ANATO-BEE

Embryology Learning Objectives for the Anato-Bee

Anato-Bee Learning Objectives were obtained from the American Association for Anatomy, Anatomical Curriculum Task Force, and adapted by the co-founders of the Anato-Bee.

TOPIC	LOCAL OBJECTIVES	REGIONAL OBJECTIVES
General Terminology	Distinguish the difference between embryonic/fetal age & gestational age.	Discuss the differences between the embryonic and fetal periods of development in terms of susceptibility to teratogens. Define the "critical period of development for an organ or organ system.
	Define the term teratogen; identify several examples and discuss the effects of each.	
Gametogenesis	Describe the process of spermatogenesis.	
	Explain the process of oogenesis.	
Fertilization and Implantation	Describe the pre-implantation development of the embryo from zygote to blastocyst.	Explain the process of implantation including the development of the trophoblast.
Gastrulation	Describe the transformation of a bilaminar disc into a trilaminar disc (ectoderm, mesoderm, endoderm).	List the three subdivisions of the intraembryonic mesoderm and identify the major anatomic derivatives of this germ layer.
	Identify the primary derivatives of the ectoderm.	
	Explain where blood cells form at different stages of development.	
	Identify the general anatomic derivatives of the endoderm.	
Neurulation	Describe the formation of the neural plate and outline the steps in its transformation into a neural tube.	Discuss the anatomic basis of various congenital anomalies of abnormal neural tube closure.
	Define the origin and migration of neural crest cells.	
Formation of Body Cavities		Explain how the common embryonic body cavity becomes separated into pericardial, pleural, and abdominopelvic cavities.
Musculoskeletal System	Describe how the limb skeleton is formed from limb mesenchyme derived from somatic mesoderm.	Describe somite formation and differentiation of somites into sclerotomes and dermomyotomes.

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Cardiovascular System	Explain how the right and left atria are formed, and how they are separated by formation of the interatrial septum.	Describe limb rotation and its effect on the adult form and dermatome pattern of the limbs.
	Describe how the interventricular septum is formed.	Describe the subdivision of the outflow region of the heart and aortic sac into ventricular outlets, the pulmonary trunk, and ascending aorta.
		Explain the differences between fetal and neonatal circulation and the changes that occur in the fetal pattern as a result of birth.
Respiratory system	Explain how the trachea, bronchial tree, and lungs are formed from the respiratory diverticulum and the surrounding splanchnic mesoderm.	Describe the errors of development in patients with tracheoesophageal fistula (TEF) and/or esophageal atresia.
		Describe the four phases of lung maturation, listing major events in each period; apply this knowledge to recognize (&/or solve) clinical problems that may arise in a premature birth.
Gastrointestinal (GI) System	List the organs that are derived from the foregut, midgut, and hindgut portions of the gut tube.	Explain the vascular and nerve supply of adult derivatives of each region of the gut tube.
Urinary and Reproductive Systems	Explain the formation of the male reproductive organs: testes, genital ducts, seminal vesicles, prostate, penis and scrotum.	Compare the development of the mesonephric and metanephric kidneys from the intermediate mesoderm. Explain the formation of the nephron and collecting system.
	Explain the formation of the female reproductive organs: ovary, uterine tubes, uterus, vagina, labia and clitoris.	
Placenta and Fetal Membranes	Describe the extra-embryonic membranes: amnion, chorion, yolk sac, and allantois.	Describe the development and function of the placenta.
Head and Neck	Define the terms pharyngeal arch, pharyngeal pouch, and pharyngeal groove.	List the skeletal components, muscle groups, nerves and arteries associated with each pharyngeal arch.

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		Name the structure in the adult that is derived from the first pharyngeal groove.
		Describe the structures in the adult that are derived from the pharyngeal pouches.