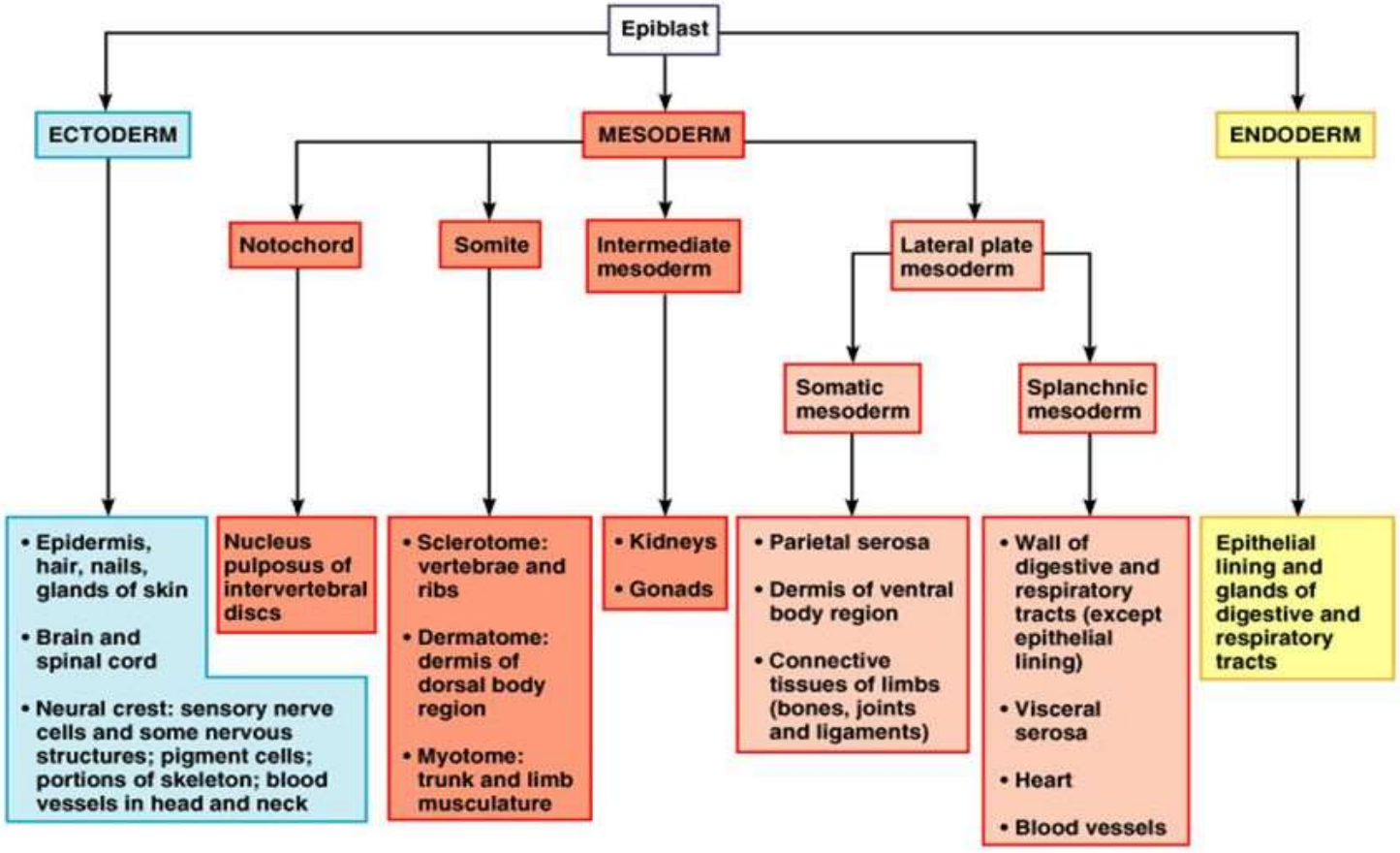
