

AUTONOMOUS NERVOUS SYSTEM

- **Autonomous Nervous System** is partly independent and not under voluntary control. This serves as an intermediary through which the central nervous system controls the involuntary activities of the animal.
- It is of two types:
 - I. Sympathetic Nervous System
 - II. Parasympathetic Nervous System
- **1. Sympathetic Nervous System:** This is also referred to as **thoracolumbar** outflow, because its outflow is by preganglionic fibres of thoracic and lumbar spinal nerves.
- There is a chain of small sympathetic ganglia from neck to the end of abdomen at the lateral sides of dorsal aorta and beneath the **vertebral column**.
- These ganglia on each chain are **two cervical**, superior and inferior cervical, **12 thoracic**, **six or seven lumbar** and **three or four sacral ganglia**.
- The sympathetic ganglia are connected with **the rami communicans** through preganglionic fibers.
- Next a few anterior thoracic nerves through their preganglionic nerve fibres go the ganglia on the sympathetic chain. The postganglionic nerve fibres from these ganglia innervate heart and lungs.
- Preganglionic nerve fibres in lower thoracic and upper lumbar regions join outside the chain to form a **coeliac ganglion**, from their join a **superior mesenteric ganglion**. Post ganglionic nerve fibres innervate stomach, liver, spleen, small intestine and anterior part of large intestine.
- Nerve fibres from sympathetic chain of lumbar region join **hypogastric** or **inferior mesenteric** ganglion that gives off nerves got posterior part of large intestine, urinary bladder, kidneys and gonads.
- **2. Parasympathetic Nervous System:** This is also called as **craniosacral outflow**. Its outflow is by the preganglionic nerve fibres of III, VII, and IX and X cranial nerves and 2nd, 3rd and 4th sacral spinal nerves. The preganglionic fibres join the ganglia, which are close to the organs.
- The III cranial nerve runs to the ciliary ganglion in the orbit and nerve fibres from these supply muscles of iris.
- The parasympathetic fibres from the VII cranial nerve supply to the lacrimal gland, mucous membrane of nasal chamber, sub-maxillary and sub-lingual salivary glands.

- Parasympathetic nerves from IX cranial nerve supply to oral mucosa, parotid gland and otic ganglion. Parasympathetic fibres from X cranial nerve innervate heart, lungs, stomach, liver, pancreas, small intestine and anterior part of large intestine.
- The nerve fibres, of the sacral region unite to form **pelvic ganglion** on each side. The nerve fibres from this ganglion supply to the posterior part of large intestine, urinary bladder, kidney and gonads
- Sympathetic and parasympathetic nerves innervate the same organs, but their effects are usually antagonistic. Hence, it is also called **accelerator and brake system** of the body.
- The nerve endings of sympathetic system produce a substance called sympathin which increases the heart beat, dilates the blood vessels in muscles, constricts peripheral blood vessels thereby increasing the blood pressure, dilates iris of the eye and, bronchi and, inhibits the activities of the gut etc.
- Parasympathetic nerves secrete **acetyl choline**. The secretion slows down heart beat, decreases the blood pressure, constricts the pupil of the eye and bronchi and increases the peristalsis of the gut etc.
- The autonomous nervous system also controls the secretion of exocrine and endocrine glands.
- **Reflex reactions:** Reflex reactions are the simplest responses and basic units of nervous coordination.
- Watering of mouth at the sight of food and blinking of eyes due to sudden appearance of an object are some common examples of **somatic reflex reactions**.
- Reflex reaction is an immediate involuntary response to a stimulus. Reflex responses occur very fast because the responses are without the sensory impulse being carried to brain centre for analysis.
- Thus reflex reactions protect the body against injurious effects of sudden stimuli. The entire impulse circuit of a reflex response is called a reflex arc
Receptor → CNS → effectors
- Reflexes developed by training and learning are called **conditioned** or **acquired reflexes**.
- E.g. Dancing, cycling etc. Some reflexes like breeding, migration are genetic and are inherited. These are called **unconditioned reflexes**.