Neural Crest Derivatives

During embryological development, the final structures formed from neural crest cells are termed neural crest derivatives. These cells fall under the larger category of ectoderm, one of the three germ layers, along with mesoderm and endoderm. Neural crest cells originate from the neural plate during early neural development and exist transiently in the embryo before migrating to various locations where they then develop into adult structures. Neural crest derivatives can be recalled using the mnemonic CA MOTEL ASS. C is for craniofacial structures of the skull and A is for the arachnoid and pia mater. In the word MOTEL, M is for melanocytes, O for odontoblasts, T for tracheal cartilage, E for enterochromaffin cells, and L is for laryngeal cartilage. Then, A is for all ganglia, S for Schwann cells, while the second S stands for spiral septum.



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CA MOTEL ASS

CA Motel Ass

Neural crest cell derivatives can be remembered using the mnemonic CA MOTEL ASS: craniofacial structures, arachnoid and pia mater, melanocytes, odontoblasts, tracheal cartilage, enterochromaffin cells, laryngeal cartilage, all ganglia, schwann cells, and spiral septum.

Craniofacial Structures (skull)

Crane Building Face and Skull

The skull is made up of 8 cranial bones and 14 facial bones that articulate at sutures which are immobile, interlocking joints. During embryonic development, fibrinous spaces called fontanels exist between cranial bones that eventually fuse closed after birth.

Arachnoid and Pia Mater

Arachnid-spider and Pie

The leptomeninges surround the brain and spinal cord. The pia mater is the deepest and thinnest meningeal layer; on top of it lies the arachnoid mater. In between these two layers is the subarachnoid space, where cerebrospinal fluid (CSF) flows to support and nourish the central nervous system.

Melanocytes

Melons

These skin cells are found in the stratum basale which is the deepest layer of the epidermis and are responsible for producing the pigment known as melanin. One of the causes of albinism can be when neural crest cells fail to migrate to this skin layer; without melanocytes, the person is devoid of melanin and will appear diffusely pale.

Odontoblasts

O-dentist-blast

Odontogenesis, or tooth development, begins at 6 weeks in-utero. Odontoblasts make dentin, a calcified mineral that supports the overlying enamel of the tooth; these cells begin making dentin during the second trimester in-utero and will continue to do so throughout a person’s life.

Tracheal Cartilage

Trachea

The trachea is part of the lower airway; it is supported anteriorly by cartilaginous C-shaped rings, which are derived from neural crest cells.

Enterochromaffin (Adrenal Medulla)

Intestinal-chrome-fin

The adrenal gland is an endocrine gland that sits directly atop each kidney and consists of an outer cortex and an inner medulla. The adrenal medulla contains enterochromaffin cells that secrete the catecholamines epinephrine and norepinephrine at a 4:1 ratio into systemic circulation. A tumor of the adrenal medulla is called pheochromocytoma.

Laryngeal Cartilage

Larynx

The shape and support of the final part of the upper airway, the larynx, is provided by various cartilaginous structures. These include the thyroid cartilage, cricoid cartilage, and epiglottis, which protects the trachea from aspiration during swallowing. Another important structure are the arytenoid cartilages, as

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they play a role in phonation by influencing position and tension of the vocal cords.

All Ganglia

Gang-lions

Ganglia are groups of nerve cell bodies that serve as switchpoints for afferent nerves from the autonomic nervous system. They usually lie outside the CNS and organize the functioning between different organ systems. Anatomically, they are seen as swellings or nodes along a nerve fiber.

Schwann Cells

Swan

In the peripheral nervous system, Schwann cells myelinate one axon per cell (unlike oligodendrocytes in the CNS, which myelinate multiple axons). They also can help regenerate axons post-injury. Schwann cells can form tumors called schwannomas or acoustic neuromas when they are located near CN VIII.

Spiral Septum (Aorticopulmonary Septum)

Spiral Scepter

The fetal heart originally has one large outflow tract known as the truncus arteriosus. Once neural crest cells migrate to the primitive heart, they begin the formation of the aorticopulmonary septum, which as it develops, spirals upwards and creates separation between outflow tracts of the right and left ventricles into the respective pulmonary arteries and aorta. If this spiraling of the septum fails to occur, a defect known as transposition of the great vessels can occur, in which outflow tracts of the ventricles are switched and the infant manifests with cyanosis at birth.

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