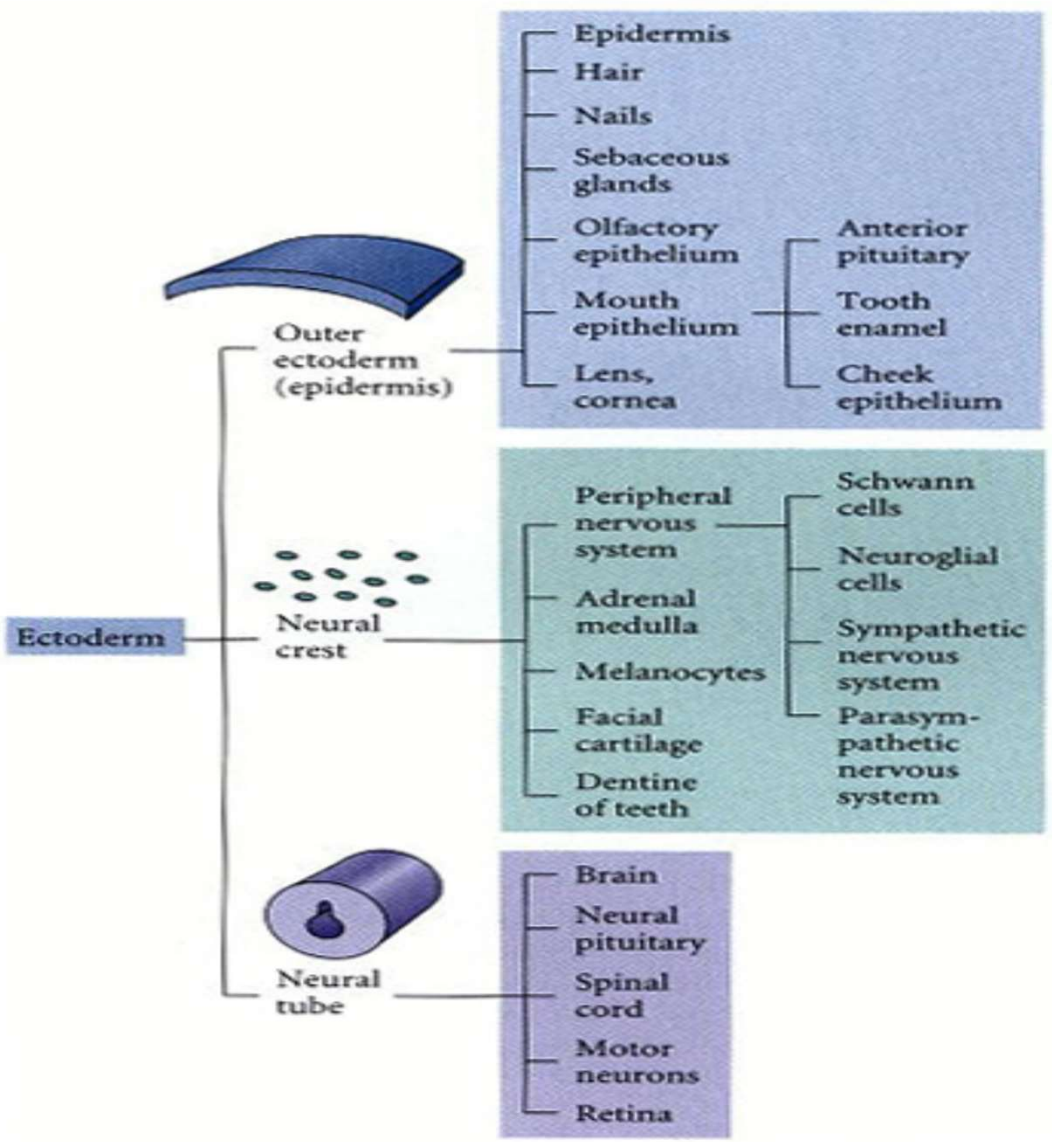
GERM LAYERS: FATE MAP

