **red when raw**, such as **beef**, **pork**, **lamb**, **veal**, **carabeef**, **chevon**, **mutton**, and **horsemeat**. The red color comes from **myoglobin**, a protein that carries oxygen in muscles.
- **White Meat**: Meat from **domestic birds**, such as **chicken**, **duck**, **quail**, **rabbit (lapan)**, and **turkey**. It has less **myoglobin**, making it **lighter in color**.
- **Game Meat**: Meat from **wild animals**, like **venison**, **wild boar**, **rat**, and **crocodile**. It is **leaner**, has a more **earthy flavor**, and contains more **protein**, **iron**, and **zinc**. However, it can be **tougher** and needs to be cooked thoroughly to avoid health risks.

Factors Influencing Meat Tenderness

- **Age of the Animal**: Younger animals have finer muscle fibers, making the meat more tender.
- **Muscle Type**: Less used muscles are tender, while frequently used muscles are tougher.
- **Marbling (Fat Content)**: More fat in the muscle increases tenderness and moisture.
- **Meat pH Level**: Lower pH (more acidic) meat tends to be more tender.
- **Post-Mortem Aging**: Aging meat allows enzymes to break down muscle fibers, improving tenderness.
- **Cooking Method**: Slow cooking tenderizes tougher cuts, while quick cooking is ideal for tender cuts.
- **Connective Tissue**: More connective tissue (collagen) makes meat tougher but can be softened by slow cooking.
- **Species and Breed**: Different species and breeds have varying tenderness based on muscle structure and fat distribution.
- **Handling and Processing**: Proper handling and minimal stress during slaughter improve meat tenderness.
- **Storage Conditions**: Proper chilling or freezing prevents moisture loss and maintains tenderness.

Quality traits of meat

- **Color**: Fresh meat should have a bright, appealing color. Red meat should be bright red, while poultry should be pale or light pink.
- **Texture**: Meat should be firm to the touch, not slimy or mushy.
- **Flavor**: High-quality meat has a clean, fresh flavor, while poor-quality meat may have off-flavors or a rancid taste.
- **Juiciness**: Meat with adequate fat and moisture content tends to be juicier.
- **Odor**: Fresh meat should have a clean, neutral smell, without any sour or unpleasant odors.
- **Fat Distribution**: Even fat distribution (marbling) contributes to meat tenderness, juiciness, and flavor.
- **Tenderness**: The ease with which meat can be cut and chewed, influenced by factors like age, muscle use, and cooking.

Animal Meat characteristics

Table 1. Important indices of different meat products.

KINDS OF MEAT	LEAN				FAT		BONES
	Color	Firmness	Texture	Odor	Marbling	Consistencies and color of fat	Texture and color of bone and bone marrow
BEEF (Cattle)	bright red dark brick red	firm	Moderately Coarse		High degree of marbling	Whitish yellow and firm	
CARABEEF (Carabao)	More reddish brown than beef	loose	Coarser texture than beef	Resembles that of a musk deer and if boiled in strong acidified water, develops a disagreeable odor similar to that of a cattle manure		Strikingly white Drier and less sticky than beef	Finer than beef and more brittle
PORK (Pig)	Gray red to dark red		coarse		8-10 mos. Slaughtered pigs have high degree of marbling	Pure white Finely granular soft	Bone marrow is soft and pink red
HORSE MEAT (Horse)	Dark red of even brown when exposed to air, it has a blush luster and even becomes blackish red to black red	firm	Very fine		No intermixing fat in the muscle	Soft, oily and light gold to dark yellow but become stiffened in the air	Bone marrow is slightly red
CHEVON (Goat)	Paler color than mutton			Peculiarly strong odor resembling the odor of mature living goat	Little fat	Pure white Hard firm and brittle	Bone marrow is slightly red
CHICKEN (Broilers and fryers, 7-12 weeks)	Pale but there are also red muscles	firm	Tender-meated soft and smooth textured skin	Odor vary inaccordance with species and feeding		Variable in consistency and color but generally soft and oily	Flexible breastbone cartilage

- **Egg: A Complete Food:** Often considered a **complete food** because they contain all of the essential amino acids, as well as a variety of important vitamins and minerals.Composition:
- **Egg Shell**: The mineralized shell surrounds the egg content, made up of 94% $CaCO_3$. It has two membranes—one attached to the shell and the other enclosing the egg content.

- **Air Cell**: Formed at the blunt end of the egg, between the membranes, shortly after laying. The size of the air cell indicates the egg's freshness and quality.
- **Cuticle**: A protective layer that blocks pores, preserving freshness and preventing microbial contamination.

- **Egg White/Albumen**: Surrounds the yolk, keeping it centered. It's rich in protein with an excellent balance of amino acids.
  Yolk: Contains fat, cholesterol, and fat-soluble vitamins (A, D, E, K), B vitamins, and minerals like iron, phosphorus, and calcium.

Common Processed Egg Products in the Philippines:

- **Balut**: A fertilized duck egg that's partially developed (18 days), creating a unique texture and flavor.
- **Penoy**: An unfertilized duck egg, fully cooked, offering a different texture and taste compared to balut.
- **Salted Eggs**: Made through brine or clay methods. Eggs are soaked in saltwater or buried in clay and salt for preservation.
- **Century Eggs**: A preserved duck egg, traditionally made in China by storing the egg in a mixture of clay, salt, wood ash, and quicklime for weeks or months.

Weight Classification of Eggs in the Philippines:

- **Jumbo**: 70 grams and above
- **Extra Large**: 65-70 grams
- **Large**: 60-65 grams
- **Medium**: 55-60 grams
- **Small**: 50-55 grams
- **Pullets**: 45-50 grams
- **Pewee**: 40-45 grams
- **No Weight**: Less than 40 grams

Temperature Danger Zone:

- The range between **40°F (4°C)** and **140°F (60°C)** where harmful bacteria like Salmonella and E. coli grow rapidly, making food unsafe; to prevent illness, keep food below **40°F** or above **140°F** during storage, cooking, and serving.

