

Cover Sheet: Request 10746

ANS3043 Growth and Development of Farm Animals

Info

Process	Course Modify Ugrad/Pro
Status	Pending
Submitter	Imler,Amie M amie.taylor@ufl.edu
Created	2/4/2016 3:29:04 PM
Updated	4/13/2016 2:52:48 PM
Description	An integration of the physiological, genetic and nutritional bases of animal growth, development, and body composition with application to livestock production.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CALS - Animal Sciences 514909000	Tenbroeck, Saundra Hodge		2/4/2016
Deleted 3043.pdf					2/4/2016
College	Approved	CALS - College of Agricultural and Life Sciences	Brendemuhl, Joel H	Approved by the CALS CC 2-12-16	2/19/2016
Deleted ANS 3043 - NEW - GD - Syllabus Spring 2016 updated version for UCC.docx					2/19/2016
University Curriculum Committee	Comment	PV - University Curriculum Committee (UCC)	Case, Brandon	Added to the April agenda.	3/21/2016
No document changes					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			3/21/2016
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|Modify for request 10746

Info

Request: ANS3043 Growth and Development of Farm Animals

Submitter: Imler, Amie M amie.taylor@ufl.edu

Created: 2/19/2016 3:44:56 PM

Form version: 2

Responses

Current PrefixANS

Course Level3

Number 043

Lab Code None

Course Title Growth and Development of Farm Animals

Effective Term Fall

Effective Year 2016

Requested Action Other (selecting this option opens additional form fields below)

Change Course Prefix?No

Change Course Level?No

Change Course Number?No

Change Lab Code?No

Change Course Title?No

Change Transcript Title?No

Change Credit Hours?No

Change Variable Credit?No

Change S/U Only?No

Change Contact Type?No

Change Rotating Topic Designation?No

Change Repeatable Credit?No

Change Course Description?No

Change Prerequisites?Yes

Current PrerequisitesBSC 2010 and BSC 2010L, or equivalent; must be AL major
Proposed PrerequisitesBSC 2010 and BSC 2010L, BSC 2011 and BSC 2011L, or equivalent; ANS 3006C or equivalent; must be AL major
Change Co-requisites?No

RationaleThe rigor of the course requires that both Core Biology 1 and 2 must be completed before the student attempts this course - particularly from a cellular biology perspective. Additionally, basic animal growth and development concepts are introduced in the Introduction to Animal Sciences course, which will provide students with an insight into animal growth curves and how farm animal growth influences food animal production concepts

Course Title

ANS 3043 Growth & Development of Farm Animals (3 Cr)

Course Instructors

Stephanie Wohlgemuth, Ph.D.

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John Driver, Ph.D.

Office: Animal Science - Bldg 499, Room 204E

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**Office hours**

Walk-in office hours will be from Tuesdays between 12 and 1 PM. However, we will accept appointments if these times do not work for your schedule. We will respond to emails within 48 hours to set-up an appointment.

Course Description

An integration of the physiological, genetic and nutritional bases of animal growth, development, and body composition with application to livestock production.

Course Objectives

ANS 3043 is a three-credit undergraduate level course offering insights into the physiological, genetic, and nutritional basis of animal growth, development, and body composition with application to livestock production.

At the end of the course, the student will be able to:

- ✓ Understand the core concepts of animal growth;
- ✓ Describe the dynamic forces that influence early embryonic, prenatal, and postnatal growth and development of domesticated livestock and other mammalian species;
- ✓ Discuss the fundamentals of cell biology, and connective tissue, muscle, bone and fat anatomy, formation and function;
- ✓ Place tissue growth in the context of endocrine, paracrine and autocrine modifiers;
- ✓ Summarize factors that control and influence animal growth and development including gender, genotype, nutrition, environment, endocrine, growth promotants, and genetic engineering.

Time and Location

MWF 8:30 – 9:20 am (2nd period)

Location: ANS 156

Prerequisites

BSC 2010, BSC 2010L, BSC 2011, BSC 2011L or equivalent; ANS 3006C or equivalent; must be AL major.

Supporting texts

There is no assigned textbook. Some reading assignments and suggestions will be provided and will come from research and popular press articles, online resources, and book chapters. However, we recommend the following textbooks, which the student may wish to consult:

- ✓ ***Principles of Animal Growth and Development***, Gerrard and Grant; ISBN13: 978-0-7575-2986-3; Kendall Hunt Publishing, Dubuque, Iowa 52002.
- ✓ ***Growth of Farm Animals***, Lawrence, Fowler and Novakofski; 3rd ed. (2012); ISBN-13: 978-1-84593-558-0 (paperback); CABI Cambridge, MA;
- ✓ College level *Biology* textbook
- ✓ *Physiology* textbook, for example: Color Atlas of Physiology, Silbernagl and Despopoulos; ISBN-13: 978-3135450063; Thieme Publishing, 6th edition 2008

Voluntary readings that may be posted on Canvas for students interested in more in depth knowledge:

- ✓ a) <http://www.nature.com/scitable/ebooks/essentials-of-cell-biology-14749010/contents>
- ✓ b) https://www.youtube.com/watch?v=cK-OGB1_ELE
- ✓ c) http://www.cellsignal.com/contents/resources-tutorials-amp-application-guides/an-introduction-to-epigenetics/resources-tutorials-epigenetics?utm_source=Epigenetics%20Brochure&utm_medium=offline&utm_campaign=Epigenetics
- ✓ d) Lei Li, Ping Zheng and Jurrien Dean (2010) *Development* 137, 859-870; doi:10.1242/dev.039487 “Maternal control of early mouse development”
- ✓ e) Bazer et al., (2009) *Reproduction* 138: 195 – 209 “Comparative aspects of implantation”
- ✓ f) Bowker et al. (2000) *Proceedings of the American Society of Animal Science*; “Muscle metabolism and PSE pork.”

Course Website on Canvas

Our course Canvas website, to be found through login to **CANVAS** (<http://elearning.ufl.edu>), will be the conversation, communication and information hub for this course. **ALL** email communications should happen through the course website. Syllabus, resources such as assigned and recommended readings, and lesson material, provided as *PowerPoint* and *pdf* files, will be posted in CANVAS. The lesson material (“the slides” as well as readings and other related material) will be organized by topic within modules. The lesson material will have blanks and missing information that need to be completed by you during the lectures. We will not post completed lesson material. The completion will be your responsibility!

If you have not made yourself familiar with CANVAS yet, please take a look at the [Canvas Student Quickstart Guide](#). An important first step to make sure you are not missing any announcement or email is that you set your CANVAS settings to receive emails and announcements related to this class as soon as possible. In order to change settings to accommodate this requirement, please:

Go to your general **CANVAS Settings** (upper right corner within CANVAS) > **Notifications** (left menu bar) > **Notification Preferences**: here set to “**ASAP**” (at least) the following activities:
Announcements and Conversations (all three subcategories).

In case you need a general introduction to CANVAS or additional help, the e-learning site and the CANVAS site provide links to more help options.

Assessments

We will use **exams, short quizzes and homework assignments** to assess your performance and knowledge. A majority of the exam and quiz material will come from the lecture notes (90%) with the remainder (10%) coming from assigned reading material. The exams and quizzes will consist of multiple choice questions, short essay answers, fill in the blanks, labeling of drawings and schemes, and free drawings. The homework assignments will draw from the knowledge gained in class and may consist of questions related to a reading assignment. **Table 1** outlines the assessments and their respective point and % values.

Table 1: Assessment points and scores

Assessment type	Number per semester	Points for each	Total points per assessment type	% of overall grade
Exam	4	75	300	75
Quiz	4	10	40	10
Homework	4	15	60	15
			Total points: 400	Total score: 100%

Assessment schedule

Table 2 outlines the assessment dates for Spring semester 2016. Please enter those dates into your calendar.

Table 2: Assessment schedule

Assessment	Quiz 1	HW 1	Exam 1	HW 2	Quiz 2	Exam 2	Quiz 3	HW3	Exam 3	Quiz 4	HW 4	Exam 4
Date	01-22-2016	01-29-2016	02-03-2016	02-12-2016	02-19-2016	02-26-2016	03-18-2016	03-25-2016	03-30-2016	04-08-2016	04-15-2016	04-20-2016

*Note: Exam 4 will **NOT** be a comprehensive exam and will **NOT** be held during Finals Week!*

Attendance Policy

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Since you are all mature, responsible, and ambitious young adults, attendance is not required nor will it be recorded. However, it is recommended that you not miss class as your final grade will be positively correlated with attendance. If attendance becomes an issue we reserve the right to give announced or unannounced quizzes for points throughout the semester.

