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Department of Biomedical Engineering

Course Name: 19GET277 – Biology for Engineers

IV Year : VII Semester

UNIT II – Biodiversity

Topic : Animal Body System

- As with any other living organism, an animal's body is made up of building blocks called **cells**

- Cells are organized into <u>successive</u> layers, each with its own specific form and function

- **Cells** that look similar and perform similar functions come together to form **tissues**.

- Different types of tissues construct functional **organs**.

- Organs that work together make up an **organ system** (or **body system**).

- Different **organ systems** work together to perform specific functions to sustain the life of an **organism**.

Animal Body system

- An **animal body system** is a collection of organs that work together to perform specific life-sustaining functions in **animals**.

- **Each organ system has its own organ composition**, with tissues that can be specific to only that organ, or shared among different organs. To understand this better we will go into more detail about some specific organ systems.

- **Each animal organ system also has its own function**. It's of vital importance for the animal's life that all organ systems perform their function well.

The Respiratory System

- All cells need [oxygen](#), the crucial ingredient for extracting energy from organic compounds.

- Animals obtain oxygen from their environment with their respiratory systems.

- The lungs of land-dwelling vertebrates gather oxygen from the air, the gills of ocean-dwelling vertebrates filter oxygen from the water, and the exoskeletons of invertebrates facilitate the free diffusion of oxygen (from water or air) into their bodies.

- The respiratory systems of animals also excrete carbon dioxide, a waste product of metabolic processes that would be fatal if left to accumulate in the body.

The Digestive System

- Animals need to break down the food they eat into its essential components in order to fuel their metabolism.

- Invertebrate animals have simple digestive systems—in one end, out the other (as in the case of worms or insects).

- But all vertebrate animals are equipped with some combination of mouths, throats, stomachs, intestines, and anuses or cloacas, as well as organs (such as the liver and pancreas) that secrete digestive enzymes.

- Ruminant mammals such as cows have four stomachs in order to efficiently digest fibrous plants.

The Reproductive System

- The most important organ system from the perspective of evolution, the reproductive system enables animals to create offspring.

- Invertebrate animals exhibit a wide range of reproductive behavior, but the bottom line is that at some point during the process, females create eggs and males fertilize the eggs, either internally or externally.

- All vertebrate animals—from fish to reptiles to human beings—possess gonads, which are paired organs that create sperm (in males) and eggs (in females).

- The males of most higher vertebrates are equipped with penises, and the females with vaginas, milk-secreting nipples, and wombs in which fetuses gestate.

The Urinary System

- All land-dwelling vertebrates produce ammonia, a by-product of the digestion process. In mammals and amphibians, this ammonia is turned into urea, processed by the kidneys, mixed with water, and excreted as urine.

- Interestingly, birds and reptiles secrete urea in solid form along with their other wastes.

- These animals technically have urinary systems, but they don't produce liquid urine.

- Fish expel ammonia directly from their bodies without first turning it into urea.

The excretory system

The main components of the **excretory system** are:

- the kidneys,
- the ureters,
- the urinary bladder, and
- the urethra.

- It is responsible for **disposing of organic wastes** and **regulating the volume of internal body fluids**.

The circulatory system and blood

- The organs of the circulatory system are the heart and the blood vessels (tubes). The heart is found in the chest cavity. It is a muscular pump which sends blood around the body.

- The blood vessels which carry blood away from the heart are called arteries. Blood returns to the heart in veins.

- Joining the arteries and veins is a fine network of small tubes called capillaries. The capillaries pass through every part of the body.

- When the heart beats its muscles contract and sends blood out through the arteries. When the heart relaxes blood flows into it from the veins.

- Every time the heart beats it sends a pulse along the arteries. You can feel it at certain points on the body. By feeling the pulse we can count the rate at which the heart beats. You can feel your pulse on your wrist.

Animal organ system	Components	Function
Digestive system	•Mouth, •Stomach, •Oesophagus •Pharynx, •Intestines, •Liver, •Pancreas •Rectum and anus.	•Nutrition: breaking down food and absorbing nutrients
Skeletal system	•Bones, •Tendons, •Ligaments, •Cartilage.	•Provide structural support to the body •Protect the internal organs •Enable the body to move •Produce blood cells in the bone marrow •Store minerals like calcium and phosphorus. Keep the acid-base balance in the body
Muscle system	•Muscle fibres	•Support and movement of the body •Blood pressure regulation
Integument system	•Skin •Hair •Nails •Sweat glands	•Protection from injuries and infections •Heat regulation

Reproductive system	•Female reproductive system:
	  • Vulva
	  • Vagina and cervix
	  • Uterus
	  • Fallopian tubes
	  • Ovaries
	•Male reproductive system:
	  • Penis and corpus cavernosum
	  • Epididymis
	  • Testes
	  • Prostate gland
	  • Seminal vesicles
	  • Urethra
	  • Vas deferens
		•Producing gametes for animals that reproduce sexually
		•Sexual hormone production (progesterone, estrogen, testosterone)

Respiratory system	•Nose •Lungs, •Larynx, •Trachea, •Lungs •Bronchi.	•Gas exchange (uptake of oxygen and removal of carbon dioxide from the body)
Circulatory system	•Heart •Blood vessels •Blood	•Nutrient and other substance distribution around the body •Maintaining **homeostasis** in the body

Immune and lymphatic systems	•Lymph vessels •Lymph nodes, •Bone marrow •Thymus •Spleen	•Fighting against infections and cancerous cells
Endocrine system	•Pituitary gland •Thyroid gland •Pancreas •Adrenal gland •Other hormone-secreting glands (e.g. ovary, testis)	•Control system •Coordinate responses
Nervous system	•Brain •Spinal cord •Nerves •Sensory organs	•Control system •Coordinate responses •Process stimuli
Excretory system	•Kidneys •Ureters •Urinary bladder •Urethra	•Disposing of organic waste •Regulating internal body fluids