Milk:

- Produced by mammals to serve as food for their offspring.
- Highly nutritious, often called a "**nearly perfect food**" due to its balanced combination of essential nutrients.
- Slightly sweet and pleasant taste, making it a popular and versatile food source for both young mammals and humans.
- **Composition of Milk**: Milk typically contains **87% water**, **4-5% fat**, **3-4% protein**, **4-5% lactose**, and **0.7-1% minerals** (including calcium, phosphorus, and magnesium).
- **Colostrum**: The **first milk** produced by female mammals after birth, rich in **white blood cells** and **antibodies** that help strengthen the immune system of newborns, providing protection against infections. It is higher in **protein, minerals, and fat** than regular milk but contains **less lactose**, making it an excellent food for newborns.
- **Milk Color**: The color of milk, typically white, can vary slightly due to factors like the cow's diet (high beta-carotene from green grass can give a yellow/orange tint), breed (e.g., Jersey cows produce creamier milk with higher butterfat), and processing (homogenized milk may appear whiter).

Different Milk Products and Forms

- **Raw Milk**: Milk that has not been pasteurized, carrying higher bacteria risks and is illegal to sell in some areas.
- **Pasteurized Milk**: Heated to 63°C (150°F) for 30 minutes to kill harmful bacteria.
- **UHT Milk**: Heated to 74°C for 15 seconds, extending shelf life without refrigeration.
- **Homogenized Milk**: Processed to evenly distribute fat, preventing cream separation.
- **Whole Milk**: Milk with at least 3.25% fat content.
- **Skim Milk**: Milk with less than 0.5% fat.
- **Dried Skimmed Milk**: Powdered milk with most fat removed.
- **Low-Fat Milk**: Milk with 1-2% fat content.
- **Reconstituted Milk**: Made by mixing powdered milk with water.
- **Fortified Milk**: Milk with added nutrients like vitamins A and D.
- **Powdered Milk**: Dehydrated milk that can be reconstituted or used in cooking.
- **Flavored Milk**: Milk with added nutrients and flavors.
- **Condensed Milk**: Milk with 60% of water removed, often sweetened.
- **Ice Cream**: Frozen dairy made from cream, milk, sugar, and flavorings.
- **Evaporated Milk**: Milk with some water removed.
- **Yogurt**: Fermented milk product with probiotics, protein, and calcium.
- **Cheese**: Made by coagulating milk proteins and aging curds.
- **Butter**: Made by churning cream to separate fat and buttermilk.

Milk Quality Tests:

- **Babcock Test**: Determines the butterfat content of milk.
- **Lactometer**: Measures the density of milk.
- **Sediment Test**: Determines the amount of unwanted insoluble material (dirt, dust) in milk.
- **Walker Test**: Used for casein determination in milk.

Different Methods of Meat Preservation:

1. **Drying**: Reduces water content from 70% to 15%, preventing microbial growth.
2. **Curing**: Preserves meat, enhances flavor, develops color, and prevents harmful bacteria (e.g., Clostridium botulinum).
3. **Canning**: Seals meat in airtight containers and heats to kill microorganisms, extending shelf life.
4. **Freezing**: Lowers temperature to stop microbial growth, retaining flavor and nutrients.
5. **Smoking**: Exposes meat to smoke, drying and infusing antimicrobial properties and flavor.
6. **Salting**: Draws moisture from meat, creating an inhospitable environment for bacteria.
7. **Refrigeration**: Slows bacterial growth by storing meat at low temperatures.
8. **Fermentation**: Introduces microbial cultures to preserve and change flavor, common in sausages.

Marketing Live Animals:

1. **Livestock Market/Concentration Yards**: Farmers and traders bring animals for sale. Markets offer facilities for animal care.
    - Transportation methods:
        - Trader to trader
        - Farmer to trader
        - Trader to farmer
    - Around 71 accredited livestock markets exist.
2. **Barrio Agents**: Skilled in live weight estimation. They either:
    - Buy livestock from backyard farms and sell to viajeros or
    - Act as viajeros (wholesalers), selling directly to retailers.
3. **Wholesaler/Viajeros**: Buy livestock in bulk, transport, and resell to wholesalers, retailers, or processors
4. **City Dealer**: Intermediary between provincial viajeros and city wholesalers.
5. **Retailers**: Buy livestock and sell directly to consumers.
6. **Contract Growing Scheme (Vertical Integration)**: The mother company buys animals, handles processing, and sells directly to consumers.

Problems in Livestock Marketing:

1. **No Grade Standards**: Lack of inspection and usable market information.
2. **Lack of Integrated Information**: Prices are not synchronized, and information is withheld, distorting the industry's true picture.
3. **Transport Difficulties**: Stiff shipping requirements and long distances.
4. **High Transportation Costs**: Makes livestock movement expensive.
5. **Lack of Suitable Public Transport**: Limited transport options for animals.