Missing an assessment:

An exam, quiz or homework deadline may not be missed without an excused absence or prior consent of the instructor. All requests to either miss an assessment or a deadline must be submitted in writing and signed by the student regardless of the reason. Any assessment missed for reasons other than those listed below or as outlined in the [UF attendance policy \(https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx\)](https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) will not be excused and a grade of zero will be recorded. In general, acceptable reasons for absence from or failure to participate in class include illness, serious family emergencies, special curricular requirements (e.g., judging trips, field trips, and professional conferences), military obligation, severe weather conditions, religious holidays and participation in official university activities such as music performances, athletic competition or debate. Absences from class for court-imposed legal obligations (e.g., jury duty or subpoena) must be excused. Other reasons also may be approved. No make-up exams will be granted without a valid excuse.

Request to re-grade an exam must be made within one week from the date the grades were assigned. Grade challenges must be submitted in writing, and returned to the instructor.

If for any reason you are having problems understanding the course material and/or are having other academic, university, or personal problems that are affecting your performance in class, please make an appointment with us as early in the semester as possible so the problems can be addressed.

Grades and Grading Policy

Grades are based on performance in the assessments (exams, quizzes and homework). Detailed information about points and % of total score distribution is given in **Table 1** above. Grade assignment and corresponding point range are shown in **Table 3**.

Table 3: Grade assignment and point range

Letter grade	A	B ⁺	B	C ⁺	C	D ⁺	D	E
% score range	90-100	85-89.99	80-84.99	75-79.99	70-74.99	65-69.99	60-64.99	≤ 59.99
Point range	360-400	340-359	320-339	300-319	280-299	260-279	240-259	≤ 249

Please note that no minus grades will be used.

For information on current UF policies for assigning grade points:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

Class Expectations

The foundation of this class will be based on developing mutual respect between students and instructors. We will work as diligently as possible to insure all individuals are treated fairly, all opinions and personalities are respected, and everyone has an equal opportunity to succeed in this class. We will put forth all our energy and enthusiasm into making this class not only academically challenging but also a rewarding and enjoyable experience. In return, we expect a similar commitment from you towards us, and equally important, towards your fellow students. We expect that you participate in in and out of class activities, such as discussions, peer evaluations, group exercises and general participation. Importantly, please respect your fellow student's opinions, their quest for knowledge, and their desire to succeed in this class.

Mutual respect includes **not using cell phones for anything, unless necessary for class and announced** (the instructors will use their cell phones also only in emergencies), and to **take a break from social media** for the duration of the class.

This class can be challenging for some, and may require some extra effort on your side – well, that is true for every class, isn't it? If you don't recall much from your Biology classes you may want to be prepared for having to catch up on some biology, physiology and cell biology alongside the provided lecture material. This extra effort will be advantageous for a better understanding of the physiology of growth and development of an organism.

Course Topics

Week* ¹	Topic
1	Introduction to the course General aspects of growth
2	Cells and principles of cell growth: <ul style="list-style-type: none"> ➤ Cell structure ➤ Mitosis ➤ Origins of individual variation ➤ Cell signaling
3-4	Embryo development: from zygote to embryo: pre-implantation embryo, implantation, early embryogenesis (incl. neurulation, somitogenesis)
5-8	Basic structure, development and function of select tissues: <ul style="list-style-type: none"> ➤ Muscle: prenatal development, structural organization, pathologies, excitation-contraction coupling, muscle fiber types & metabolism, postnatal growth ➤ Connective tissue: general structure and types, cartilage, ➤ Bone as connective tissue type: types, structure and anatomy, prenatal development, ➤ Adipose tissue: types, structure and anatomy, prenatal development, regulation
9-10	Hormonal influences on growth: <ul style="list-style-type: none"> ➤ General characteristics of hormones ➤ Growth hormone and IGF-1 ➤ Sex hormones ➤ Insulin and Glucagon ➤ Leptin ➤ Catecholamines ➤ Glucocorticoids ➤ Thyroid hormones
11-12	Whole animal development: <ul style="list-style-type: none"> ➤ Phases of the growth curve ➤ Models of growth ➤ Types of growth curves ➤ Components of whole body growth ➤ Allometric growth ➤ Types of growth curves ➤ Whole body composition ➤ Types of growth curves ➤ Chemical composition of body tissues
13-14	Genetic factors affecting growth: <ul style="list-style-type: none"> ➤ Species effects on growth ➤ Breed effects on growth ➤ Sex effects on growth
15	Environmental factors affecting growth: <ul style="list-style-type: none"> ➤ Nutritional effects on growth ➤ Microbial effects on growth ➤ Stress effects on growth ➤ Physical activity and growth
<i>Special topics</i> * ²	<i>For example: Muscle to Meat; Poultry Development; New Technologies in Embryo Growth; Development of the Mammary Gland</i>

! *¹: Please note that the syllabus is an evolving animal. Contents, topics and timeline listed in the syllabus may therefore be subject to slight modifications, in part tailored to you.

! *²: Contents and timing of special topics lectures will depend on guest speaker availability.

Important dates besides the assessment schedule (see above)

First class meets on Wednesday, January 6th. Last class (Exam 4) is on Wednesday, April 20th. Reading days are April 21st and 22nd.

No classes on: January 18th (Martin Luther King Jr. Day), February 29-March 4th (Spring Break).



General information

Services for Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Online course evaluation process

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”*

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

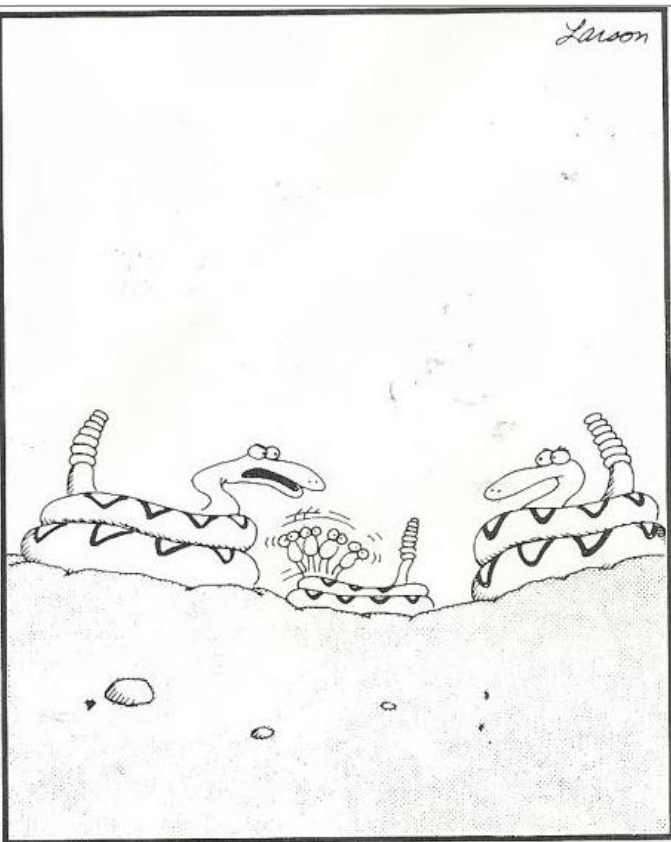
- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/
 - Counseling Services
 - Groups and Workshops
 - Outreach and Consultation
 - Self-Help Library
 - Wellness Coaching
- U Matter We Care, www.umatter.ufl.edu/
- Career Resource Center, First Floor JWRU, 392-1602, www.crc.ufl.edu/

University of Florida Complaints Policy

For information on the University of Florida Complaints Policy, please see [here](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf) (https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).



Lalson



"This is your side of the family, you realize."

EMBRYOGENESIS

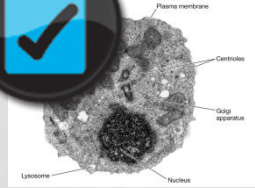


"You know, Vern ... the thought of what this place is gonna look like in about a week just gives me the creeps."



