AGA 2110

LECTURE 1

INTRODUCTION TO ANATOMY & PHYSIOLOGY OF FARM ANIMALS

INTRODUCTION

- FARM ANIMALS – Animals kept for agricultural purposes
- Include
  - ✓Cattle
  - ✓Sheep
  - ✓Goats
  - ✓Pigs
  - ✓ chickens
  - ✓Rabbits
  - ✓horses
- Animals are complex organisms
- They have **systems** & processes that allow them to remain in living condition.

INTRODUCTION

ANATOMY

- The study of the FORM and STRUCTURE of the living organism
- It involves looking at architecture, at the different positions, shapes, and sizes of various living tissues.
- It also involves studying the relationship between body parts of an animal.
- Species differences & similarities occur
- Anatomy helps you appreciate how body systems function in different species
- Knowledge of anatomy is the basis of recognizing state of health & disease

ANATOMY & PHSIOLOGY SUMMARY

- ANATOMY – study of parts of an animals body
- Physiology – study of what the body does (function)
- Anatomy & Physiology help one to understand other disciplines eg chemistry, biology
- Helps to learn how an animals body works
- Function/ role of a part follows or reflects its form eg bones are hard so as to protect the soft parts of the body. This is true for cells, tissues & systems

2 MAJOR CLASSES (SUBTYPES) OF ANATOMY

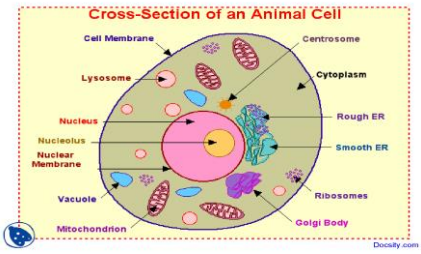
A. MACROSCOPIC ANATOMY (GROSS ANATOMY)

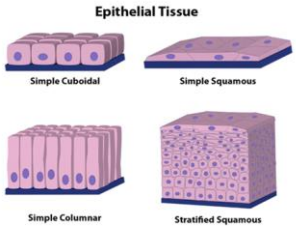
- is the study of anatomical structures that can be seen with the naked (unaided) eye.
- It includes learning the names & locations of bones, muscles, arteries, veins, & nerves.

2 MAJOR CLASSES (SUBTYPES) OF ANATOMY

A. MICROSCOPIC ANATOMY (HISTOLOGY)

- The study of the microscopic structures of tissues & organs
- Structures that can only be seen under magnification





A. STUDY APPROACH TO GROSS ANATOMY

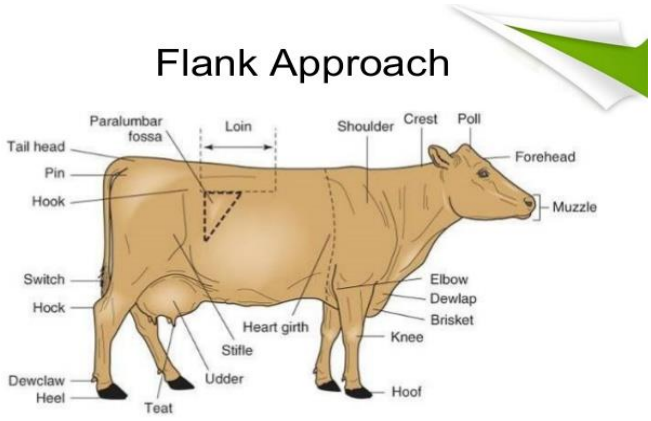
Study of Gross anatomy can be approached in 03 ways:

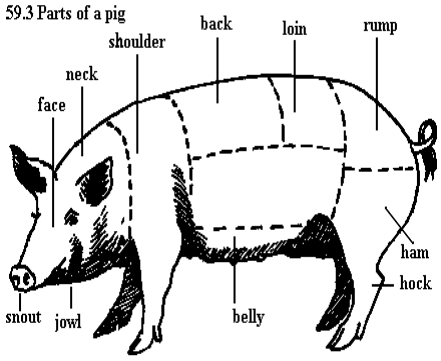
i) **Surface anatomy** (or superficial anatomy) - the study of external anatomical features without dissection.

ii) **Regional anatomy** - focuses on specific external & internal regions of the body (eg head/chest) & how different systems work together in that region.