ANIMAL PRODUCTION

Number of Items in LEA - ANSC - 50/100

- **Swine Terminologies:** Boar (male pig), Sow (mature female), Gilt (young female, not yet given birth), Shote (young pig ~60kg), Barrow (castrated young male), Stag (castrated mature male), Weanling (5-week-old separated piglet), Suckling (unweaned piglet).
- **Small Ruminant Terminologies:** Ram (male sheep), Ewe (female sheep), Lamb (young sheep <1 yr), Wether (castrated young male sheep), Shearling (yearling sheep with two teeth), Fleece (sheep wool), Billy/Buck (male goat), Doe (female goat), Kid (young goat <1 yr), Wether goat (castrated male goat), Pelt (wool & skin of sheep).
- **Poultry Terminologies:** Poultry (domestic birds for economic use), Chicken (a poultry species), Chick (young chicken), Rooster (male ≥1 yr), Cockerel (male <1 yr), Capon (castrated male), Pullet (female <1 yr), Hen (female ≥1 yr), Fryer (overgrown broiler), Roaster (young chicken >1.6kg), Duckling (young duck), Plumage (feathers), Drake (male duck), Duck (female duck), Poult (young turkey), Gobbler/Tom (male turkey), Jenny (young female turkey).
- **Horse Terminologies:** Horse (*Equus caballus*), Broodmare (breeding female), Colt (young male <3 yrs), Filly (young female <3 yrs), Foal (young <1 yr), Gelding (castrated male), Mare (mature female), Ridging (stallion with undescended testes), Stallion (mature male), Studhorse (breeding stallion), Yeld/Dry Mare (not producing young).

- **Large Ruminant Terminologies:** Ox (bovine draft animal), Cattle (domesticated bovines), Bull (breeding male), Cow (mature female), Heifer (young female <3 yrs, not yet given birth), Steer (castrated young male), Stag (castrated mature male), Calf (young <1 yr), Bull calf (young male <1 yr), Carabull (male carabao), Caraheifer (young female carabao <3 yrs), Caracow (mature female carabao).

Diseases of Poultry and Livestock

1. Bacterial Diseases

- **Tetanus** – Affects pigs, ruminants, and horses. Characterized by stiffness, erect ears, and rigid tail due to Clostridium tetani neurotoxin. Prevented by toxoid vaccination (artificial active immunity). Horses are the most sensitive.
- **Blackleg** – A bacterial disease of cattle caused by Clostridium chauvoei. Characterized by emphysematous swelling in heavy muscles. Prevented through vaccination.
- **Fowl Cholera** – Also known as pasteurellosis in chickens. The chronic form manifests as swollen wattles, joints, and footpads.
- **Infectious Coryza** – A respiratory disease of chickens with symptoms like nasal discharge, sneezing, and swelling under the eyes.

2. Viral Diseases

- **Foot and Mouth Disease (FMD)** – A contagious viral disease of ruminants and pigs. Symptoms include fever and vesicles in the mouth and foot areas. Preventive measures include vaccination, slaughter of affected animals, and movement restrictions.
- **Gumboro Disease (Infectious Bursal Disease)** – Characterized by swollen cloacal bursa and hemorrhagic muscles in chickens.
- **Avian Pneumoencephalitis** – Caused by paramyxovirus, presenting respiratory symptoms (coughing, sneezing) and nervous signs (twisting neck, paralysis).
- **Newcastle Disease** – Affects chickens, causing respiratory distress and nervous system symptoms. LaSota vaccine is administered via intraocular route.
- **Fowl Pox** – Causes proliferative skin lesions and thick scabs in chickens. Vaccinated via wing web method.
- **Porcine Respiratory and Reproductive Disease (PRRD)** – A viral disease affecting pigs, causing reproductive failure in sows and respiratory issues in piglets and growing pigs.
- **African Swine Fever (ASF)** – A highly contagious viral disease affecting domestic and wild pigs, leading to high mortality rates and severe economic losses.

3. Parasitic Diseases

- **Coccidiosis** – Common in chickens, caused by protozoa. Leads to severe diarrhea and high mortality.
- **Brooder Pneumonia** – A mycotic (fungal) disease caused by Aspergillus fumigatus affecting the respiratory system of chickens.
- **Surra** – A protozoan disease of horses and ruminants, caused by Trypanosoma evansi. Transmitted by biting flies, leading to fever and anemia.
- **Haemonchus contortus** – A roundworm causing severe anemia in ruminants, found in the abomasum.
- **Trichuris suis** – A whipworm in pigs, located in the cecum.
- **Strongyloides ransomi** – An endoparasite of pigs transmitted prenatally.
- **Fasciola gigantica** – A liver fluke infecting ruminants; the infective stage is metacercaria.
- **Schistosoma japonicum** – A blood fluke infecting both humans and animals through skin penetration of cercaria.

4. Non-Infectious Diseases

- **Milk Fever (Parturient Paresis)** – A metabolic disorder occurring before or during parturition due to low serum calcium.

Breed Classification of Chickens

Based on Utility (Purpose)

1. **Egg Class** – Small-bodied, active, non-sitters, lay white-shelled eggs. Examples: Leghorn, Minorca, Ancona, Mikawa
2. **Meat Class** – Large, slow, gentle, poor layers, lay brown-shelled eggs. Examples: Brahma, Cochin, Langshan, Cornish, White Rock
3. **General Purpose Class** – Medium-sized, good layers, fast-growing young. Examples: New Hampshire, Rhode Island Red, Barred Plymouth Rock, Lancaster, Nagoya, Cantonese
4. **Fancy Class** – Unique appearance, ornamental, rare breeds. Examples: Frizzle, Bantam, Long-Tailed, Creepers, Silkie
5. **Fighting Class** – Gamecocks bred for cockfighting. Examples: Ruble, Claret, Oasis, Hulsey, Blue Face, Jumper, Sweater, Lemon, Eagle Eyes, Round eSGHead

Poultry Production Short Summary

1. Incubation (21 Days)

- **Methods:** Natural (hens) or artificial (incubators).
- **Conditions:** Proper oxygen flow, humidity control (<10% moisture loss), and maintained temperature: **37.5–37.6°C (First 18 days), 36.9°C (Last 3 days)**.
- **Egg Turning:** 6x/day until day 18.
- **Candling:** Remove infertile eggs & dead embryos on **days 4, 7, and 14**.