Major derivatives of the embryonic germ layers



Ectoderm


Ectoderm
Outer ectoderm (epidermis)
Epidermis
Hair
Nails
Sebaceous glands
Olfactory epithelium
Mouth epithelium
Lens, cornea
Anterior pituitary
Tooth enamel
Cheek epithelium
Neural crest
Peripheral nervous system
Adrenal medulla
Melanocytes
Facial cartilage
Dentine of teeth
Schwann cells
Neuroglial cells
Sympathetic nervous system
Parasym-pathetic nervous system
Neural tube
Brain
Neural pituitary
Spinal cord
Motor neurons
Retina

Neural Crest and its Derivatives

The neural crest cells migrate extensively to generate a prodigious number of differentiated cell types. These cell types include

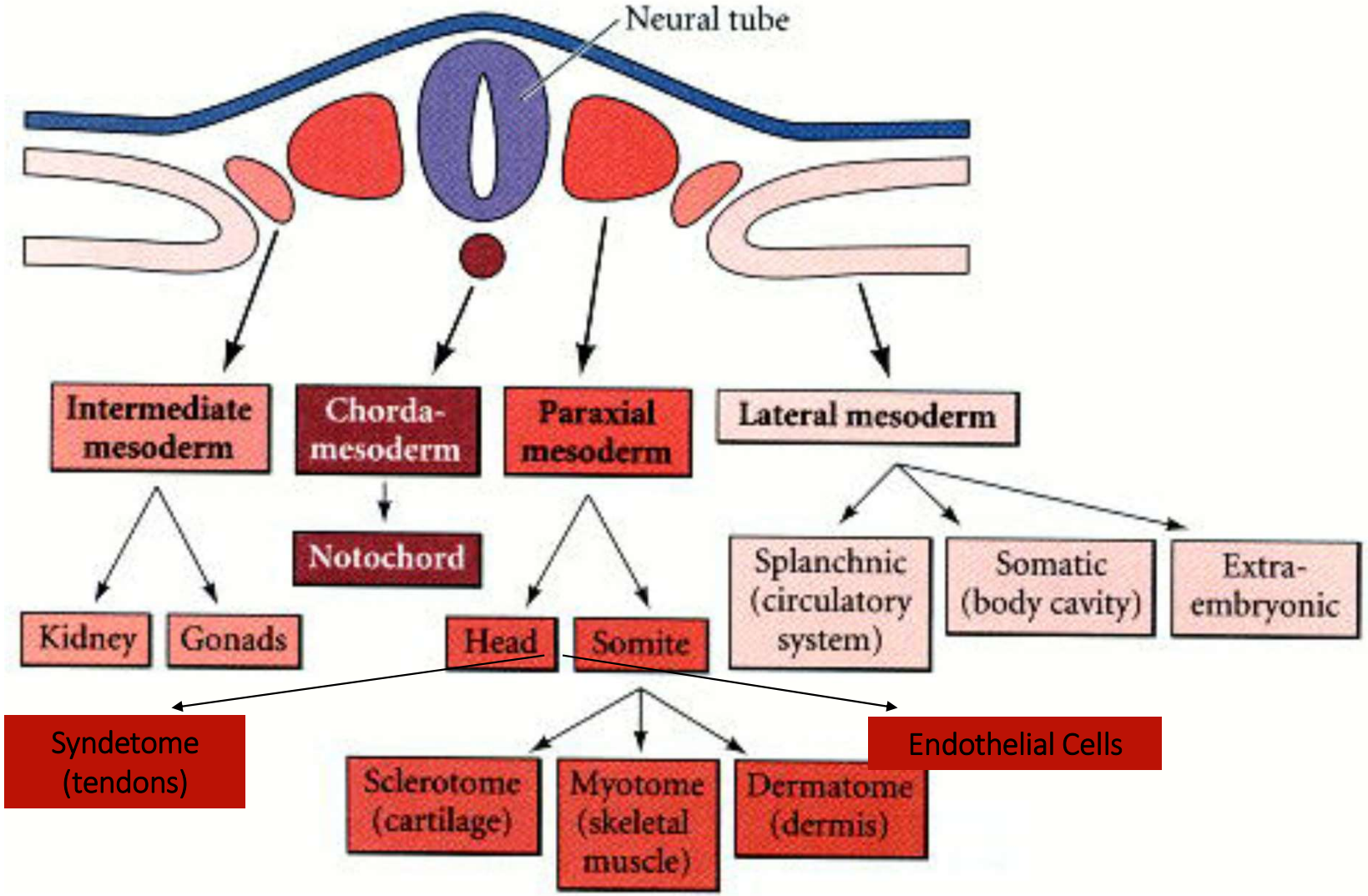
(1) the neurons and glial cells of the sensory, sympathetic, and parasympathetic nervous systems,

