NERVOUS SYSTEM

In cockroach nervous system includes

a) Central nervous system
b) Peripheral nervous system
c) Autonomous nervous system

Central nervous system

- It includes nerve ring, double ventral nerve cord and segmental ganglia.
- In cockroach nerve ring is present around the oesophagus.
- Nerve ring is formed by a pair of **supra oesophageal ganglia,** a pair of **sub- oesophageal ganglia,** a pair of **circum oesophageal connectives** which connect them.
- Supra oesophageal ganglia or brain is present on dorsal side of oesophagus. The brain is mainly a **sensory** and an **endocrine center** releasing hormones into the hacmolymph.
- A pair of subocsophageal ganglia that lies below the oesophagus. It is the **motor center** that controls the movements of mouth parts, legs, wings.
- A pair of circumocsophageal connectives lhat is present around the oesophagus, connecting the supraocsophageal ganglia with the subocsophageal ganglia.

Ventral nerve cord

- In cockroach ventral nerve cord is present on ventral side of A.C
- It consists of two longitudinal nerves which are solid. Hence it is described as double solid ventral nerve cord.
- The nerve cord extends in between sub- oesophageal ganglia and the last abdominal ganglia present in the 7th segment.

Segmental ganglia

- Total no. of segmental ganglia in cockroach are **9.** Among them 3 are present in thoracic region and 6 in the abdominal region.
- In cockroach abdominal ganglia are present in ^,2,3,4,6 and 7 segments.
- Abdominal ganglia are absent in 5, 8, **9 and 10** segments.
- The largest abdominal ganglion is 6th ganglion present in 7th abdominal segment.

b) Peripheral nervous system

- It includes nerves which arise from CNS and supply to the different parts of the body.
- From the brain **3 pairs** of nerves arise and supply to compound eyes, antennae and labrum and also to frontal ganglion.
- Sub-oesophagcal ganglia gives off **3 pairs** of nerves to mandibles, maxillae and labium.
- Thoracic ganglia supply nerves to legs and wings.
- Metathoracic ganglia send nerves to first abdominal segment. Nerves from each of the first five abdominal ganglia innervate all organs of each of the segments, two to six serially (1 to 4 ganglia innervate segments 2 to 5 respectively and 5''' ganglion innervates the 6''' segment).

- All organs present in 7^{lh} to 10^{lh} segments receive nerves from the **last abdominal ganglion.** The organs include the reproductive organs, copulatory appendages besides anal cerci.
- Abdominal ganglia supply nerves to body wall and other parts in those segments.
- The last abdominal ganglion supply neves to 7th, 8th, 9th and 10 th segments including anal cerci and anal styles in males.

c) Autonomous nervous system

- Autonomous is also called somatogastric or visceral nervous system.
- It includes 4 nerve ganglia and nerves which connect them and supply to visceral organs.
- The nerve ganglia are
- Frontal ganglion - present on pharynx, just infront of the brain.
- Occipital ganglion or Hypoccrebral ganglion - Present behind the brain above the oesophagus.
- Visceral ganglion orlngluvial ganglion - present on the wall of crop.
- Provenlricular ganglion : It is present on gizzard.
- Stomatogastric nervous system supply nerves to alimentary canal heart and other visceral organs. It regulates the functions of those organs hence it is called visceral nervous system.

SENSE ORGANS

- In cockroach sense organs are Scnsillae and compound eyes
- Sensilla arc the sensory units of sense organs

Structure of sensillum:

Each sensillum consists of a trichogen cell with a movable hairlike process, tormogen cell that forms the socket around the base of the movable hair and a sensory neuron which starts at the base of the hair and conducts impulses to the central nervous system.

Scnsillae arc different types.

- **Thermoreceptor sensilla** of cockroach arc located in the 1st, Ilnd, Illrd segment of the tarsus of legs.
- **Photoreceptors** are sensitive to light present in compound eyes and ocelli.
- **Olfactory sensilla** arc chemorcceptors sensitive to smell. Present on antennae, maxillary palps and labial palps.
- **Gustatory sensilla** arc chemoreccptors sensitive to taste. Present on inner surface of the labium, maxillary palps and labial palps.
- **Chordotonal sensilla** are a kind of mechanoreceptors, which are sensitive to ground vibrations and sound vibrations. They occur on **anal cerci and pedicel** of antennae.

Simple eyes

- A pair of simple eyes are present on the dorsal side of head and nearer to the base of antennae.
- Simple eyes act as photoreceptors. They arc also called **fenestrae or ocelli.**
- In adult cockroach, simple eyes are also treated as reduced or vestigeal eyes.
- In cockroach both simple eyes and compound eyes act as photoreceptors.