Anatomy notes for Mouse Atlas model EMA27

ANNOTATIONS ON ARBITRARY BOUNDARIES OF TISSUES:

GENERAL REMARKS:

The delineation of tissue boundaries is based on cell shape and configuration as seen in the original sections under a microscope. Where it was not possible to base boundaries on these grounds, we tried to look in other planes in the digital model. In a few cases, this led to an unambiguous boundary e.g. for the somites. However, in the majority of the cases in which boundaries could not be discerned in the original sections, decisions had to be based on other criteria than cell shape and configuration; we call these 'arbitrary' boundaries. Arbitrary boundaries are generally based on 3-dimensional shape, for example, division between the branchial arch and the rest of the embryo.

In this document we list the tissues with arbitrary boundaries and the grounds for each decision. The tissues are listed alphabetically in bold under the main components in the anatomy database. Tissues adjacent to the arbitrary boundary are displayed in italics if they are part of a different component in the anatomy database. Boundaries which, though based on cell shape and configuration, were doubtful are also listed.

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body cavity:	Peritoneal cavity, pericardio-peritoneal canals and pericardiac cavity:	Division between these parts based on 3D shape and location of the heart and the septum transversum.
	Mesothelial lining of peritoneum, pericardio-peritoneal canals and pericardiac cavity:	Based on the boundaries of the cavities of these components.
branchial arches:	All.	Boundary with *head mesenchyme* based on 3D shape and difference in grey level density of the two tissues.
	Surface epithelium and endodermal lining of the branchial arches and branchial pouches:	Those parts of gut and *surface epithelium* that touch the mesenchyme of the branchial arches. For the endoderm: endodermal lining of the gut that lines the arches, but excluding the branchial pouches. Branchial pouches are based on 3D shape.

surface epithelium:	Rathke's pouch:	Separation from *surface epithelium* based on 3D shape only.
	Surface epithelium of the branchial arches:	See under *branchial arches*.
gut:	Biliary bud:	Separation from *gut* based on 3D shape only.
	Thyroid primordium:	Separation from *gut* based on 3D shape only.
	Branchial pouches:	Separation from *gut* based on 3D shape only.
	Endodermal lining of branchial arches:	See under *branchial arches*.
head-body division:	Somites:	The first four visible somites are considered to be the occipital somites. This assumes that the first, transient somite has disintegrated.
	Nervous tissue (future brain and future spinal cord):	Based on the division of future brain and future spinal cord according to our assessment of position in the embryo as a whole and morphology of the neural tube. This boundary is approximate. Correlation with gene expression patterns and other data will be required to determine the true position of the head/body boundary.
	Mesenchyme:	Based on the division of the somites into head- and body-somites.
heart:	Cardiac jelly and endothelium of different parts of the heart:	Boundaries follow the boundaries of the walls of the heart, unless otherwise stated.
	Common atrium wall:	Boundary with *septum transversum* based on difference in cell compaction. Boundary with *mesothelial lining of pericardio-peritoneal canals* based on 3D shape and a possible slight difference in cell compaction. The laterally asymmetric shape of the embryo accords with the observation that the atrial wall extends further caudally on the left than on the right. Boundary with primitive ventricle was constructed by extrapolating cranially the line connecting the atrio-ventricular canal and atrio-ventricular groove.
	Common atrium endothelial lining:	Boundary with sinus venosus: the cranial end of sinus venosus is taken as the point where the lumen of the common atrium splits into two parts.
	Primitive ventricle:	Boundary with outflow tract was constructed by extrapolating the bulbo-ventricular groove cranially.

	Outflow tract:	Boundary with *mesothelial lining of pericardiac cavity* is defined by both the extent of cardiac jelly and 3D shape of the wall of the pericardiac cavity. Boundary with bulbus cordis is based on 3D shape.
embryonic/extraembryonic:	All.	Painting was done on the basis of the original transverse sections, so the comments should be considered from that viewpoint. Lumina: Each intraembryonic lumen that is formed gradually is considered to be included in intraembryonic space from the moment the tissues that will enclose the lumen start to rise. The lumen will thus be bordered by the shortest line (in the transverse section plane) between the tips of the tissues that will later fuse to enclose it. An example is the lumen of the forming neural tube. Affecting: neural lumen, peritoneal cavity, gut, otic pit. Lumina that will never be fully enclosed are not considered to be intraembryonic. Boundary between the embryo and the allantois is based on 3D shape.
mesenchyme:	Body mesenchyme:	Those parts of the body mesenchyme that are not paraxial, intermediate mesenchyme, or lateral plate. Contains sclerotome-derived and neural-crest-derived cells. (Affected: *somites*, intermediate mesoderm, *nephrogenic cord, presumptive nephric duct*).
	Intermediate mesenchyme:	Condensed mesenchyme between the *somites* and the lateral plate mesenchyme. Where it has differentiated into two parts, the medial part is labelled *nephrogenic cord* and the lateral part *presumptive nephric duct*. Intermediate mesenchyme may contain migrating neural-crest-derived and somite-derived cells.
	Splanchnic / somatic, lateral plate mesenchyme:	Medial limits of the splanchnopleure- and somatopleure-derived mesoderm are defined by the medial extension of the mesothelial lining of the peritoneum.
	Unsegmented paraxial mesenchyme:	Mesenchyme medial to the lateral plate mesenchyme, caudal to the somites and rostral and lateral to the primitive streak.
	Intercellular space:	Spaces between and around somites and intermediate mesoderm that may result from shrinkage during fixation.
	Facio-acoustic and trigeminal neural crest:	Separation from mesenchyme on the basis that the neural-crest-derived cells that form these ganglia are more compacted than the surrounding mesenchyme. Therefore, ganglia cells may be excluded and other head mesenchyme cells included or vice versa. Other neural-crest-derived cells have not been painted because these could not be recognised morphologically.

sensory organs:	Optic vesicles:	Separation from future brain based on 3D shape only.
notochord:	notochord	We have based the presence of a notochord on a distinctly different cellular organisation from the adjacent *future spinal cord*. If there is no different organisation of cells the area is labelled primitive streak. Boundary between notochord and surrounding *mesenchyme* is based on cell arrangement.
somites:	somites	Most caudal site of radial organisation in cells of the paraxial mesenchyme, as observed under the microscope, is defined as the last formed somite.
vascular system:	vascular system	All boundaries between different parts based on 3D shape only.