Introduction to Embryology

This lecture will introduce you to the science of developmental biology or embryology. The lecture will provide an overview of the science and the language used to describe the comprehensive study of development – from an individual organism’s conception to its death, as well as the broader aspect of phylogenetic development. You will also be introduced to the basic descriptive terminology that describes the various developmental stages and processes. After this lecture you should be able to:

- Define the different terms used to describe aspects of developmental biology.
- Describe the developmental stages in ontogeny from conception to death.
- Define and illustrate the processes that describe how cells move during development.
- Define the nomenclature used to describe body parts, positions, and relationships.

He who sees things grow from the beginning will have the finest view of them.

Aristotle 384 – 322 B.C.
Embryology – What is It?
Terms describing development

Definition in the broadest sense

More specific terminology
Developmental biology

Embryology

Ontogeny

Embryogenesis

Organogenesis

Morphogenesis
Why Study Embryology
My perspective

Powerful reasons
Understanding the why of adult anatomy

Predicting and understanding variation

Understanding the patterns of the vertebrate body

Knowing how and why things can go wrong

Intellectually rewarding

Historical Perspectives
Insights into intellectual progress
Developmental Periods

Nomenclature of ontogeny

Divisions of the human life span

Prenatal life

- Spermatozoon and oocyte

  Zygote

  Embryo

  Fetus

Birth

Postnatal life

- Newborn
  - First month of postnatal life

- Infancy
  - Months 2 through 12 of postnatal life

- Childhood
  - From 13 months until puberty

- Puberty
  - Females - ages 12 to 15 years; males - ages 13 to 16 years

- Adolescence
  - Approximately ages 11 to 19

- Adult
  - Years 18 to 21 until death

Comparisons in other vertebrates
Developmental Processes
Descriptions of developmental cell movements

**Epiboly**
The mass movement of epithelial sheets that spread as a single unit instead of as individual cells. This most commonly occurs as the outer ectoderm layer of the embryo spreads to enclose deeper embryonic layers.

**Invagination**
This process involves an infolding of a region of cells. It occurs at sites where rapid cell development is surrounded by areas of less rapid cell development and the cells cannot spread anywhere but deep into the underlying tissue.

**Evagination**
This process is the opposite of invagination, where the surface cells fold outward from a surface of rapid cell development rather than inward.

**Involution**
The inward movement of an expanding surface layer in a mass movement of cells that spread beneath the deep surface of the remaining external cells. This process effectively creates a new deeper tissue layer.

**Ingression**
The migration of single cells from a surface layer of the embryo into deeper regions of the embryo.

**Delamination**
The splitting of one cellular sheet into two or more less parallel sheets of cells.
**Review of Positional Terminology**

**Terms of position, comparison, relationship**

You should be able to readily use the terms below and apply them to the study of the embryo. These terms can be reviewed in greater detail in the Human Anatomy Lecture Manual. Using the embryonic figures to the right, clearly label them with the respective terms below.

- **Dorsal or posterior versus ventral or anterior**
- **Superior versus inferior**
- **Medial versus lateral**
- **Proximal versus distal**
- **Cranial versus caudal (common in embryological parlance)**
- **Superficial versus deep**

**Anatomical planes and sections**

The study of embryology often involves the study of embryonic sections. For this reason it is important to remember the basic terminology used to describe the various planes associated with body sections. Remember that sections are slices through the body in the different planes of three-dimensional space. There are two basic sections: longitudinal sections, which run in the direction of the long axis of the thing being sectioned, and transverse sections, which are made at right angles to the long axis. These sections can occur in the different planes summarized below. Using simple straight lines draw the sections in the following planes on the illustrations of the embryo to the right.

**Sagittal planes**

- Median plane or median sagittal plane
- Paramedian plane or parasagittal plane

**Coronal or frontal plane**

**Horizontal plane**