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Structure and Evolution of Central Nervous System

Haung Chen*

Department of Neurology, Juntendo University, Tokyo, Japan

Commentary

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***For Correspondence:**
Haung Chen, Department of Neurology, Juntendo University, Tokyo, Japan
E-mail: chenhaung123@gmail.com

DESCRIPTION

The brain and spinal cord make up the majority of the Central Nervous System (CNS), which is a component of the nervous system. The brain coordinates and influences the activity of all sections of the bodies of bilaterally symmetric and triploblastic animals, all multicellular organisms aside from sponges and diploblasts; and integrates the information that is received, giving the CNS its name. It is a structure made of nerve tissue that runs the length of the body, from rostral (the nose end) to caudal (the tail end). It may have a brain at the rostral end that is larger. The meninges surround the spinal cord and brain in vertebrates

The meninges surround the spinal cord and brain in vertebrates. The brain is shielded from the majority of neurotoxins frequently found in food by the meninges, which act as a barrier to compounds dissolved in blood. The body fluid found outside the cells of all bilateral animals is replaced by cerebral spinal fluid, which is contained within the meninges and bathes the brain and spinal cord. The retina and optic nerve (cranial nerve II), as well as the olfactory nerves and olfactory epithelium, are all parts of the CNS in vertebrates. They have no intermediary ganglia because they are CNS components that connect directly to brain neurons.

In vertebrates, the brain is housed in the cranial cavity within the skull, while the CNS is contained within the dorsal body cavity. The spinal canal within the vertebrae is where the spinal cord is located. The interneuronal area in the Central Nervous System (CNS) is populated by numerous non-nervous support cells known as neuroglia or glia, which is the Greek word for "glue." Early in the development of the vertebrate embryo, a longitudinal groove on the neural plate gradually deepens and the ridges on either side of the groove (the neural folds) grow higher. Eventually, the neural folds meet, converting the groove into the neural tube, a closed tube. The process of creating a neural tube is known as neurulation. At this stage, the ventricular zone, a portion of the neural tube's walls, is home to proliferating neural stem cells. Through the process of neurogenesis, the neural stem cells, mostly radial glial cells, multiply and produce neurons, producing the basic structure of the CNS.

Both the brain and spinal cord are derived from the neural tube. Three brain vesicles (pockets) first separate from the anterior (or "rostral") region of the neural tube: The prosencephalon at the front, the mesencephalon, and the rhombencephalon between the mesencephalon and spinal cord. The prosencephalon then further separates into the telencephalon and diencephalon (by six weeks in the human embryo), while the rhombencephalon splits into the metencephalon and myelencephalon. The caudal, or back, end of the neural tube is where the spinal cord develops.

These vesicles continue to develop as a vertebrate grows. The first and second ventricles develop from the cavity of the telencephalon, which also develops into the striatum, hippocampus, and neocortex. The third ventricle is formed by the cavity of the diencephalon, which also contains the subthalamus, hypothalamus, thalamus, and epithalamus. The mesencephalon, which has a cavity that develops into the mesencephalic duct, gives rise to the tectum, pretectum, cerebral peduncle, and other structures (cerebral aqueduct). The medulla oblongata is formed by the myelencephalon, whereas the chambers of the metencephalon and myelencephalon grow into the fourth ventricle, respectively.