2. Brooding (Chick Care)

- **Preparation:** Clean, disinfect, and dry house before chick arrival; use **2-inch litter** (rice hull, shavings, or newspaper).
- **Temperature:**
  - **0–1 wk:** 32.2–35.6°C | **1–2 wks:** 29.4–32.2°C
  - **2–3 wks:** 26.7–29.4°C | **3–4 wks:** 23.9–26.7°C
- **Floor Space:**
  - **Egg-type:** 0.5 sq. ft./bird (1st 6 wks) → 1 sq. ft./bird (6–10 wks).
  - **Meat-type:** 0.75–1 sq. ft./bird (1st 8 wks) → 1–1.5 sq. ft./bird (8+ wks).

3. Feeding & Watering

- **Feed:** Chick starter mash (21–22% CP).
- **Water:** First **6–8 hrs:** Add **5–10% sugar**; First **3 days:** Provide **vitamins, minerals, and antibiotics**, especially in bad weather.

Systems of Rearing

1. **Range** – Free-roaming with minimal housing, ideal for free-range farming.
2. **Semi-Confinement** – Access to both shelter and outdoor runs.
3. **Complete Confinement** – Fully indoor, controlled environment for efficiency

Types of Poultry Flooring

- **Litter Floor** – Covered with bedding (e.g., rice hull, wood shavings) for comfort and waste absorption.
- **Slat Floor** – Raised wooden or plastic slats for better drainage and hygiene.
- **Combination (Slat + Litter)** – Part slatted, part littered for balance in comfort and waste management.

Types of Roofing

- **Gable** – Two-sloped roof; good ventilation and rain runoff.
- **Shed** – Single-sloped; simple, low-cost, and easy to construct.
- **Semi-Monitor** – Partially raised center; improves airflow and cooling.
- **Monitor** – Fully raised center; best for ventilation and heat dissipation.

Signs of Sexual Maturity

- Comb & wattles enlarge and turn red.
- Pullet becomes friendly and cackles.
- Starts looking for a nest.
- Becomes docile and social.
- Vent & abdomen enlarge.
- **Surest sign:** First egg laid.

Note: **Transfer pullets to the layer house at 18–21 weeks** to prevent egg laying in the rearing house, egg eating, high mortality, and low egg production.

Effects of Early Sexual Maturity

- More small eggs, lower production rate & persistency.
- Higher mortality & prolapse risk.

Ways to Delay Sexual Maturity

- Reduce feed by 20% or dilute with high-fiber material.
- Use low-protein/low-lysine diet.
- Skip feeding & reduce light exposure.
-

Why Broilers Should Not Be Kept Beyond 8 Weeks

- **Poor Feed Conversion Efficiency (FCE)** – Older broilers consume more feed but grow less efficiently.
- **Marketability Issues** – Oversized broilers (beyond 1.0–1.5 kg) have lower demand and price.
- **Physiological Changes** – Males become plump, females thin, affecting meat quality.
- **Farm Management Disruptions** – Delays schedules, marketing, and proper sanitation practices.

Signs of Culling Birds

- **Comb:** Good layer – large, red, glossy | Poor layer – small, pale, scaly
- **Eyes:** Good layer – bright | Poor layer – dull
- **Vent:** Good layer – large, dilated, oblong | Poor layer – small, contracted, round, dry
- **Abdomen & Spread:** Good layer – soft, pliable, 3+ fingers between pubic bones & keel | Poor layer – hard, full, <3 fingers

Common Pig Breeds & Characteristics

1. Philippine Native Pig (Philippines)

- **Physical Features**: Small, black, short body
- **Characteristics**: Hardy, slow-growing, low carcass yield

2. Meishan (China)

- **Physical Features**: Black with white extremities, large drooping ears
- **Characteristics**: Prolific (15-16 piglets/litter), early sexual maturity, slow-growing

3. American Landrace (USA)
- **Physical Features**: Long body, white, large drooping ears
- **Characteristics**: High meat yield, good mothering ability

4. Yorkshire/Large White (UK/Canada) or the "mother breed"
- **Physical Features**: White, erect ears, long body
- **Characteristics**: Lean, fast-growing, good feed efficiency

5. Duroc (USA) or "**red power**"
- **Physical Features**: Solid red, medium body, drooping ears
- **Characteristics**: Good feed efficiency, high meat quality, used in crossbreeding

6. Pietrain (Belgium) or **"muscle pig"**
- **Physical Features**: White with black spots, erect ears
- **Characteristics**: Lean**, well-muscled,** prone to stress

7. Berkshire (UK)
- **Physical Features**: Black with white points, erect ears
- **Characteristics**: Excellent meat quality, efficient growth

8. Hampshire (USA) or the **"Belted white"**
- **Physical Features**: Black with white belt, erect ears
- **Characteristics**: Lean meat, good carcass quality

9. Large Black (UK)
- **Physical Features**: All-black, large drooping ears
- **Characteristics**: Hardy, excellent for pasture farming

10. Spotted Poland China (USA)
- **Physical Features**: White with black spots, drooping ears
- **Characteristics**: Good feeders, early maturing, prolific

11. Synthetic Breeds (Various origins)
- Developed for superior traits (e.g., growth rate, meat quality)
- Examples: Nieuw Dalland/TOPIGS, Hypor, Seghers, Camborough, JSR, Meat Master

FEEDING MANAGEMENT FOR SWINE

Dry/Pregnant Sows and Gilts
- **2.5 kg/day** of sow and weaner meal for maintenance.
- **+1.0 kg/day** one week before and after mating.

Lactating Sows
- **2.5 kg/day** of sow and weaner meal for maintenance.
- **+0.25 kg/day per piglet** being suckled.

Boars
- **2.0 kg/day** of boar meal or sow and weaner meal.
- **2.5 kg/day** if used regularly for breeding.

Piglets
- **0.5 - 1.0 kg/day** of creep pellets from **day 7 to weaning (21 days)**.
- **Mix creep feed with sow and weaner meal** during the last week before weaning.

