Invertebrate excretory systems

Invertebrates such as echinoderms, cnidarians, and sponges, have no organs to which an excretory function can be confidently ascribed. Since all of these animals are aquatic, it is reasonable to suppose that they excrete nitrogen (as ammonia) by simple diffusion.

In freshwater invertebrates the urine is commonly, though not invariably, more dilute than the body fluids. By producing dilute urine a freshwater invertebrate conserves the salt content of its body while eliminating the water that enters its body by osmosis through its water-permeable surface.

There appear to be five main types of invertebrate excretory organ: contractile vacuole,

nephridium,

renal gland,

coxal gland,

malpighian tubule.

Contractile vacuoles of protozoans:

Some protozoan animals possess an organelle having the form of an internal sac, or vacuole, which enlarges by the accumulation of a clear fluid and then discharges its contents to the exterior. The cycle of filling and emptying may be repeated as frequently as every half minute. The chief role of the contractile vacuole appears to be in osmotic regulation, not in nitrogen excretion. Contractile vacuoles occur more frequently and are more active in freshwater species than in closely related marine species.

Nephridia of annelids, nemertines, flatworms, and rotifers

The word nephridium applies in its strict sense only to the excretory organs of annelid. Annelids are segmented animals that typically contain a pair of nephridia on each segment. Each nephridium has the form of a very fine tubule, often of considerable length; one end usually opens into the body cavity and the other to the exterior.

In some annelids, however, the tubule does not open into the body cavity but ends internally in a cluster of cells of a special type known as solenocytes, or flame cells. Animals belonging to all of these phyla are primarily aquatic, and, in the few cases known, the main excretory product is ammonia.

Body fluid enters the nephridium via an internal opening called the nephridiostome. As the fluid passes along the tubule, probably driven by cilia, its composition is modified. In the two lower regions of the tubule the fluid becomes progressively more dilute, presumably as a result of the reabsorption of salts. Finally, a very dilute urine passes into the bladder (an enlarged portion of the tubule) and then to the exterior through the external opening, or nephridiopore. The rate of urine flow for an earthworm may be as much as 60 percent of its body weight in a period of 24 hours.

Renal glands of molluscs

The renal gland is a relatively wide tube opening from a sac (the pericardium) surrounding the heart, at one end, and to the mantle cavity (effectively to the exterior) at the other.

The vast majority of mollusks are aquatic and excrete nitrogen in the form of ammonia. In octopuses, however, nitrogen is excreted as ammonium chloride, which is quite strongly concentrated in the urine. Terrestrial snails and slugs excrete uric acid but may also excrete ammonia when living in moist surroundings.

Coxal glands of aquatic Arthropods

Coxal glands are tubular organs, each opening on the basal region (coxa) of a limb. Since arthropods are segmented animals, it is reasonable to suppose that the ancestral arthropod had a pair of such glands in every segment of the body. In modern crustaceans there is, as a rule, only a single pair of glands, and in higher crustaceans these open at the bases of the antennae. Its called as Antennary Gland or Green Gland.

In lobsters and marine crabs the urine in all parts of the organ has the same ion concentration as the blood.

In freshwater crayfishes the urine has the same concentration as far as the end of the labyrinth; from that point on reabsorption takes place in the canal and the urine leaves the body as a very dilute solution.

Malpighian tubules of Insects

The insects, have evolved an entirely different type of excretory system. The malpighian tubules, which vary in number from two in some species to more than 100 in others, end blindly in the body cavity (which is a blood space) and open not directly to the exterior but to the alimentary canal at the junction between midgut and hindgut.

Water is then reabsorbed together with the soluble products of digestion and other useful substances, including the bulk of the ions that entered the primary urine. In insects that live in dry surroundings the rectum has remarkable powers of reabsorption, its contents finally being voided as hard, dry pellets containing solid uric acid.