

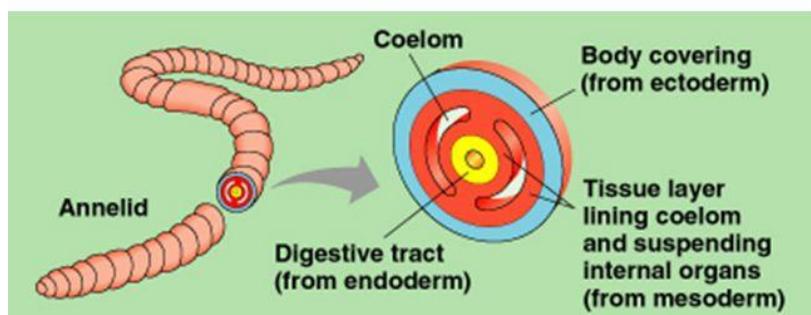
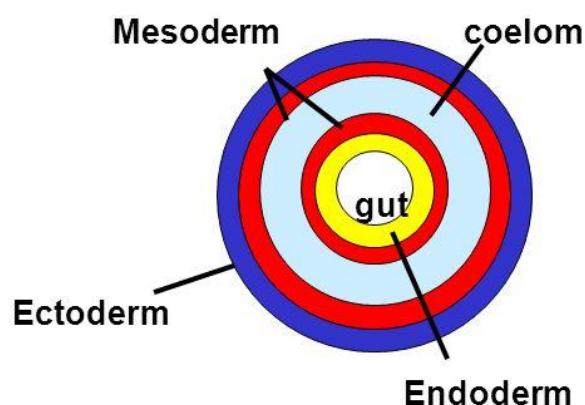
Coelom, Functions of a Coelom and its Importance

Coelom Definition

The coelom is a body cavity found in metazoans (animals that develop from an embryo with three tissue layers: ectoderm, mesoderm, and endoderm). The cells in each tissue layer become differentiated during development, becoming different tissues, organs, and a digestive tract. Derived from the mesoderm, the coelom is found between the intestinal canal and the body wall, lined with mesodermal epithelium. The mesodermal tissue also goes on to form the blood, bones, digestive tract, gonads, kidneys, and other organs. Organisms that possess a true coelom are called (true) coelomates.

Body Cavities

Eucoelomate-
body cavity
completely
lined with
mesoderm



True coelomates are often grouped into two categories: protostomes and deuterostomes. This distinction is based on patterns of [cell division](#), coelom formation, and the fate of the blastopore. In protostomes, the blastopore becomes the mouth. In deuterostomes, the blastopore becomes the anus.

Organisms that possess a body cavity that is not fully lined with mesodermal epithelium are called pseudocoelomates, while organisms that lack a body cavity are called acelomates.

Functions of a Coelom and its Importance

Absorb Shock

The coelomic cavity is filled with a fluid known as coelomic fluid, which serves to separate the organs from the outer body, and ultimately works to protect the organs from mechanical shock or trauma. The disconnect between the organs and the outer body also allows for greater ranges of movement and flexibility, as the organs are unperturbed by minor displacement as the body bends or stretches.

Hydrostatic Skeleton

In soft bodied animals, such as earthworms and many other invertebrates, the fluid filled coelom can act as a hydrostatic [skeleton](#). A hydrostatic skeleton is a type of structure that functions like a skeleton, but is supported by fluid pressure rather than bones. This allows movement in soft bodied animals.

Immune System Support

Coelomocytes play a key role in the immune system of most invertebrates. They are macrophage-like cells that are involved in important functions, such as [phagocytosis](#), inflammation, and the [secretion](#) of humoral factors that impart [humoral immunity](#).

Circulatory System

The coelomic fluid also facilitates the transport of gases, nutrients, and waste products between different parts of the body. Nutrients absorbed in the coelomic fluid are distributed to all parts of the body in a manner similar to that of a circular system, and any un-needed substances left after metabolic processing are excreted via the coelomic fluid. In fact, the emergence of the coelom in organisms has allowed for the evolution of larger body sizes because of this facilitated transport of materials.

Evolution and Development of the Coelom

The evolutionary history of the coelom is uncertain. There are two contending theories about the emergence of the coelom: the [acoelomate](#) theory and the enterocoel theory. The acoelomate posits that the coelom evolved from an acoelomate ancestor, while the enterocoel theory posits that the coelom evolved from gastric pouches of a cnidarian ancestor. While neither have been proven false, there is more research supporting the enterocoel theory.

The development of the coelom begins in the gastrula stage, and can be formed by one of two processes: schizocoely or enterocoely.

In schizocoely, a blind pouch called the archenteron forms as the embryo's digestive tube begins to develop. The mesoderm splits into two layers, one attaching to the ectoderm (which becomes the parietal layer) and the other surrounding the endoderm (which becomes the visceral layer). The space between these two layers becomes the coelom of the [organism](#).

In enterocoely, the mesoderm buds from the walls of the archenteron then hollows out to form the coelomic cavity.

Examples of Coelomates

Mollusks, Annelids, and Some Arthropods

Clams, snails, slugs, octopuses, earthworms, and are [protostome](#) coelomates, meaning they are formed from [head](#) to [foot](#) (or mouth to foot). The mouth first develops from the blastopore, which is the first developmental opening. Protostomes undergo spiral and determinate cleavage in the early embryonic stages, and the coelom is formed through the process of schizocoely.

Echinoderms and Chordates

Sea stars, sea urchins, fish, and humans are [deuterostome](#) coelomates, meaning they are formed from anus to head. The blastopore becomes the anus, and the mouth is formed later. Deuterostomes undergo radical and indeterminate cleavage in the early embryonic stages; the coelom is formed through the process of enterocoely.