Growing and Finishing Pigs
- **Starter diet** for pigs **weaned at 3 - 5 weeks (11 - 13 kg)** until they reach **18 kg**.
- **Gradual transition to sow and weaner meal** for pigs **weaned at 7 weeks or older**.

NEWBORN PIGLET CARE AND MANAGEMENT

Navel Cord Care (0-6 hours old)
- May or may not be clipped (clipping may introduce infection).
- Falls off naturally within 6 hours; longer for weak piglets.
- If bleeding: tie 1-2 inches from the body and disinfect with tincture of iodine.
- Prevents navel ill, greasy pig disease, arthritis.

Needle Teeth Clipping (0-1 day old)
- Clip all 8 teeth at birth to prevent injuries among littermates.

Temperature Requirements for Newborn Piglets
- Ideal: 33-37°C

Brooder Management (0-7 days old)
- Newborns rely on brown adipose tissue for warmth.
- Maintain 30-32°C using:
  - Two 75-watt bulbs or three 50-watt bulbs (esp. 1-4 AM).
- Best practice: observe piglet behavior.

Colostrum Intake (0-36 hours old)
- Pigs lack immunoglobulin transfer via placenta → passive immunity via colostrum.
- Must suckle immediately after birth; absorption stops after 36 hours.
- Maternal immunity lasts ~10 days; piglets build own immunity after 14 days.

Fostering (0-2 days old)
- Best done within 1-2 days of farrowing.
- Transfer bigger piglets to new sow to improve survival.

Crushing Prevention (0-7 days old)
- **Risk factors:**
  - Weak-legged sows.
  - Weak piglets unable to move away.
  - Poor pen design (slippery floors, bad farrowing hurdles).
  - Inadequate heating → piglets huddle near sow.
  - Poor water supply → sow frequently stands & lies down.
  - Excessive disturbances in the farrowing unit.

OTHER ACTIVITIES AFTER BIRTH

Iron Injection (1-3 days old)
- Given 1st-3rd day after birth.
- Newborn iron reserve: 50 mg.
- Needs 150-180 mg for 30 days (deficiency: 5-6 mg/day).

Castration (5-10 days old)

- Best done at 5-10 days old when piglets still have maternal antibodies.

Ear Notching (Before 10 days old)

- Litter number first, pig number second (e.g., 8-10 = 10th pig in 8th litter).
- Max: 2 notches per ear quadrant.

FEEDING MANAGEMENT

- Creep feed starts at 5-7 days old.
- Pre-starter feed at 2 weeks old.

Age (weeks)	Feed Type	Amount (g/head/day)
2	Pre-starter	100
3	Pre-starter	150
4	Pre-starter	200
5	Pre-starter + Starter	300
6-10	Starter	400-800

NURSERY MANAGEMENT

Weaning (21-28 days old)

- 5.5 kg piglets can be weaned at 21 days.
- Smaller ones weaned at 25-28 days (split weaning).
- Leave in farrowing crates 2-3 days after sow removal.
- Transfer preferably at night.

Post-Weaning Management

- Optimum temperature: 28-32°C (1-2 weeks post-weaning).
- **Grouping strategies:**
  - By sex (males & females separated).
  - By size (to minimize feed competition).
  - By health status.

Harvesting

- Target weight: 18 kg before transfer to grower farms.
- Preventive medication: 3 days before transfer, provide water-soluble medicine.

Methods for Detecting Estrus in Swine

- **Haunch Pressure Test** – Applying firm pressure on the sow's haunches (hindquarters). A sow in estrus will stand still, indicating receptivity to mating.
- **Semen-on-Snout Test** – Exposing the sow to boar semen odor. If the sow exhibits a standing response (immobility), she is in heat and ready for breeding.
- **Riding-the-Back Test** – A person or another pig mounts the sow. If she remains still rather than moving away, she is in estrus.
- **Teaser Method** – Introducing a boar to the sow. If she shows interest and allows mounting, she is in heat and ready for insemination.

Production Systems of Swine

- **Growing-Finishing** – Focuses on raising pigs from weaning to market weight.
- **Sow Herd** – Maintains breeding sows for continuous piglet production.
- **Farrow to Weanling** – Produces piglets up to weaning, then sells them.
- **Farrow to Finish** – Covers the entire cycle from birth to market weight.
- **Farrow to Breeder** – Produces piglets intended for breeding stock.
- **Boar for Hire (Boar Stud)** – Provides breeding services for multiple farms.

Buffalo Production Lecture Notes

Breeding

- Carabaos can breed year-round, but mating peaks in the wet season.
- Estrous cycle: 21 days (range: 18-25 days); Estrus lasts ~18 hours (5-36 hrs).
- Ovulation occurs ~15 hrs after estrus.
- First breeding: 2.5-3 years old (250-300 kg body weight).
- **Signs of Heat:**
  - Stands still when mounted (best indicator).
  - Swollen vulva, reddened vaginal lining.
  - Mucus discharge (clear & watery → turbid & sticky).
  - Mounting other animals, restlessness, reduced appetite.
- **Best Breeding Time:**
  - Natural mating or artificial insemination (AI).
  - Follow the "a.m.–p.m. rule" for AI (inseminate twice, 12 hours apart).

Parturition (Giving Birth)

- **Stages:**
  - Labor: 2-6 hrs
  - Fetus expulsion: 0.5-3 hrs
  - Placenta expulsion: 0.5-8 hrs (Retained if >12 hrs → Call a vet).
- **Signs:**
  - Milk presence, swollen teats, thick mucus discharge.
  - Water bag & forelegs appear first (normal delivery).
  - Cow removes fetal membrane by licking/eating.
  - Calf must suckle colostrum within 1 hour.
  -

Calf Management

- **Immediately After Birth:**
  - Clear nostrils, dry body.
  - Tie & cut navel cord, apply iodine.
  - Move to dry, clean pen with fresh water.
- **Feeding:**
  - Colostrum (passive immunity) → 1.5-2L per feeding, 2-3x/day at 38°C.
  - Introduce mix feed & hay early for rumen development.