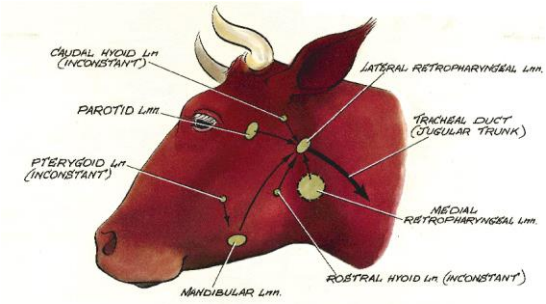
iii) **Systemic anatomy** - focuses on the anatomy of different organ systems, such as the respiratory or nervous system.

SUPERFICIAL ANATOMY

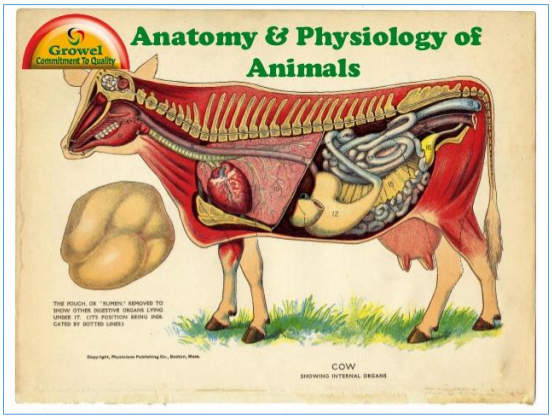




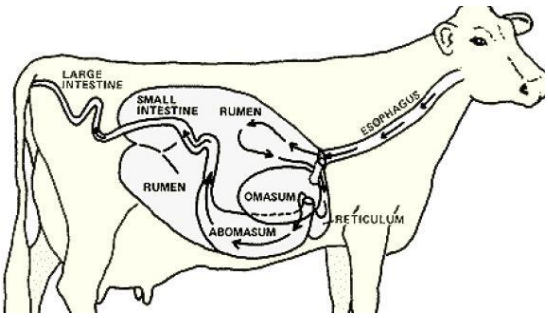
REGIONAL ANATOMY

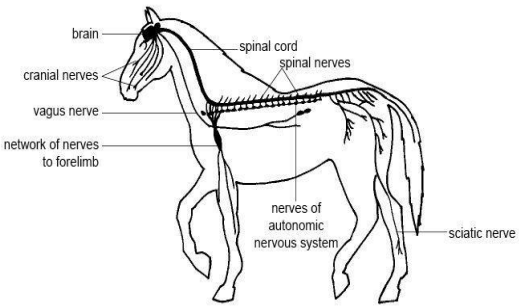


LYMPH NODES OF PAROTID, MANDIBULAR AND RETROPHARYNGEAL LYMPHOCENTRES OF COW'S HEAD.



SYSTEMIC ANATOMY





PHYSIOLOGY

- **Physiology**- the study of the functions of cells, tissues, organs & organ systems of the living organism.
- Physiology also includes relationships among functions by different systems of an organisms
- Study of how organs & systems within the body work, how they **communicate**, and how they **combine** their efforts to make conditions **favourable** for survival.
- Physiology can be considered a study of the functions & processes that create life

PHYSIOLOGY

- Study of how the body works includes

i. Physical function

ii. Chemical function

- Study of physiology occurs at many levels which include
  - cells
  - organs
  - Organ system
  - organism