(2) the epinephrine-producing (medulla) cells of the adrenal gland

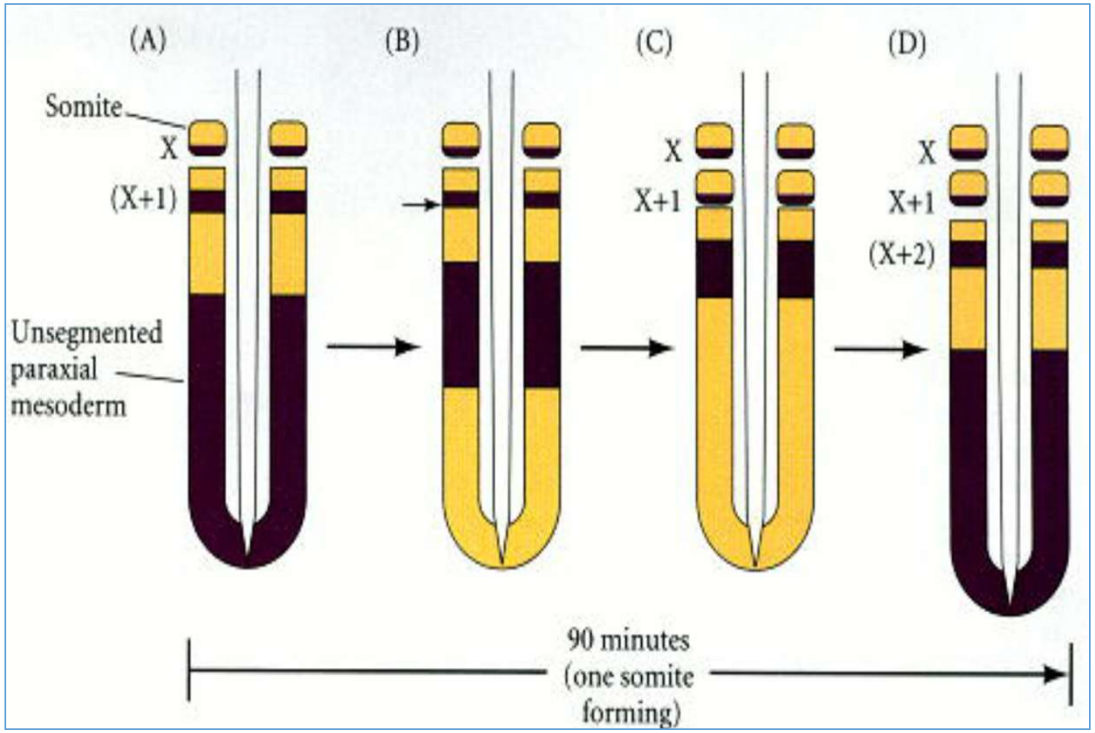
(3) the pigment-containing cells of the epidermis

(4) many of the skeletal and connective tissue components of the head

MESODERM


Neural tube
Intermediate mesoderm
Chorda-mesoderm
Paraxial mesoderm
Lateral mesoderm
Notochord
Kidney
Gonads
Head
Somite
Splanchnic (circulatory system)
Somatic (body cavity)
Extra-embryonic
Syndetome (tendons)
Sclerotome (cartilage)
Myotome (skeletal muscle)
Dermatome (dermis)
Endothelial Cells