Weaning & Growth Stages

- **Post-Weaning (3-6 Months):**
  - Move to a new pen, feed for 500g ADG.
  - Monitor health, deworm if needed, provide mineral lick.
- **Heifer Management:**
  - Reach 300-350 kg before breeding (~16 months puberty).
  - Allow interaction with males, deworm, provide minerals.
- **Bull Management:**
  - Select from high-producing parents.
  - Feed well for a target BCS of 3.0, ensure tameness.
  - Separate from females at 8-10 months.
  - At 2 years: 300g/day weight gain → Fit for breeding at 2.5 years.
  - Must pass Breeding Soundness Evaluation (BSE).
  - **Good Bulls:** >80% live sperm; **Poor Bulls:** >20% abnormal sperm → Low fertility.

Animal Health Management

- **Deworming Schedule:**
  - Calves: 1 week, 1 month, 3 months, then every 4-6 months.
  - Adults: Every 4-6 months.
  - **Dewormers:** Albendazole (1mL/10kg BW), Triclabendazole (1mL/10kg BW).
- **Vaccination:**
  - **FMD & Hemosep:** Initial (3 months), Booster (4 months), then every 6 months.
  - **Tuberculosis Test:** Annually.
  - **California Mastitis Test (CMT):** Monthly for milking cows.

Weaning Practices

- Smallholder: 8-12 months.
- Early Weaning: 4-5 months.
- Commercial: 3-5 days, then bucket-feeding milk.

Parameter	Cattle (Beef)	Buffalo (Carabeef)	Sheep (Mutton)	Goat (Chevon)
Parturition	Calving	Calving	Lambing	Kidding
Puberty Age (Months)	8-10	24-36	5-7	7-10
Estrous Cycle (Days)	21	21	16	21
Estrus Length (Hours)	12-24	12-18	24-36	34-38
Ovulation Time	10-15 hrs after estrus	10-15 hrs after estrus	Late estrus	Late estrus
Gestation Length (Days)	283	324	148	148
Normal Body Temp (°C)	37-41	38-39	38-40	38-40

Dairy Management

- Milking: **Twice daily (6 AM & 3 PM).**
- **Best Practices:**
  - Use milking machines (or hand milking if necessary).
  - **Post-milking care:** Iodine dip/spray.
  - CMT test weekly, TB test annually.
  - FMD & Hemosep vaccination.

Sheep Breeds

- **Philippine Native Sheep** – Roman-nosed, thin-tailed, erect-eared; originated from the Merino breed.
- **Barbados Blackbelly** – Hair sheep with small, slightly drooping ears.
- **Katahdin** – Hair sheep; widely adaptable and parasite-tolerant.
- **St. Croix** – Hair sheep; excellent forager, fertile, and parasite-resistant.
- **Suffolk** – Wool-type breed with black face, ears, and legs; unsuitable for Philippine conditions.
- **Karakul** – Oldest domesticated sheep breed; "fur sheep" known for meat, milk, tallow, and wool production.

Recommended Floor Spacing for Goats

- **Young Stock (up to 1 year old)** – 1.0 sq.m. per head
- **Breeding Male** – 2.0 sq.m. per head
- **Breeding Female** – 1.5 sq.m. per head

Goat Breeds

- **Boer** – Meat-type; white body with black or reddish-brown head and rear legs.
- **Saanen** – "Queen of Dairy Goats"; highest milk producer (1.8L/day); pure white to off-white.

- **Toggenburg** – Oldest dairy goat breed; 1.5L/day yield; distinct white face and leg markings.
- **Alpine** – 1.5L/day yield; medium-to-large with upright ears; off-white to black.
- **Anglo-Nubian** – Large, dual-purpose breed with Roman nose and pendulous ears; 1.5L/day milk yield.
- **Angora** – Produces mohair fiber.
- **Philippine Native Goat** – Small, stocky, and low-set; color varies; milk mainly for kids.
- **La Mancha** – Recognizable by its "gopher" ears.

Summary of Common Computations in Animal Science

- **Egg Production Metrics**
  - **Hen-Day Egg Production (HDEP)** = (Eggs collected / No. of chickens) × 100
  - **Hen-Housed Egg Production (HHEP)** = (Eggs collected / No. of hens housed) × 100
  - **Hatchability Percentage** = (No. of chicks / No. of hatching eggs) × 100
- **Mortality Rate** = (Number of deaths / Total population) × 100
- **Dressing Percentage** = (Dressed Carcass Weight / Live Weight) × 100
  - **Common Dressing Percentages:**
    - Buffalo/Cattle: 43-54%
    - Sheep: 40-50%
    - Goat: 43-52%
    - Pig: 70-75%:
    - Broiler: 70%
    - Hen: 65%
    - Duck: 65%
- **Feed Efficiency and Conversion**
  - **Average Daily Gain (ADG)** = (Final Weight - Initial Weight) / Number of Days
  - **Feed Conversion Ratio (FCR)** = Feed Consumed (kg) / Weight Gain (kg)
    - **Common FCR Values:**
      - Broiler Chicken: 1.5 - 1.8
      - Pig: 2.5 - 3.0
      - Layer Chicken: 2.0 - 2.5
  - **Egg Weight FCR** = Feed intake (kg) / Egg production (kg)
  - **Per Dozen Egg FCR** = Total Feed Consumed (kg) / (Total Eggs Produced / 12)
- **Urea Requirement in a Ration** = Total ration × Recommended percentage
  - Example: 12.5 kg × 1% = 0.125 kg or 125 g
- **Soilage Requirement**
  - **Dry Matter Intake (DMI)** = Body weight × 3%
  - **Total Soilage Requirement**
    - Example: 180 kg × 3% = 5.4 kg
    - 5.4 kg / 20% = 27 kg
- **Farrowing Interval** = Total time (months) / Number of farrowings
  - Example: 18 ÷ 3 = 6 months
- **Gestation Calculation (3-3-3 Rule for Pigs)**
  - **Expected Farrowing Date:** Breeding Date + 3 months + 3 weeks + 3 days
    - Example:
      - Breeding Date: April 16
      - +3 months: July 16
      - +3 weeks (21 days): August 6
      - +3 days: August 9
- **Crude Protein (CP) Computation**
  - **From Feed Composition:** CP = Total weight × CP percentage
    - Example: 50 kg × 48% = 24 kg
  - **From Nitrogen (N) Content:** CP = N × 6.25
    - Example: 8% × 6.25 = 50%
- **Body Weight Estimation**
  - **Sheep & Goat** = [(Heart Girth² × Body Length) / 300] / 2.205
    - Example: (35 × 35 × 30) / 300 = 122 lbs
    - 122 / 2.205 = 55.33 kg
  - **Pigs** = [(Heart Girth² × Body Length) / 400] / 2.205
    - Example: (45 × 45 × 54) / 400 = 273 lbs
    - 273 / 2.205 = 123.81 kg
  - **Cattle** = [(Heart Girth² × Body Length) / 300]/ 2.205
    - Example: (70 × 70 × 78) / 300 = 1274 lbs
    - 1274 / 2.205 = 577.78 kg