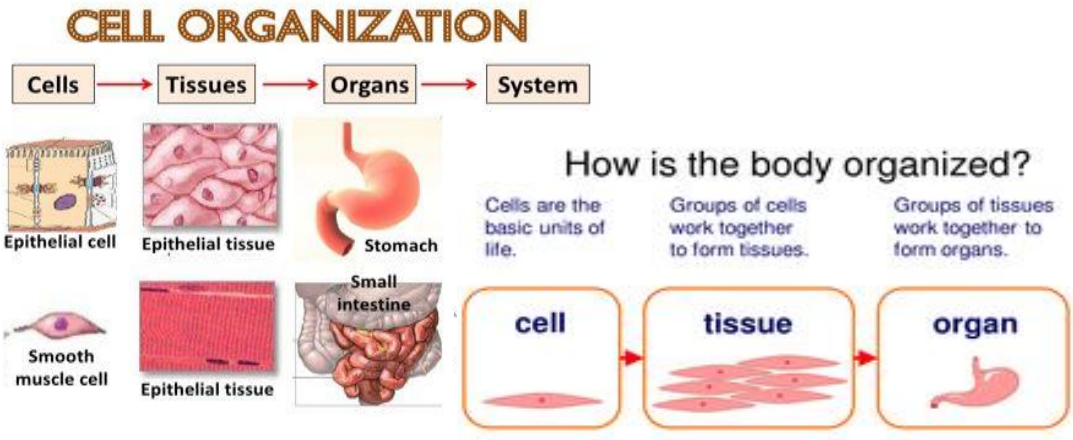
ANATOMY AND PHYSIOLOGY SUMMARY

- ❑ Anatomy is closely related to physiology.
- ❑ Anatomy refers to the study of form and the structure of body parts, but physiology focuses on how these parts work .

LEVEL OF ORGANISATION OF AN ANIMALS' BODY

- ❑ All living organisms are made up of one or more cells.
- **Unicellular organisms** eg amoebas, consist of only a single cell.
- **Multicellular organisms**, eg animals & humans are made up of many cells.
- ❑ Cells are considered the fundamental units of life.
- ❑ Cells are the basic building blocks of all living organisms.
- ❑ Cells are the simplest level of organization.
- ❑ Multicellular organisms have 5 levels of organisation

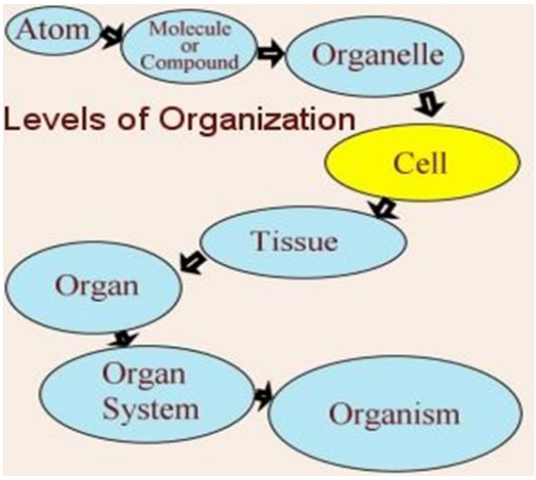
ORGANISATION OF AN ANIMAL'S BODY



LEVELS OF ORGANISATION OF AN ANIMALS' BODY

- 5 levels of organisation which are: **cell**, **tissue**, **organ**, **organ system, organism**

- At each level of organisation the structure (**anatomy**) is closely related to the function (**physiology**)



LEVEL OF ORGANISATION OF AN ANIMALS' BODY

- Specialised cells are organised in a **hierarchy**
- Level of organisation of increasing order
- Cells in complex multicellular organisms are organized into **tissues**.
- **Tissues** - groups of similar cells that work together on a specific task
  - Cells in the GIT – absorbs nutrients hence look different from Heart muscle cells which pump blood to the body
- **Organs** are structures made up of two or more tissues organized to carry out a particular function
  - Examples of organs – liver, lungs, stomach

LEVEL OF ORGANISATION OF AN ANIMALS' BODY

- groups of organs with related functions make up the different **organ systems.**

Examples;

i. Digestive system - composed of stomach, liver, pancreas, & intestines
ii. Cardiovascular system – heart & blood vessels (circulate blood)
iii. Respiratory system - nose, trachea, larynx, lungs,

- **Organ systems** makeup an organism (animal)

ORGAN SYSTEMS

❑ Animals body has 11 organ systems

1. Integumentary system (skin)
2. Skeletal system (bones)
3. Muscular system (muscles)
4. Digestive system (stomach & intestines)
5. Nervous system (nerves)
6. Circulatory system (heart & blood vessels)
7. Respiratory system (lungs & passageways)
8. Urinary system (kidneys & bladder)
9. Endocrine system (glands & hormones)
10. Reproductive system (organs involved in producing offspring)
11. Lymphatic system (D