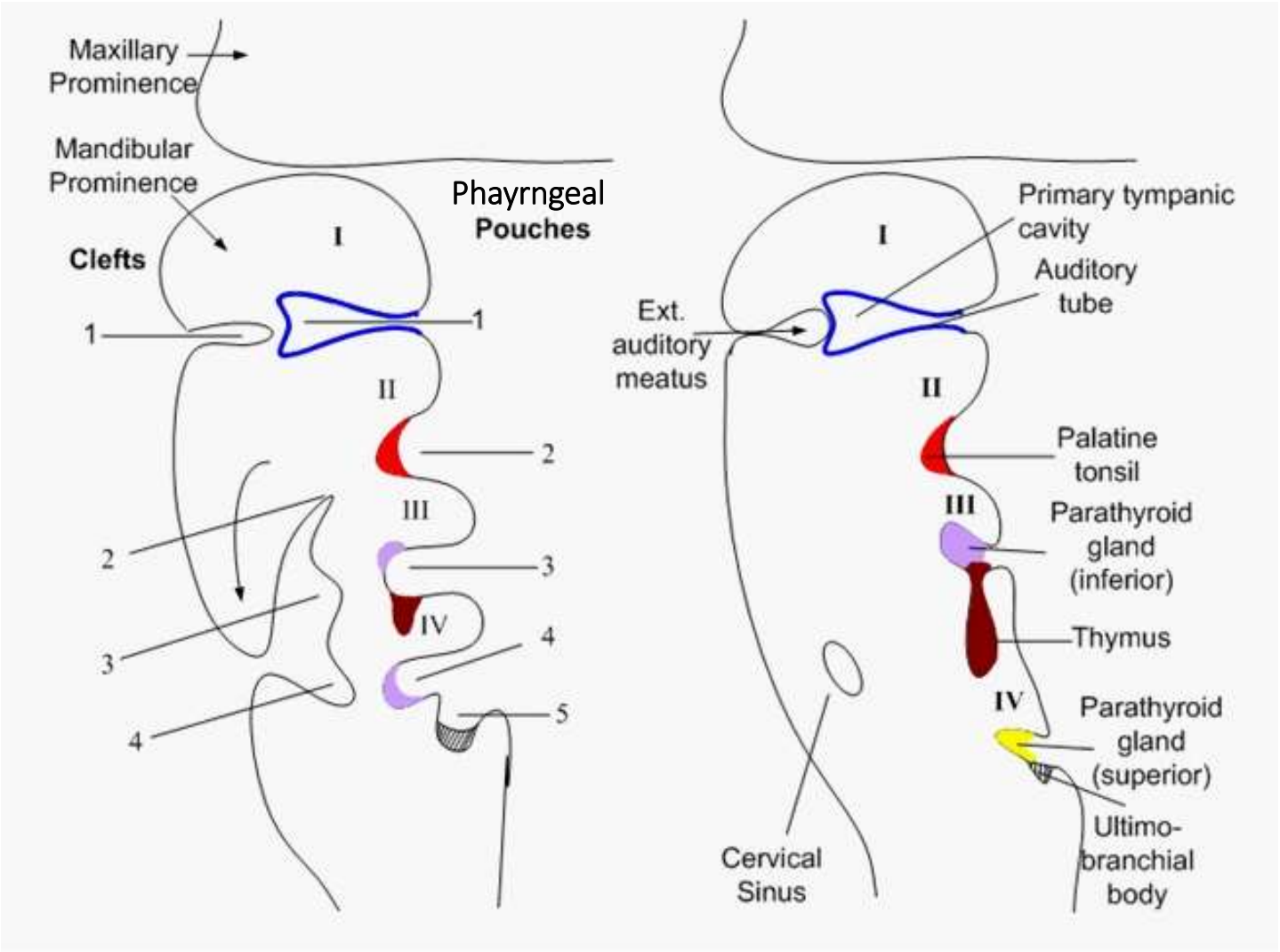
Somites form
(1) the cartilage of the vertebrae and ribs
(2) the muscles of the rib cage, limbs, and back
(3) the dermis of the dorsal skin.



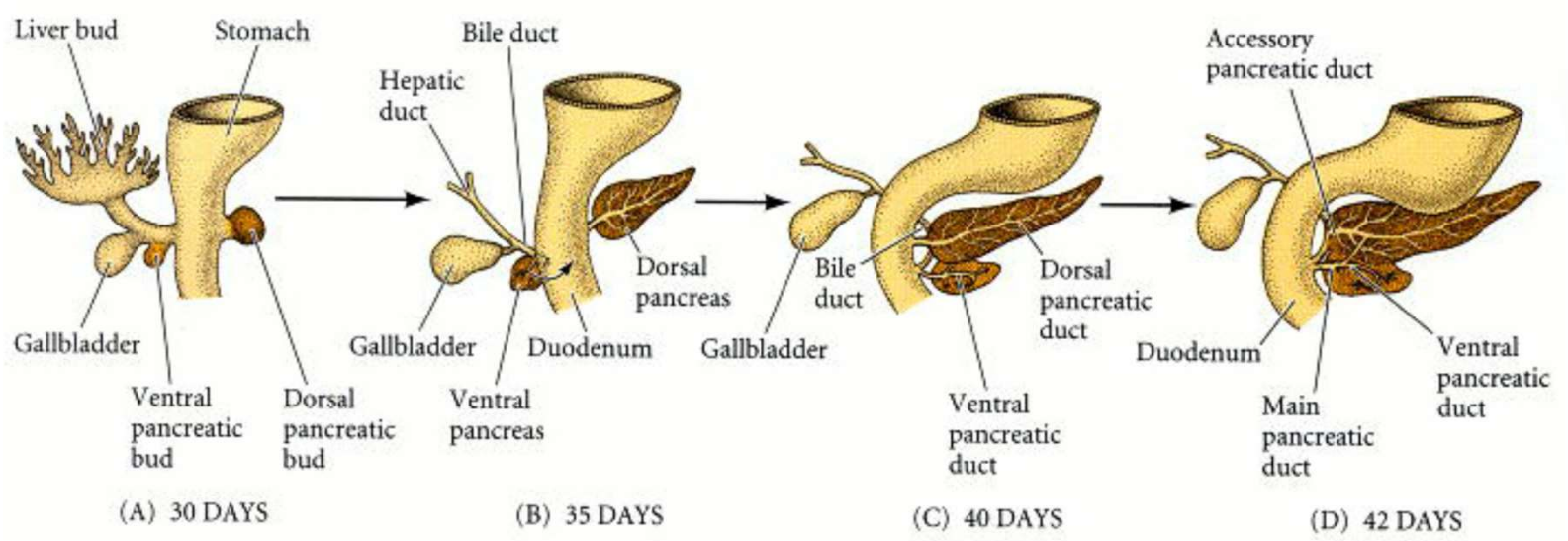
Although all the somites look identical, they will form different structures at different positions along the anterior-posterior axis.