NOTE: (2.205 is the conversion factor from pounds to kg)

IMPORTANT SCIENTIFIC NAMES

Poultry and Birds

- **Domestic Chicken** – *Gallus gallus domesticus*
- **Red Junglefowl** – *Gallus gallus*
- **Sri Lankan Junglefowl** – *Gallus lafayettii*
- **Grey Junglefowl** – *Gallus sonneratii*
- **Green Junglefowl** – *Gallus varius*
- **Mallard Duck** – *Anas platyrhynchos*
- **Muscovy Duck** – *Cairina moschata*
- **Domestic Goose** – *Anser anser domesticus*
- **Swan** – *Cygnus olor*
- **Domestic Turkey** – *Meleagris gallopavo*
- **Guinea Fowl** – *Numida meleagris*
- **Common Quail** – *Coturnix coturnix*
- **Japanese Quail** – *Coturnix coturnix japonica*
- **Ostrich** – *Struthio camelus*
- **Peafowl** – *Pavo cristatus*
- **Pigeon** – *Columba livia*
- **Pheasant** – *Phasianus colchicus*

Swine
- **Pig / Domestic Pig** – *Sus scrofa domesticus*
- **European Wild Boar** – *Sus scrofa*

Cattle and Bovids
- **European Cattle** – *Bos taurus*
- **Zebu (Humped Cattle)** – *Bos indicus*

Buffalo
- **Riverine Buffalo** – *Bubalus bubalis bubalis*
- **Swamp Buffalo / Carabao** – *Bubalus bubalis carabanensis*
- **Tamaraw** - Bubalus mindorensis

Small Ruminant
- **Goat** – *Capra hircus*
- **Sheep** – *Ovis aries*

Equine
- **Horse** – *Equus ferus caballus*
- **Donkey** – *Equus africanus asinus*
- **Mule** – (No scientific name; sterile hybrid of horse and donkey)

Camelids
- **Dromedary Camel (one hump)** – *Camelus dromedarius*
- **Bactrian Camel (two humps)** – *Camelus bactrianus*
- **Llama** – *Lama glama*
- **Alpaca** – *Vicugna pacos*

Lagomorph
- **Rabbit** – *Oryctolagus cuniculus*

Aquatic Plants used in Livestock
- **Duckweed** – *Lemna spp.*
- **Azolla / Mosquito fern** – *Azolla pinnata*
- **Water purslane** – *Ludwigia octovalvis*
- **Pickerel weed** – *Monochoria vaginalis*
- **Water lettuce** – *Pistia stratiotes*
- **Gooseweed** – *Sphenoclea zeylanica*
- **Rice flatsedge** – *Cyperus iria*
- **Flat flower umbrella plant** – *Cyperus difformis*
- **Purple nutsedge (Mutha)** – *Cyperus rotundus*
- **Fimbristylis** – *Fimbristylis littoralis*
- **Bulrush** – *Scirpus maritimus*
- **Shiny barnyard grass** – *Echinochloa glabrescens*
- **Barnyard grass** – *Echinochloa crus-galli*
- **Jungle rice** – *Echinochloa colona*
- **Knotgrass** – *Paspalum distichum*
- **Sprangletop** – *Leptochloa chinensis*

Broadleaf Weeds
- **Spiny amaranth** – *Amaranthus spinosus*
- **Slender amaranth** – *Amaranthus viridis*
- **Beggar-ticks** – *Bidens pilosa*
- **Garden spurge** – *Euphorbia hirta*
- **Spindle top** – *Cleome rutidosperma*
- **Dayflower** – *Commelina benghalensis*
- **Spreading dayflower** – *Commelina diffusa*
- **Little ironweed** – *Vernonia cinerea*
- **Common purslane** – *Portulaca oleracea*
- **Horse purslane** – *Trianthema portulacastrum*
- **Three-lobe morning glory** – *Ipomoea triloba*
- **Sensitive plant** – *Mimosa pudica*
- **Devilweed (Hagonoy/Toxic to ruminants)** – *Chromolaena odorata*
- **Lantana (Kantutay/ Toxic to ruminants)** – *Lantana camara*
- **Banana** – *Musa spp.*
- **Sweet Potato (Kamote)** – *Ipomoea batatas*