"Ben—what d'ya say we turn the power off for a while and let the little guy roam around?"

WHERE ARE WE ON THE TIMELINE OF GROWTH AND DEVELOPMENT ANS3043?

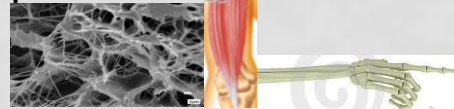
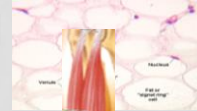


Cell as Unit of Growth and Development

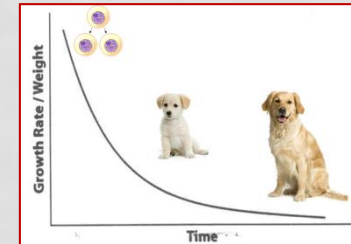
Embryo development



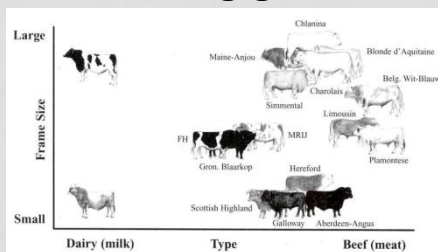
Tissue structure and development



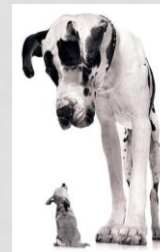
Whole animal growth



Genetic factors affecting growth



Hormonal regulation of growth



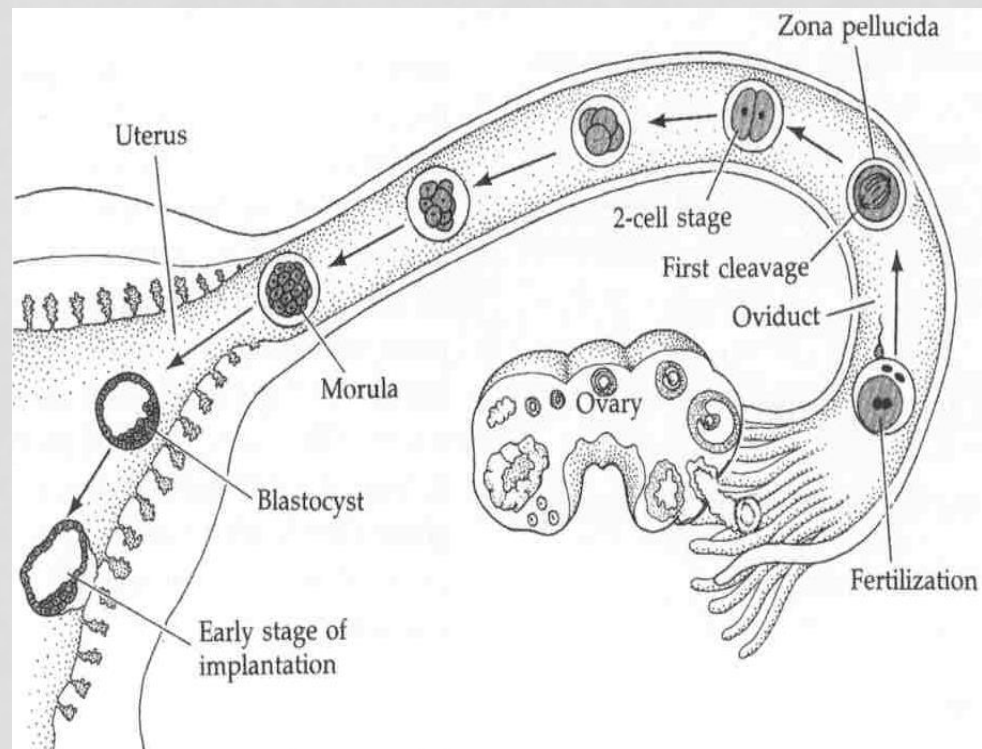
Environmental factors affecting growth



EMBRYOGENESIS



- We will dive into early embryo development
 - Also called: embryogenesis



LEARNING MODULE

EMBRYO DEVELOPMENT - EMBRYOGENESIS



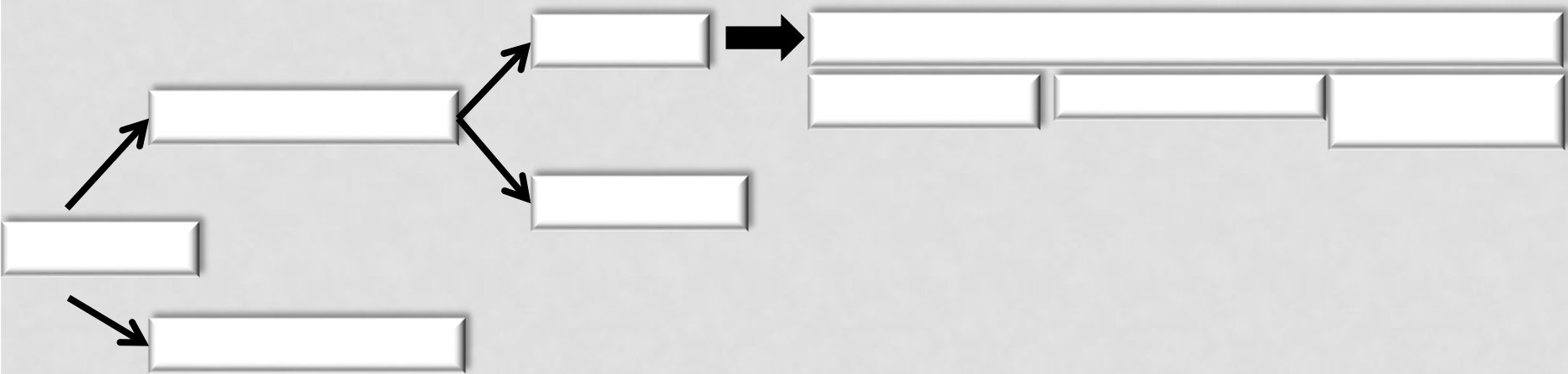
Objectives

- Describe how the early embryo develops and characterize the different phases and structures:
 - Embryogenesis
 - ✓ Zygote
 - ✓ Cleavage and Morula
 - ✓ Blastocyst
 - ✓ Bilaminar Embryo
 - ✓ Gastrulation and Germ Layers
 - ✓ Neurulation
 - ✓ Somitogenesis