FUNCTIONS OF THE ORGAN SYSTEMS

ORGAN SYSTEM	MAIN COMPONENT	MAIN FUNCTION
DIGESTIVE	mouth, stomach, intestines, liver, pancreas, anus	FOOD PROCESSING (dig, absorption & elimination)
CIRCULATORY	Heart, blood vessels, blood	Internal distribution of materials
RESPIRATORY	Lungs, trachea	Gas exchange (uptake of oxygen, removal of CO2
EXCRETORY	Kidney, ureter, urethra, bladder	Disposal of metabolic waste, regulation of osmotic balance of blood
ENDOCRINE	Pituitary, thyroid, pancreas, hormone secreting glands	Coordination of body activities eg digestion & metabolism
REPRODUCTIVE	Ovaries, testes & associated organs	reproduction
NERVOUS	Brain, spinal cord, nerves, sensory organs	Coordination of body activities: detection of stimuli, formulation of responses

FUNCTIONS OF THE ORGAN SYSTEMS

ORGAN SYSTEM	MAIN COMPONENT	MAIN FUNCTION
INTEGUMENTARY	SKIN & its derivatives (claw, hair, skin glands)	Thermoregulation & Protection against mechanical injury, infection.
SKELETAL	Bones, tendons, ligaments, cartilage	Body support, protection of internal organs, movement
MUSCULAR	Muscles	Movement, locomotion

INTERGRATED FUNCTION OF THE ORGAN SYSTEMS

- ❑ Study of anatomy & physiology is really the study of the animal machine, what makes it up, and how the whole thing works.
- ❑ The language of Anatomy & Physiology uses terms like cells, tissues, organs & systems, but we're really talking about the component parts of this living machine.
- ❑ The functions of the components delicately interrelated.
- ❑ One must understand how animals are put together & how their bodies work.
- ❑ The various parts of the body must work together in near-perfect harmony to maintain the life & well-being of an animal.

INTERGRATED FUNCTION OF THE ORGAN SYSTEMS

- ❑ Organ systems keep the body regulated & in a stable state.
- ❑ These organ systems often work together & rarely work in isolation.
- ❑ The function of an organ system depends on the integrated activity of its organs. For instance, digestive system organs cooperate to process food.
- ❑ The survival of the organism depends on the integrated activity of all the organ systems coordinated by the endocrine & nervous systems
- ❑ In turn an animal is able to **move**, **feed**, **respire** (burn food to make energy), **grow**, sense their environment, **excrete** and reproduce. All these activities are necessary to keep the animal alive

- ❖ Disease and death often result from the *absence of normal body structure and functioning.*
- ❖ Normal anatomy & physiology are critical to an animal's health and survival, and our knowledge of them is critical to our ability to *influence* the animal's health and survival in cases of disease or injury

HOMEOSTASIS

- Homeostasis is the process by which an organism maintains a stable relatively constant internal environment.
- maintaining steady internal environment involves controlling the following;

✓ Temperature range
- ✓pH
- ✓fluid balance (eg Na, K, Ca level) e.t.c
- ✓Ion concentration
- ✓Dissolved oxygen concentration
- ✓wastes, hormones
- ✓ enzyme production, blood pressure etc

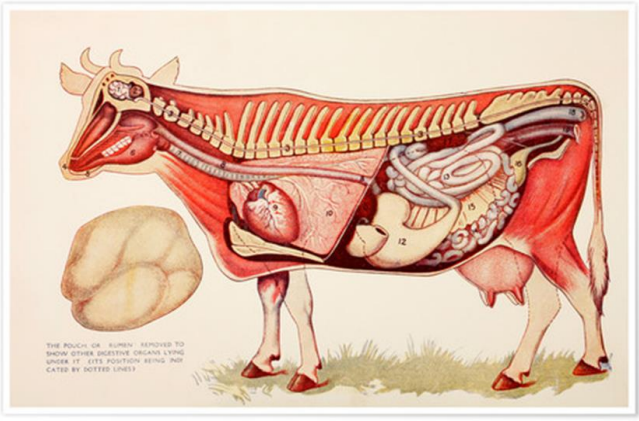
- The body adjusts to ongoing internal & external changes to maintain constant internal conditions.

WHY IS IT IMPORTANT TO MAINTAIN HOMEOSTASIS IN THE BODY?