Grasses (Weedy and Upland Forage)
- **Samoratta grass** – *Ischaemum rugosum*
- **Bermuda grass** – *Cynodon dactylon*
- **Crabgrass** – *Digitaria ciliaris*
- **Itch grass** – *Rottboellia cochinchinensis*
- **Cogon grass** – *Imperata cylindrica*
- **Goosegrass** – *Eleusine indica*
- **Amorseco** – *Chrysopogon aciculatus*
- **Bagokbok** – *Themeda triandra*

Improved Forage Grasses
- **Guinea grass** – *Panicum maximum*
- **Napier grass** – *Pennisetum purpureum*
- **Signal grass** – *Brachiaria decumbens*
- **Para grass** – *Brachiaria mutica*
- **Sugarcane** – *Saccharum officinarum*
- **Carabao grass** – *Paspalum conjugatum*
- **Star grass** – *Cynodon plectostachyus*
- **Pangola grass** – *Digitaria decumbens*
- **Paspalum grass** – *Paspalum atratum*
- **Alabang X** – *Dichanthium aristatum*

Leguminous Forage Trees and Vines
- **Ipil-ipil** – *Leucaena leucocephala*
- **Pigeon pea** – *Cajanus cajan*
- **Gliricidia / Madre de cacao** – *Gliricidia sepium*
- **Arachis / Mani-mani** – *Arachis pintoi*
- **Kudzu** – *Pueraria phaseoloides*
- **Trichanthera / Madre de agua** – *Trichanthera gigantea*
- **Centro** – *Centrosema pubescens*
- **Stylo** – *Stylosanthes guianensis*
- **Desmanthus** – *Desmanthus virgatus*
- **Rensonii** – *Desmodium rensonii*
- **Sesbania** – *Sesbania sesban*
- **Katuray** – *Sesbania grandiflora*
- **Flemingia** – *Flemingia macrophylla*
- **Malunggay** – *Moringa oleifera*
- **Calopogonium** – *Calopogonium mucunoides*

- **Siratro** – *Macroptilium atropurpureum*

🌾 Cereal Grains for Feeds

- **Corn (Maize)** – *Zea mays*
- **Rice (Palay)** – *Oryza sativa*
- **Sorghum** – *Sorghum bicolor*
- **Wheat** – *Triticum aestivum*
- **Barley** – *Hordeum vulgare*
- **Soybean** – *Glycine max*
- **Oats** – *Avena sativa*
- **Pearl Millet** – *Pennisetum glaucum*
- **Finger Millet** – *Eleusine coracana*

🪱 Other Invertebrates Related to Animal Science

- **Black Soldier Fly** – *Hermetia illucens*
- **Earthworm** – *Eisenia fetida* (used in vermiculture and as feed)

- 🍯 **Major Honey-Producing Bees**
- **European Honey Bee** – *Apis mellifera*
  - Most widely used for commercial honey and pollination globally
- **Asian Honey Bee** – *Apis cerana*
  - Native to Asia; used for small-scale honey production and wild pollination
- **Giant Honey Bee** – *Apis dorsata*
  - Wild, aggressive bee; produces large honeycombs high in trees or cliffs
- **Dwarf Honey Bee** – *Apis florea*
  - Small, wild bee; builds exposed combs on twigs
- **Stingless Bee (Philippine native)** – *Tetragonula biroi*

🦟 Insect Pests in Livestock and Poultry

- **Horn Fly** – *Haematobia irritans*
  - Blood-sucking fly that causes irritation, anemia, and weight loss in cattle.
- **Stable Fly** – *Stomoxys calcitrans*
  - Painful biter; reduces weight gain and milk yield; can transmit *Trypanosoma*.
- **Mosquito** – *Aedes aegypti*
  - Vector of arboviruses; may transmit fowlpox and avian malaria.
- **Biting Midges** – *Culicoides spp.*
  - Transmit Bluetongue virus and Epizootic Hemorrhagic Disease to ruminants.
- **Tsetse Fly** – *Glossina spp.*
  - Blood-feeding fly; vector of *Trypanosoma* causing sleeping sickness
- **Housefly** – *Musca domestica*
  - Spreads pathogens like *Salmonella*, *E. coli*, and Newcastle Disease; contaminates feed and wounds.
- **Blowflies** – *Lucilia spp., Calliphora spp.*
  - Lay eggs in wounds; larvae (maggots) cause myiasis (flesh-eating infestations).
- **Sticktight Flea** – *Echidnophaga gallinacea*
  - Embeds in poultry skin (combs, wattles); causes anemia and irritation.
- **Poultry Body Louse** – *Menacanthus stramineus*
  - Chews skin and feathers; leads to stress, irritation, and poor productivity in poultry.
- **Swine Mange Mite** – *Sarcoptes scabiei var. suis*
  - Causes sarcoptic mange in pigs; intense itching, crusty skin, and reduced growth.

🦠 Common Animal Diseases

- **Chronic Subclinical Mastitis** – *Staphylococcus aureus*
- **Foot-and-Mouth Disease (FMD)** – *Aphthovirus*
- **Anaplasmosis** – *Anaplasma marginale*
- **Hemorrhagic Septicemia** – *Pasteurella multocida*
- **Rabies** – *Lyssavirus*
- **Porcine Reproductive and Respiratory Syndrome (PRRS)** – PRRS virus (*Arterivirus*)
- **Classical Swine Fever (Hog Cholera)** – Classical swine fever virus (*Pestivirus*)
- **African Swine Fever (ASF)** – African swine fever virus (*Asfarvirus*)
- **Newcastle Disease** – Newcastle disease virus (NDV) (*Paramyxovirus*)
- **Avian Influenza (Bird Flu)** – Avian influenza virus (AIV) (*Orthomyxovirus*, Type A)
- **Infectious Bursal Disease (Gumboro)** – Infectious bursal disease virus (IBDV) (*Birnavirus*)
- **Fowl Cholera** – *Pasteurella multocida*
- **Coccidiosis** – *Eimeria spp.* (protozoan parasites)