Excretion in Annelida:

Excretion is the process of removal of nitrogenous waste which are produce during metabolism. In Annelida excretion takes place by means of minute coiled tubes which are segmentally arrange is called **Nephridia**. Nephridia are internally ciliated and open in the coelom through an opening called **Nephrostome** that receives body fluid. The cells of the Nephridia separate the waste products by way of ultrafiltration from the **haemocoelomic fluid**. The Nephridia also remove the excess of water from the body and thereby regulating the osmotic pressure of the haemocoelomic fluid. The excretory fluid flows through the central canal and is finally collected into the terminal vesicle and then discharged to the exterior through the Nephridiopore. **Aquatic** species excrete **ammonia** and **terrestrial** species excretes **urea.**

(A) Nephridia:

Nephridia is the fundamental unit of excretory system. They are minute coiled tubes of ectodermal origin. They are-

i. **Embryonic and permanent Nephridia**:

Embryonic Nephridia are temporary and disappear along with the development of permanent ones. They are two type embryonic **head Nephridia** and embryonic **trunk Nephridia**. Permanent Nephridia remain through the life of the organism.

ii. **Proto Nephridia and Meta Nephridia**:

Based on the presence and absence of the Nephrostome, Nephridia may be **open or closed** type. **Proto Nephridia** are **primitive** type and **closed**. The nephrostome through which the Nephridia open in the coelom is absent**. Meta Nephridia** is more advanced type with Nephrostome. They open at both ends.

iii. **Micro/Mero Nephridia and Mega/Holo Nephridia**:

Based on size and number Nephridia divided as **Micro and Mega** Nephridia. **Micro** Nephridia are **small** in size and **numerous** in each segment, **Mega** Nephridia are **large** in size but usually **one pair** is found in each segment.

iv. **Exonephric and enteronephric**:

Nephridia that released the waste material **directly** outside are called **exonephric** and **enteronephric** Nephridia releases the waste material into the lumen of the **alimentary canal**.

In majority of annelids, paired meta-nephridia are present that contains ciliated nephrostome via which they open into the coelom. In some adult annelids Proto Nephridia are found. Both Meta Nephridia and separate coelomoducts are found in a few annelids. The number of nephridia is usually reduced in Annelids with incomplete septum. In some forms, Nephridia found in **anterior region are excretory** whereas the Nephridia of the **posterior region are used for both spawning and excretion.**

Functions of nephridia:

i. Nephridia help in excretion of nitrogenous waste products from the body to the exterior.
ii. They help in maintaining water balance of the body.
iii. It helps in regulating the osmotic balance.
iv. They secondarily help in reproduction. In some cases, they act as gonoducts.

(B) Coelomoducts:

Coelomoducts are segmentally arranged wide tubes of mesodermal origin. It also helps in excretion. At one end they open outside by the means of genital pores and at the other end, they open into the coelom by large ciliated funnels, the coelomostome. Coelomoducts primarily help in reproduction and secondarily as excretory organs.

Nephromixia :

Coelomoducts may remain fused partially or wholly with nephridia to form Nephromixia. It serves for both excretion as well as exit of gametes. According to degree of combination nephromixia are------

Protonephromixia : When a protonephridium is fused with coelomoduct, the combination is called Protonephromixium.

Metanephromixium: When metanephridium remain fused with coelomoducts, it is known as Metanephromixium.

Mixonephridium: in some cases nephridium and coelomoduct are intimately fused together to form a simple organ. In this form, the coelomoduct forms the funnel and the nephridium forms the ducts.

(C) Chloragogen cells:

In some Annelids, yellow cells called chloragogen cells are present surrounding the intestine. They are derived from the coelomic epithelium of the alimentary canal and take up nitrogenous waste products from the blood capillaries of the gut and deposit them as yellow granules in their cytoplasm. These cells are also involved in neutralizing toxins deamination of proteins and synthesis of urea and ammonia. Their function is similar to that of liver in vertebrates.

Physiology of Excretion: Nephridia help in the removal of excretory waste both from blood and coelomic fluid. It is richly supplied with blood vessels. The dissolved nitrogenous waste from blood diffuses into the lumen of the nephridia from where they move to the nephridial ducts. As the fluid travels through these tubes, nutrients and water are reabsorbed while the concentrated waste fluid is released directly to the exterior by nephridiopores or into alimentary canals. Water is reabsorbed through the wall of the alimentary canal and again utilized by the animal. Thus, excessive loss of water is checked by the enteronephric system which is advantageous to the animal found in dry condition. Nephrostome found in metanephridia, is the funnel by which the nephridia communicate with the coelom. By the ciliary action of the nephrostome and tubules, the nitrogenous waste is drawn into the nephridia from the coelom and passed out.