- To maintain cellular function
  - Cells depend on the body's environment to live and function

- When body conditions are wrong, certain processes will not function properly
- Once homeostasis is disturbed, disease or death may result
- The whole body is responsible for homeostasis

POSITION OF DIFFERENT ORGANS



LEVELS OF ORGANISATION

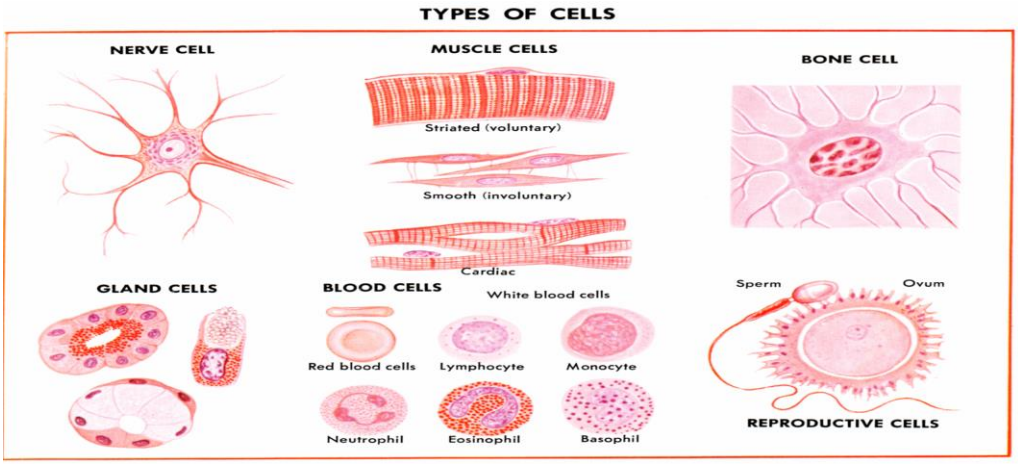
- **Cell** – A functional unit of an animal
- **Tissue** –Tissues are groups (sheets) of similar cells that have a common function
- **Organs** - structures made up of two or more tissues organized to carry out a particular function,
- **Organ system** – A number of organs that work together to accomplish a common purpose. Eg digestive system

THE CELL

- The cell is a basic unit of living things.
- It can exist alone as a single, free-living plant or animal, or it can combine with other cells to form elaborate complex organisms, such as trees, horses & people.
- The cell is dynamic & performs all of the functions by which life is defined.
- It has a metabolism, can grow, develop, reproduce, adapt, respire, become influenced by outside stimuli, maintain a stable internal environment & convert food into usable energy.

EXAMPLES OF CELLS

- Cells have diverse morphology (shape & structure)
- Shapes & sizes vary due to having specialised functions



EXAMPLES OF CELLS

- In a **multicellular** organism eg cow, cells have differentiated & become grouped into specialized tissues that work collaboratively to sustain life for the animal as a whole. These tissues, as well as the systems they form, are the focus of anatomy & physiology, but it is important to remember that their functional unit is the cell.
- It is in the cell that molecular messages are transmitted and received, electrical impulses generated, oxygen absorbed, and energy manufactured.
- Thus we must first learn about cells before we can understand the anatomy & physiology of the tissues & systems they compose.