GOAL: TO FOLLOW DEVELOPMENTAL STEPS FROM ZYGOTE TO EMBRYO PROPER

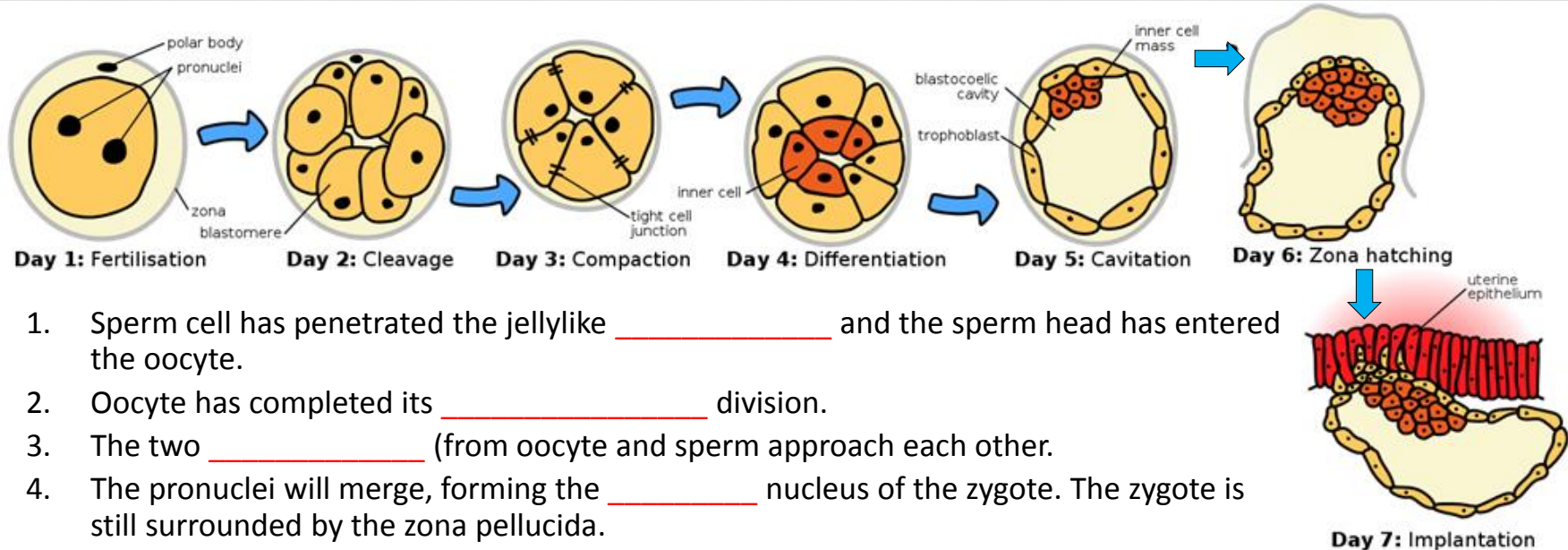


Pre-Implantation	Implantation	Early Embryogenesis	
Fertilization			
Zygote			



HUMAN EMBRYOLOGY

FROM ZYGOTE TO BLASTOCYST AND IMPLANTATION

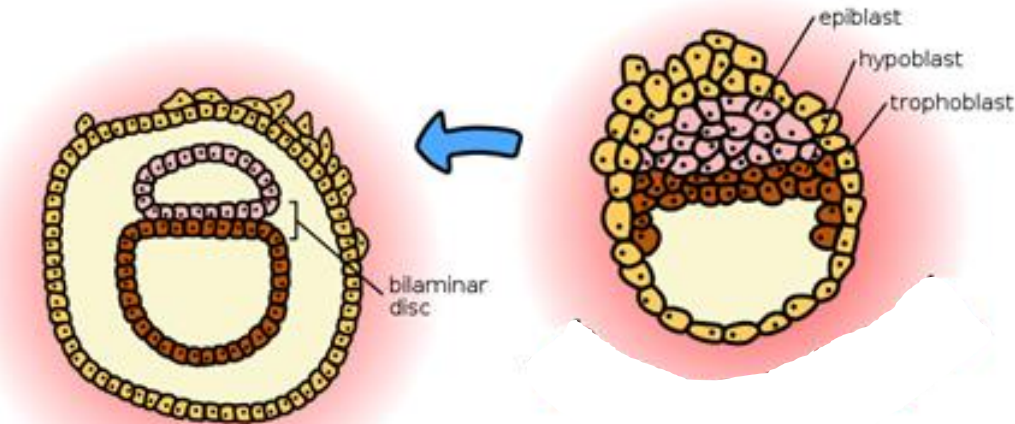


1. Sperm cell has penetrated the jellylike _____ and the sperm head has entered the oocyte.
2. Oocyte has completed its _____ division.
3. The two _____ (from oocyte and sperm approach each other.
4. The pronuclei will merge, forming the _____ nucleus of the zygote. The zygote is still surrounded by the zona pellucida.
5. _____ cell divisions occur (_____), forming a more or less loose “ball of cells” – the _____.
6. The morula _____ and the cells form _____.
7. Cells start to _____; an outer layer and an inner layer are of cells become apparent.
8. The morula forms a hollow inner cavity (_____) and fluid is drawn into the center – this structure is now called the _____. The cells have differentiated into an “ _____ ” and an outer layer called the “ _____ ”.
9. When the embryo reaches the uterus, the zona pellucida dissolves and the embryo “ _____ ”.
10. The embryo _____.

HUMAN EMBRYOLOGY

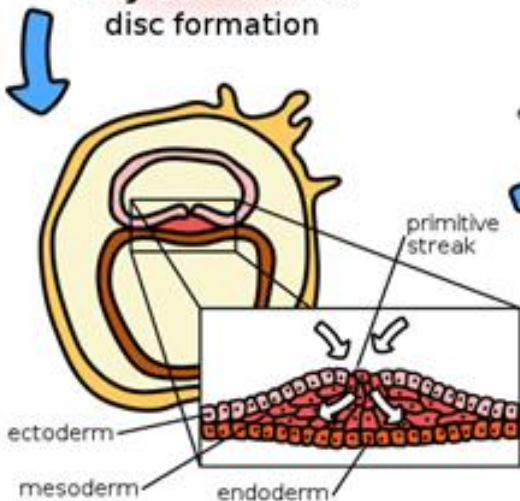
THE EMBRYO DEVELOPS FURTHER

The _____ is completed when the developing organism begins to reflect its _____ form. Once species identification can be established, the organism is considered a _____.

