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Development and Significance of Human Brain

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Editorial

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EDITORIAL

The central nervous system is made up of the spinal cord and the human brain, which together make up the human nervous system. The cerebrum, brainstem, and cerebellum make up the brain. The majority of the body's functions are controlled by this organ, which also decides which commands to provide the rest of the body after analyzing, integrating, and coordinating the information it gets from the sense organs. The bones of the skull in the head house and guard the brain.

The neural plate is formed by the embryonic ectoderm at the start of the third week of development. The neural plate has enlarged by the fourth week of development, giving rise to a broad cephalic end, a less broad middle section, and a narrow caudal end. The prosencephalon, mesencephalon, and hindbrain are the precursors of these swellings, which are referred to as the primary brain vesicles (rhombencephalon).

The lateral borders of the plate near the neural folds are populated with neural crest cells, which are ectoderm derived. The neural folds constrict to form the neural tube in the fourth week, during the neurulation stage, bringing the neural crest cells together. With cranial neural crest cells at the cephalic end and caudal neural crest cells at the tail, the neural crest extends the entire length of the tube. Inside the tube, cells separate from the crest and travel in a craniocaudal (head to tail) wave. The brain is formed from cells at the cephalic end, and the spinal cord is formed from cells at the caudal end.

The crescent shaped cerebral hemispheres at the head are formed as the tube flexes during growth. On day 32, the cerebral hemispheres initially manifest.

The cephalic portion undergoes a severe forward bend at the beginning of the fourth week. The portion that is flexed becomes the forebrain (prosencephalon), the portion that is next to it that curves becomes the midbrain (mesencephalon), and the portion that is caudal to the flexure becomes the hindbrain (rhombencephalon). The three major brain vesicles, which make up these regions, are swellings that develop there. There are five secondary brain vesicles in the fifth week of development. An anterior telencephalon and a posterior diencephalon are formed when the forebrain divides into two vesicles. The cerebral cortex, basal ganglia, and other associated structures all develop from the telencephalon. Both the thalamus and the hypothalamus are produced by the diencephalon. The metencephalon and the myelencephalon are the other two regions of the hindbrain that divide. The cerebellum and pons develop from the metencephalon. The medulla oblongata develops from the myelencephalon. The brain divides into repeating units called neuromeres during the fifth week as well. These are referred to as rhombomeres in the hindbrain.

Gyrification, or the folding of the cortex, is a feature of the brain. The brain is smooth during little over five months of the prenatal development. The wrinkly morphology revealing the fissures that start to identify designate the brain lobes is obvious by the gestational age of 24 weeks. Although the reason for the cortex's wrinkling and folding is unclear, gyrification has been associated with intellect and neurological conditions, and several gyrification ideas have been put forth. Axonal tension, mechanical buckling, differential tangential expansion, and axonal tension are a few of the theories mentioned. It is evident that gyrification is not a random process but a sophisticated, developing process that produces fold patterns that are constant across people and the majority of species.

The lateral cerebral fossa is the first groove to develop in the fourth month. To fit into the constrained space, the increasing caudal end of the hemisphere must bend over in a forward motion. This covers the fossa and transforms it into the lateral sulcus, a much deeper ridge that distinguishes the temporal lobe. By the sixth month, additional sulci that distinguish the frontal, parietal, and occipital lobes have developed. The human genome has a gene called ARHGAP11B that may be crucial for gyrification and encephalization.