CELL – AS SEEN WITH AN ELECTRON MICROSCOPE

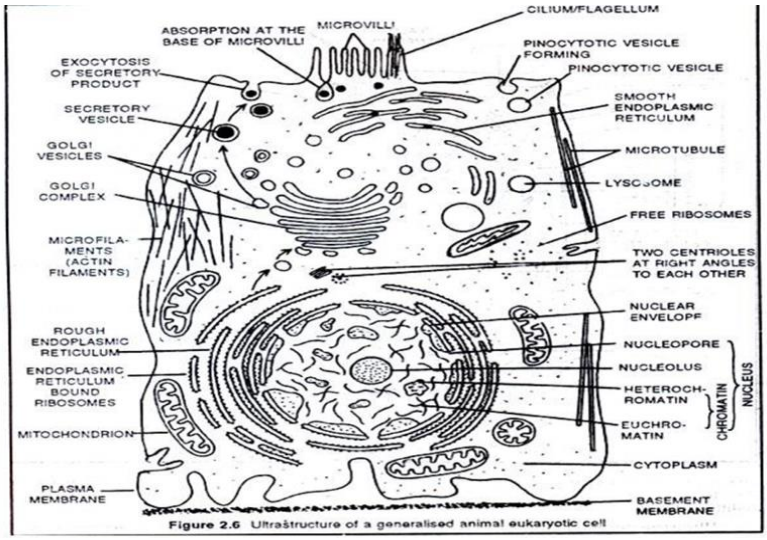
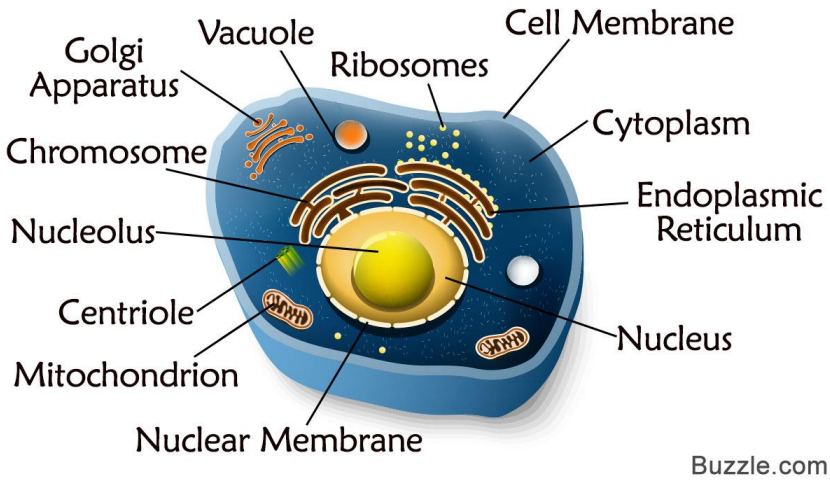
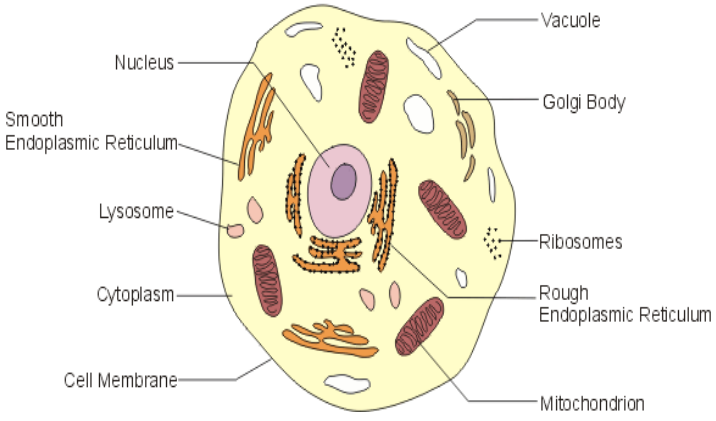


Figure 2.6 Ultrastructure of a generalised animal eukaryotic cell

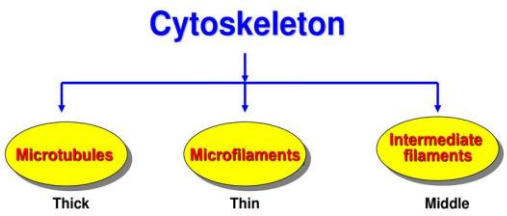
ORGANELLES WITHIN THE CYTOPLASM

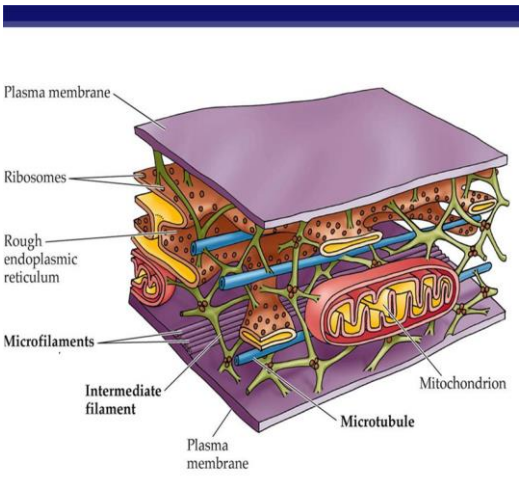


ORGANELLES WITHIN THE CYTOPLASM



PARTS OF A CYTOSKELETON





CYTOSKELETON

- It is a network of fibers that organize the structures & activities of the cell
- It provide mechanical support & maintains the shape of the cell
- it also provides anchorage for the organelles