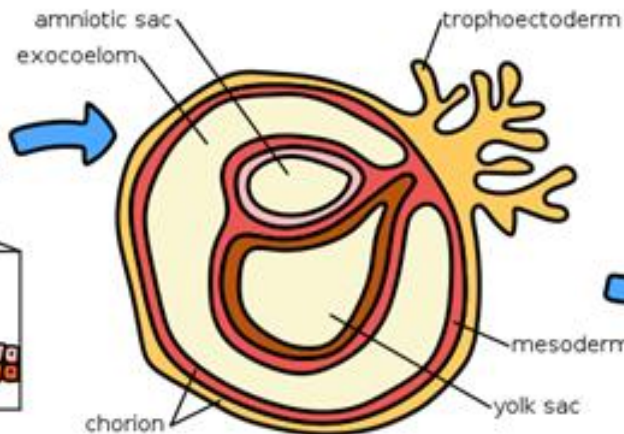


Day 12: Bilaminar disc formation

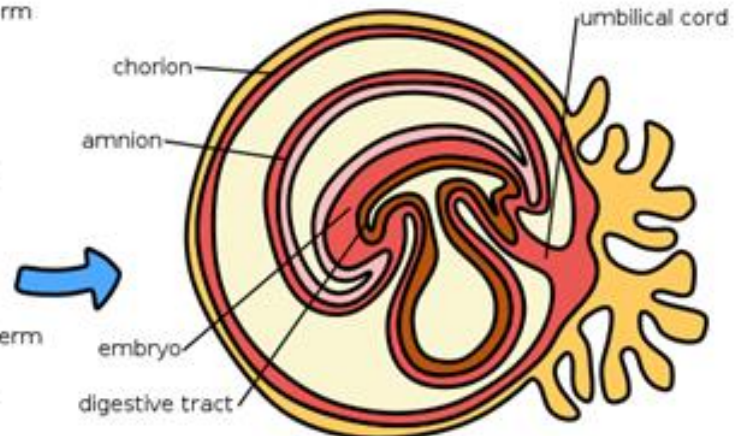
Day 9: cell mass differentiation



Day 12: Mesoderm formation



Day 18: Mesoderm spreading



Day 23: Amniotic sac enlargement

EMBRYOGENESIS



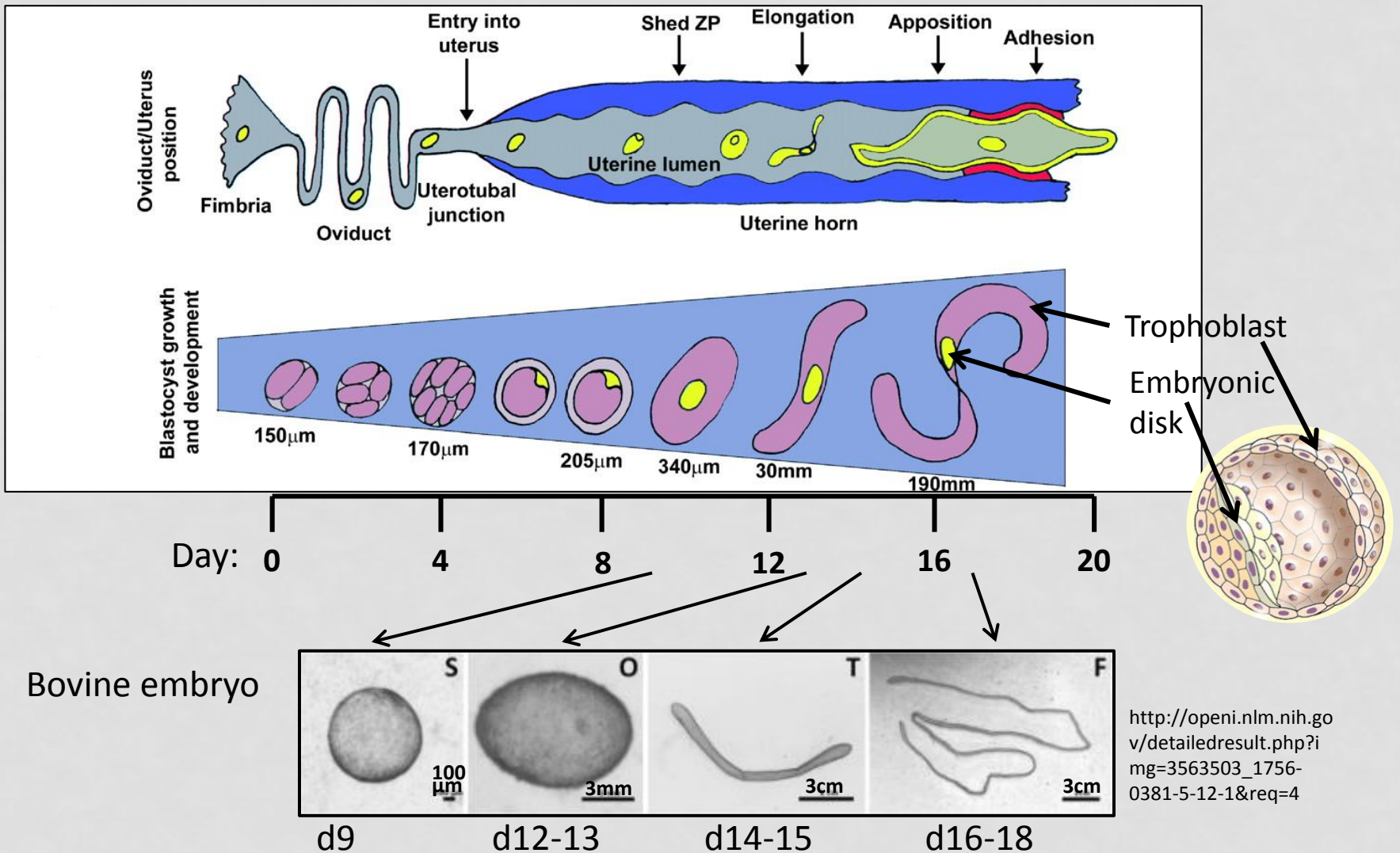
Embryogenesis:

- **Recap:** Embryogenesis is the process by which the _____ is formed and develops, until it develops into a _____.
- _____ of the egg forming the _____
- Rapid _____ divisions with no significant growth (_____), formation of the morula
- Cellular _____, _____
- Further development and differentiation of the _____
- Once species identification can be established, the organism is considered a _____

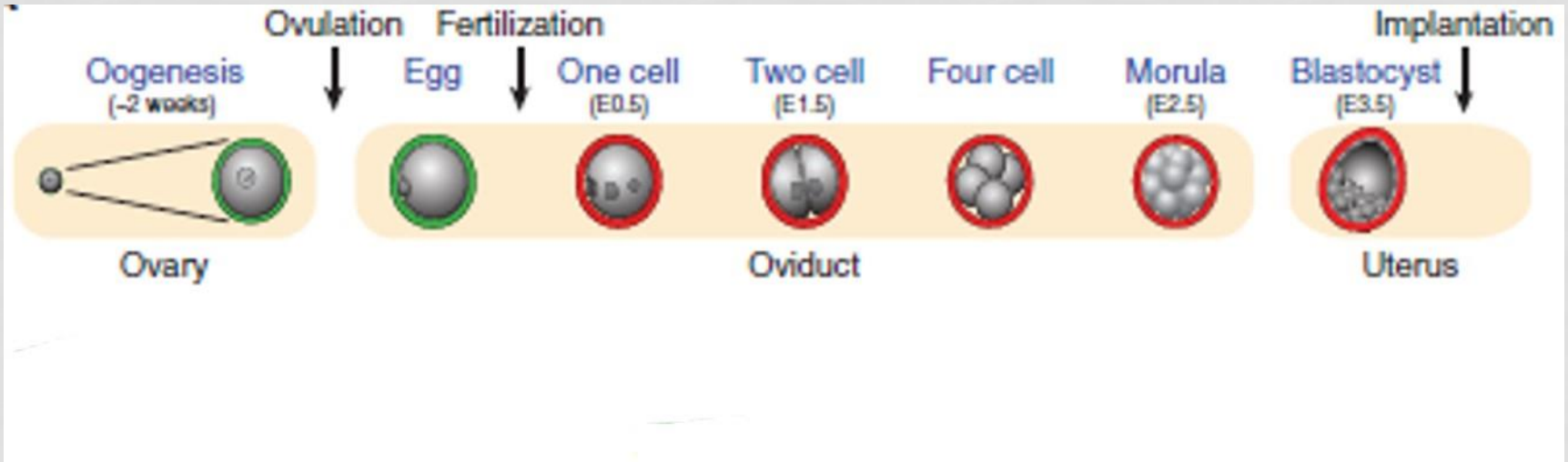
EARLY PREGNANCY EVENTS IN SHEEP

ELONGATION OF THE EMBRYO

Spencer T E et al. Reproduction 2004;128:657-668
 © 2004 Society for Reproduction and Fertility