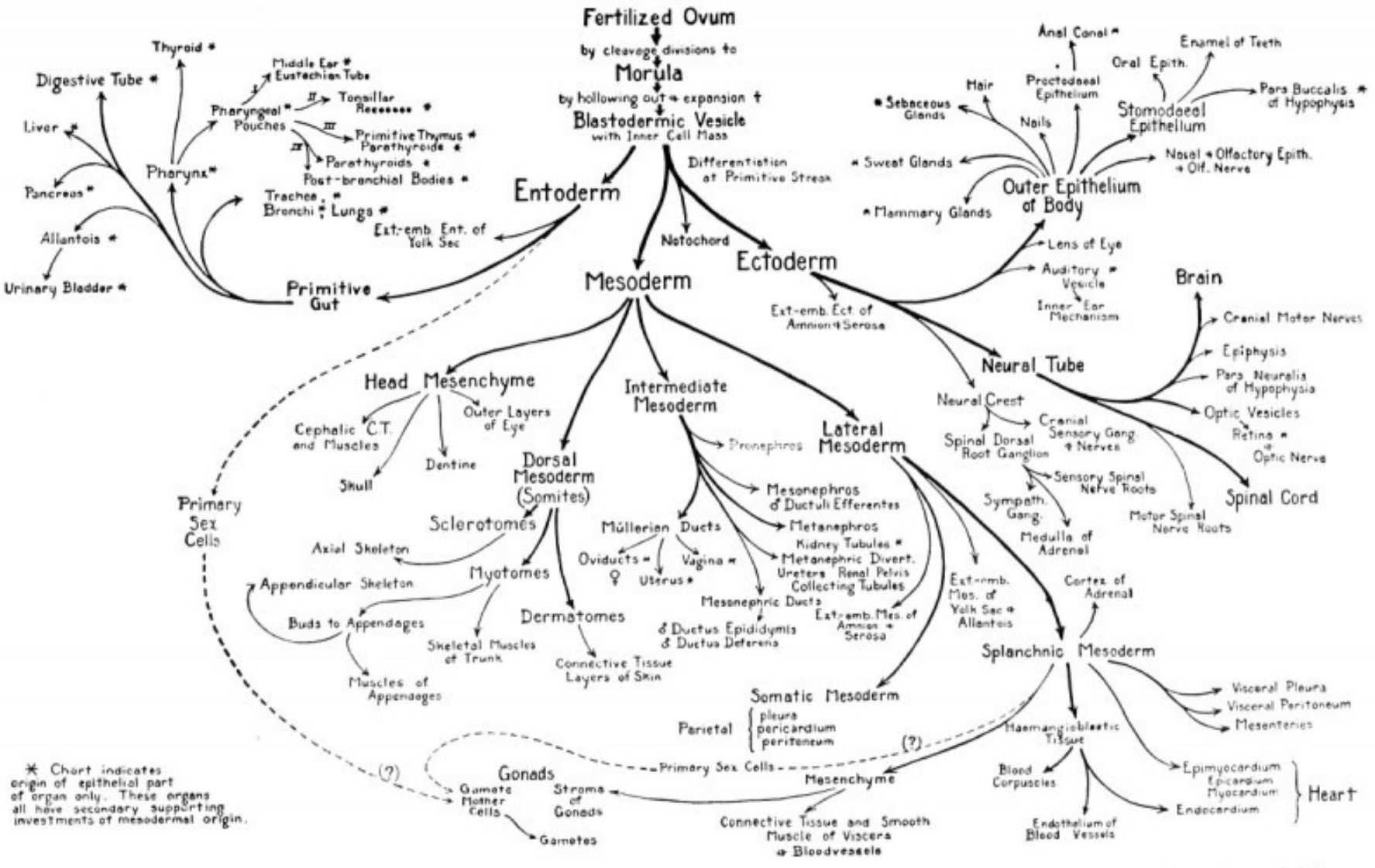
For instance, the ribs are derived from only by the somites forming the thoracic vertebrae.