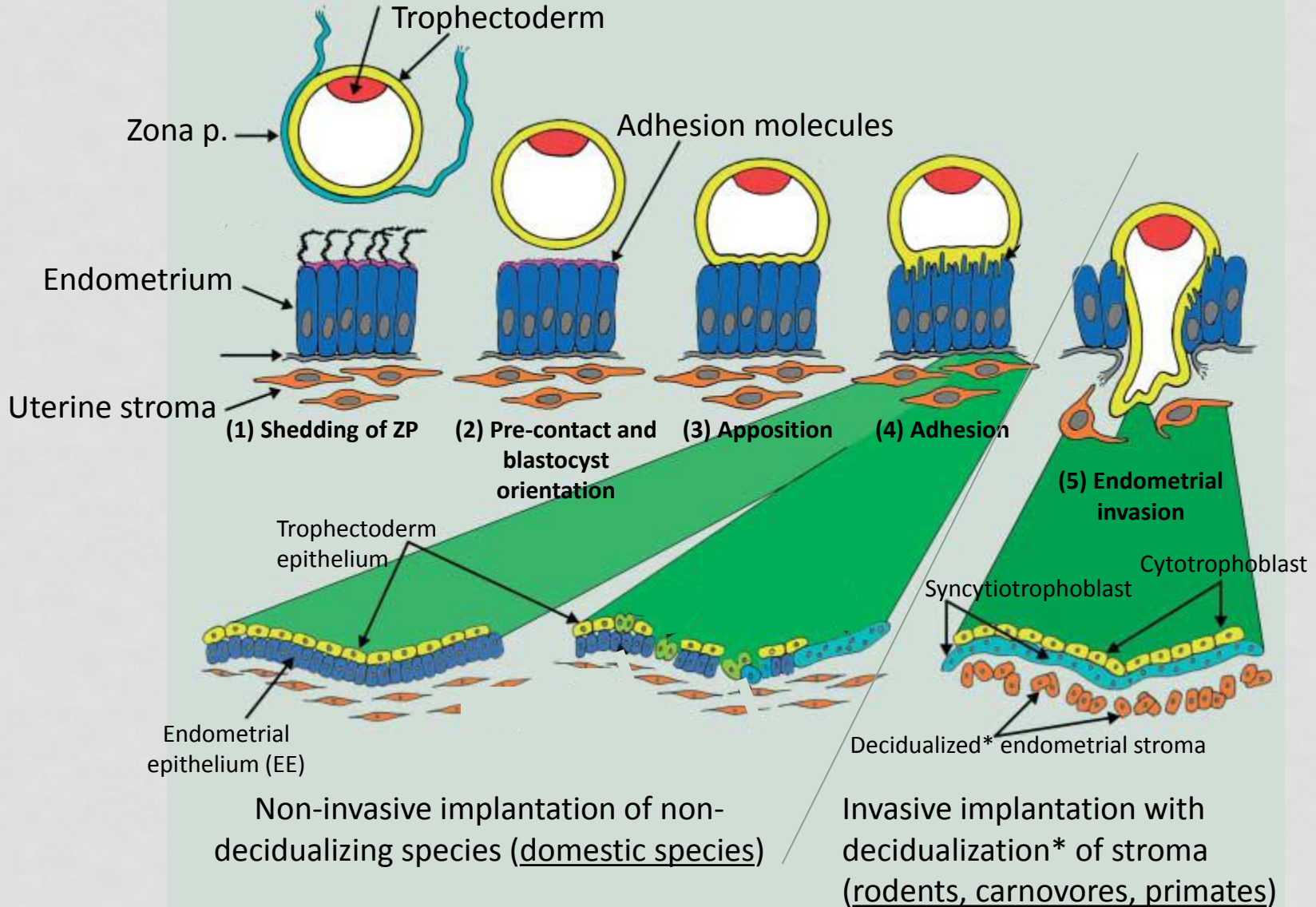
CONTROL OF EARLY DEVELOPMENT



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UTERINE-TROPHOBLAST INTERACTION CAN BE DIFFERENT BETWEEN SPECIES

(adapted from Bazer et al., 2009)

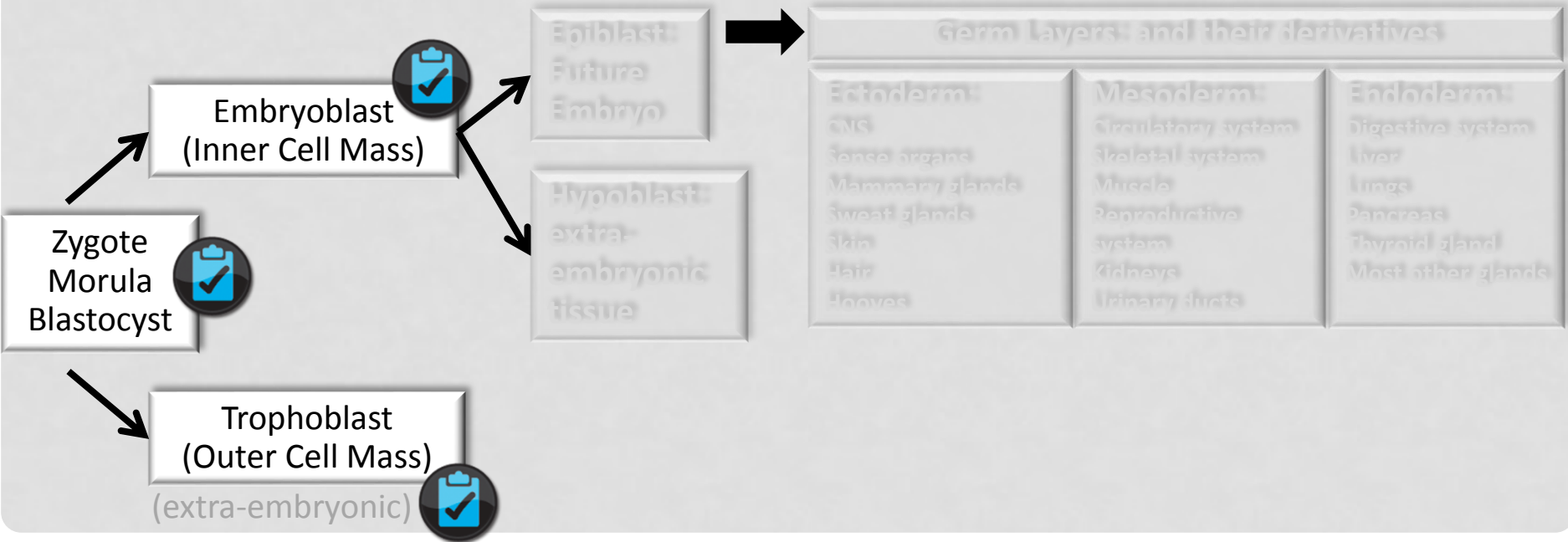


*Wiki: **Decidua** is the term for the endometrium during a pregnancy, which forms the maternal part of the placenta.

OVERVIEW

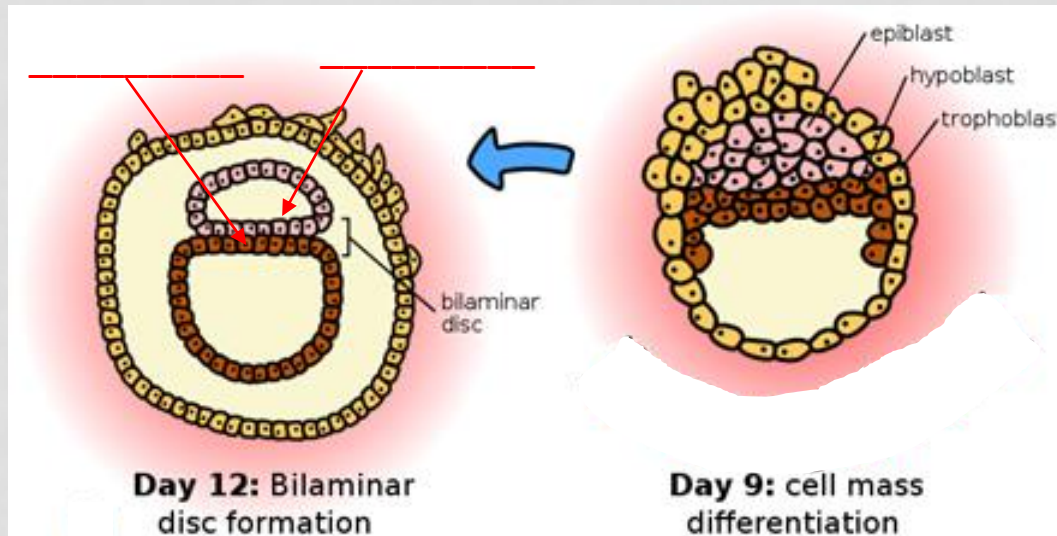


Pre-Implantation	Implantation	Early Embryogenesis	
Fertilization Proliferation and _____			
Zygote Morula Blastocyst	<u>Embryonic Disk</u>		



FORMATION OF LAYERS WITH DIFFERENT FATE

I. _____ EMBRYONIC DISK



Formation of the three primary germ layers begins with formation of the _____ consisting of two layers: _____ and _____