ENDODERM


Maxillary Prominence
Mandibular Prominence
Clefts
Phayrngeal Pouches
I
II
III
IV
1
2
3
4
5
Ext. auditory meatus
Primary tympanic cavity
Auditory tube
Palatine tonsil
Parathyroid gland (inferior)
Thymus
Parathyroid gland (superior)
Ultimo-branchial body
Cervical Sinus

Development of Pancreas, Liver and Gall Bladder




Fertilized Ovum
by cleavage divisions to
Morula
by hollowing out + expansion
Blastodermic Vesicle
with Inner Cell Mass
Differentiation at Primitive Streak
Entoderm
Mesoderm
Ectoderm
Notochord
Primitive Gut
Digestive Tube *
Thyroid *
Middle Ear * Eustachian Tube
Pharyngeal Pouches
II Tonsillar Recesses *
III Primitive Thymus * Parathyroids *
IV Parathyroids *
Post-branchial Bodies *
Liver *
Pancreas *
Pharynx *
Trachea, Bronchi * Lungs *
Ext-emb. Ent. of Yolk Sac
Allantois *
Urinary Bladder *
Anal Canal *
Enamel of Teeth
Oral Epith.
Para Buccalis * of Hypophysis
Hair
Proctodaeal Epithelium
Stomodaeal Epithelium
* Sebaceous Glands
Nails
* Sweat Glands
Nasal * Olfactory Epith. * Olf. Nerve
* Mammary Glands
Outer Epithelium of Body
Lens of Eye
Auditory * Vesicle
Inner Ear Mechanism
Ext-emb. Ect. of Amnion + Serosa
Brain
Cranial Motor Nerves
Epiphysis
Para Neuralis of Hypophysis
Neural Tube
Optic Vesicles
Retina * Optic Nerve
Neural Crest
Cranial Sensory Gang. + Nerves
Spinal Dorsal Root Ganglion
Sensory Spinal Nerve Roots
Sympath. Gang.
Medulla of Adrenal
Motor Spinal Nerve Roots
Spinal Cord
Head Mesenchyme
Cephalic C.T. and Muscles
Outer Layers of Eye
Skull
Dentine
Intermediate Mesoderm
Pronephros
Mesonephros & Ductuli Efferentes
Metanephros
Kidney Tubules *
Metanephric Divert. Ureters Renal Pelvis Collecting Tubules
Müllerian Ducts
Oviducts * ♀
Vagina *
Uterus *
Mesonephric Ducts
♂ Ductus Epididymis & Ductus Deferens
Lateral Mesoderm
Ext-emb. Mes. of Amnion + Serosa
Ext-emb. Mes. of Yolk Sac + Allantois
Cortex of Adrenal
Splanchnic Mesoderm
Visceral Pleura
Visceral Peritoneum
Mesenteries
Haemangioblastic Tissue
Blood Corpuscles
Epimyocardium Epicardium Myocardium
Endocardium
Heart
Endothelium of Blood Vessels
Dorsal Mesoderm (Somites)
Sclerotomes
Axial Skeleton
Myotomes
Appendicular Skeleton
Buds to Appendages
Skeletal Muscles of Trunk
Muscles of Appendages
Dermatomes
Connective Tissue Layers of Skin
Somatic Mesoderm
Parietal
pleura
pericardium
peritoneum
Primary Sex Cells
(?)
Gonads
Gamete Mother Cells
Stroma of Gonads
Gametes
Mesenchyme
Connective Tissue and Smooth Muscle of Viscera + Bloodvessels
* Chart indicates origin of epithelial part of organ only. These organs all have secondary supporting investments of mesodermal origin.

Germ Layer Origins Flowchart
(Slightly modified, from Carlson, B.M. 1999. Human Embryology & Developmental Biology)