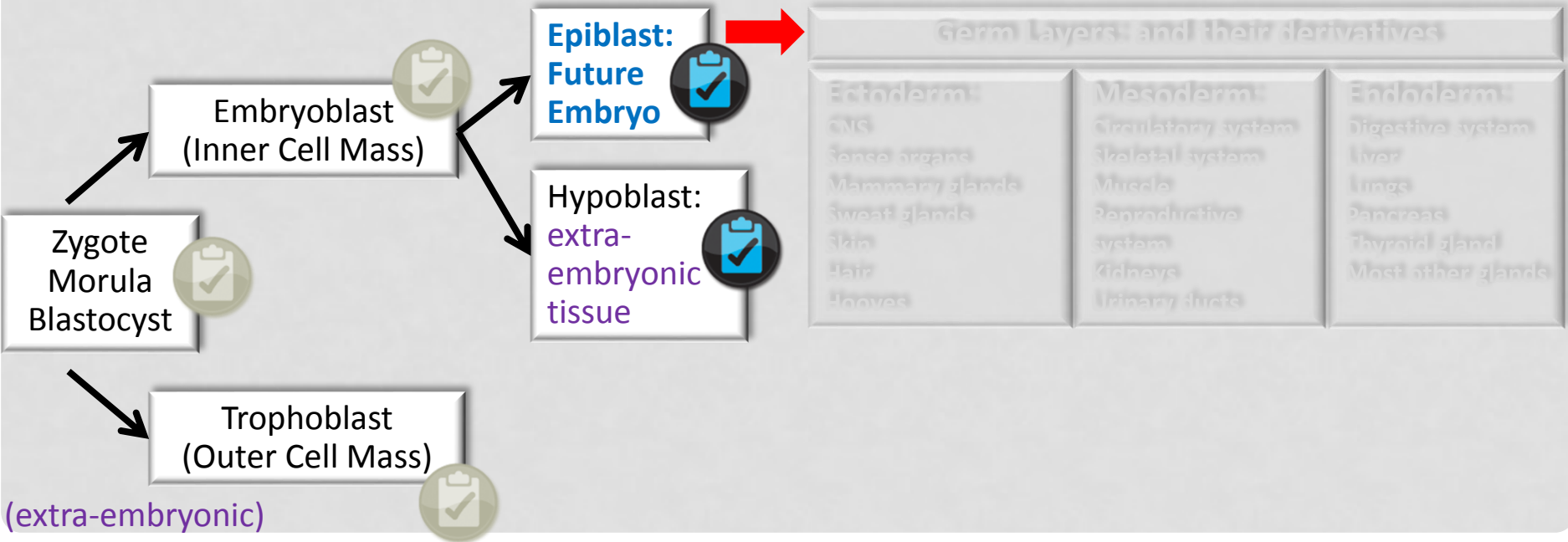
Future

_____ tissues

OVERVIEW

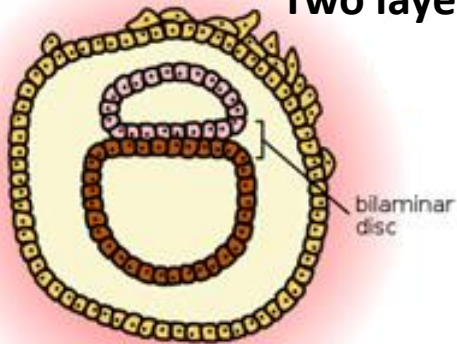


Pre-Implantation	Implantation	Early Embryogenesis	
Fertilization Proliferation and Early Differentiation			
Zygote Morula Blastocyst	Bilaminar Embryonic Disk	Embryonic Disk (Germ Layers)	



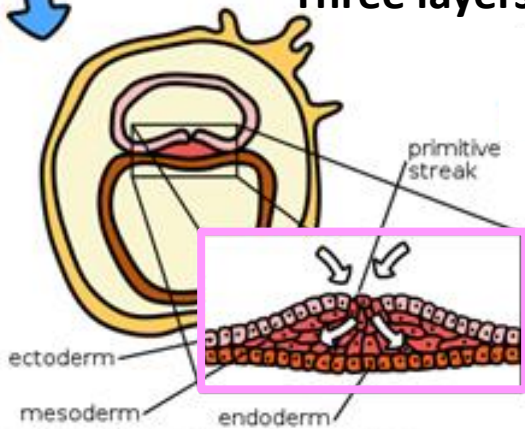
THE DEVELOPMENT OF THE THREE-LAYER-EMBRYO

Two layers

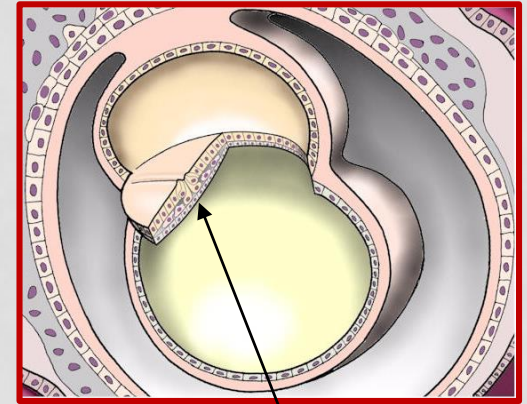
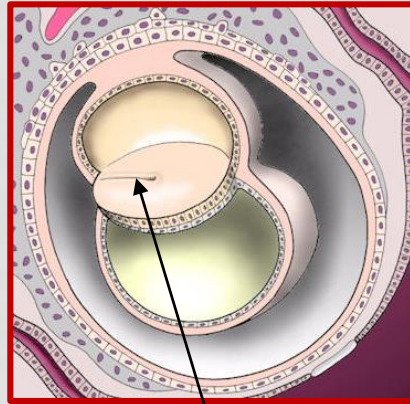


Day 12: Bilaminar disc formation

Three layers

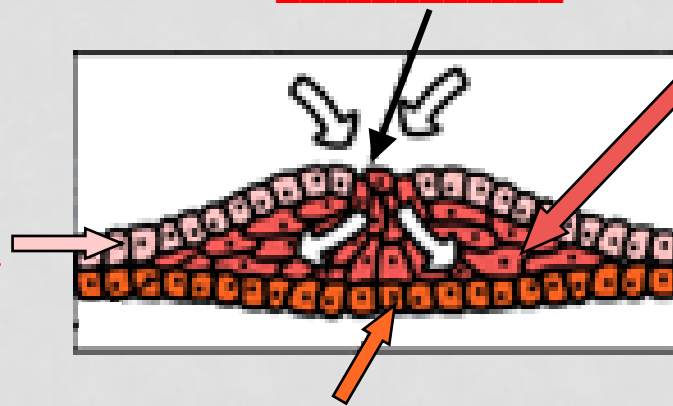


Day 12: Mesoderm formation

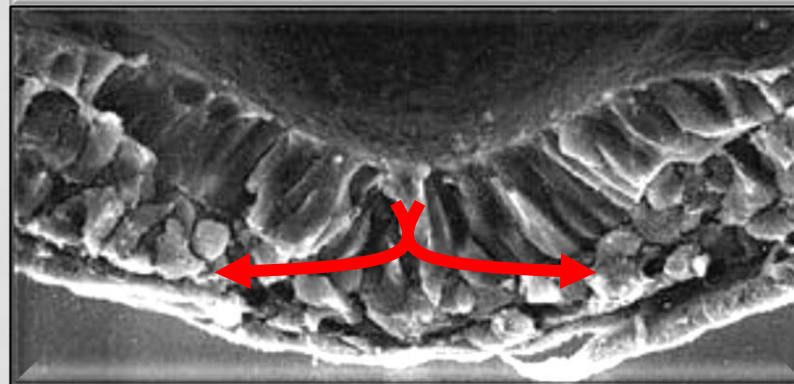


- The embryonic disk becomes oval.
- The _____ appears near the narrower *posterior* end
- thickening of the cell layer
- _____ and _____ of epiblast cells “in-between” the two layers, thereby forming a third, middle layer

DEVELOPMENT OF _____ AND _____



Cell migration



SUMMARY



Pre-Implantation	Implantation	Early Embryogenesis	
Fertilization Proliferation and Early Differentiation		_____	
Zygote Morula Blastocyst	_____	_____	
	Embryonic Disk	Embryonic Disk (Germ Layers)	

Videos (gastrulation and tubulation):



Germ Layers and their derivatives:



<http://www.youtube.com/watch?v=3AOoikTEfeo>



3:17 min

<http://www.youtube.com/watch?v=qMnpxP6EeIY>



2:37 min; later stages of embryo folding

<http://www.youtube.com/watch?v=sUuX-4fEF3A>

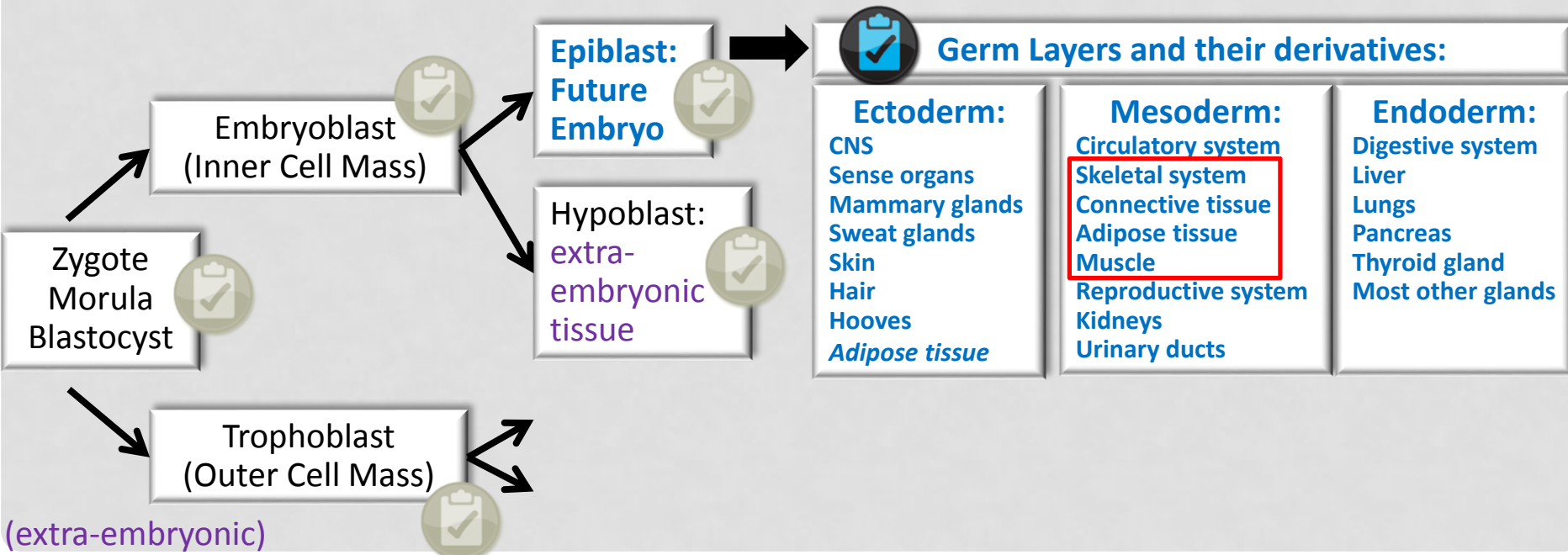


3:32 min; later stages of notochord formation

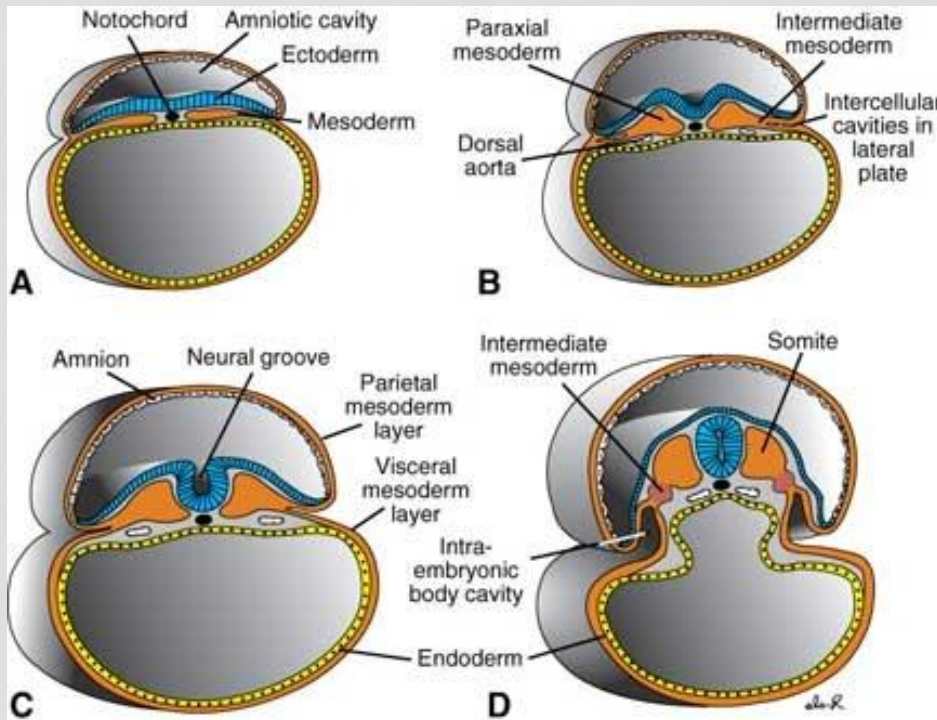
OVERVIEW



Pre-Implantation	Implantation	Early Embryogenesis	
Fertilization Proliferation and Early Differentiation		_____	_____
Zygote Morula Blastocyst	_____	_____	_____
	Embryonic Disk	Embryonic Disk (Germ Layers)	



FOLDING OF THE EMBRYONIC LAYERS AND TISSUES



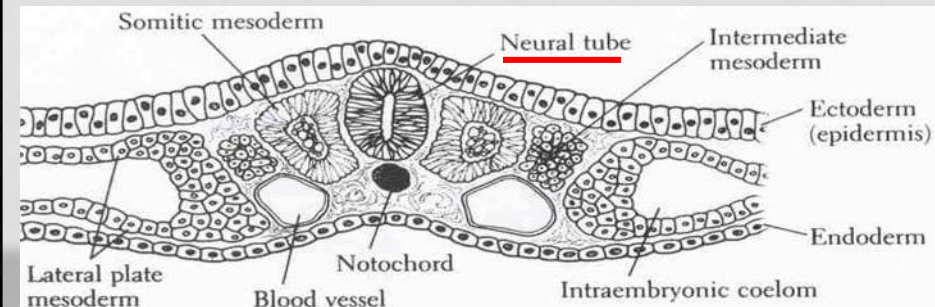
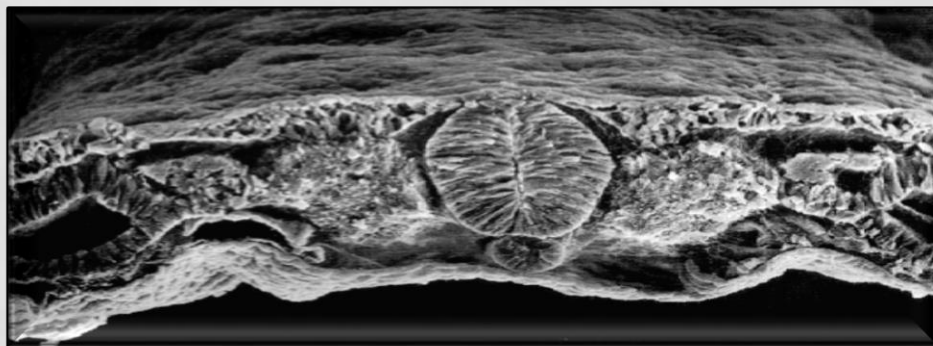
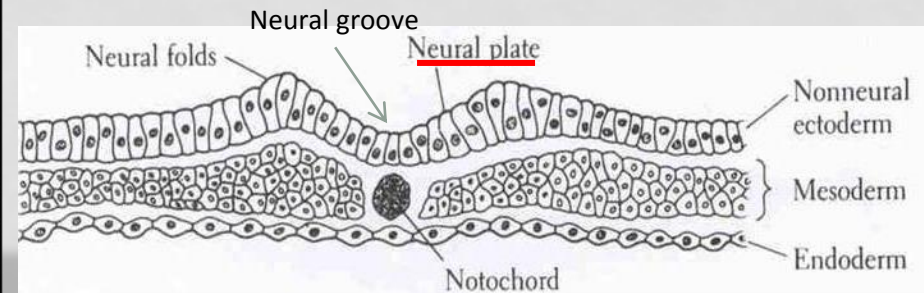
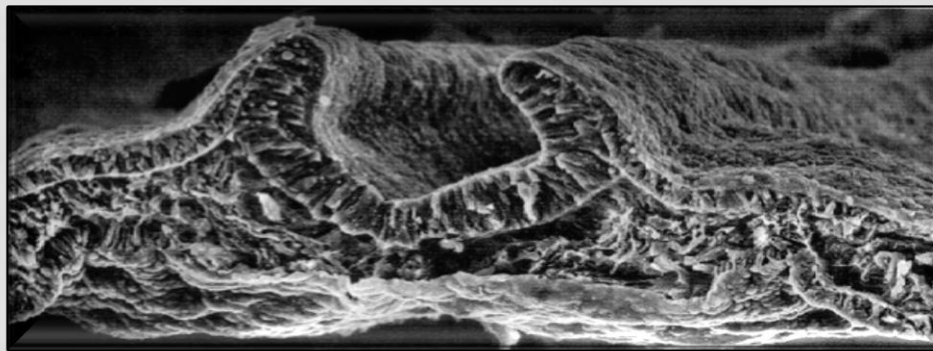
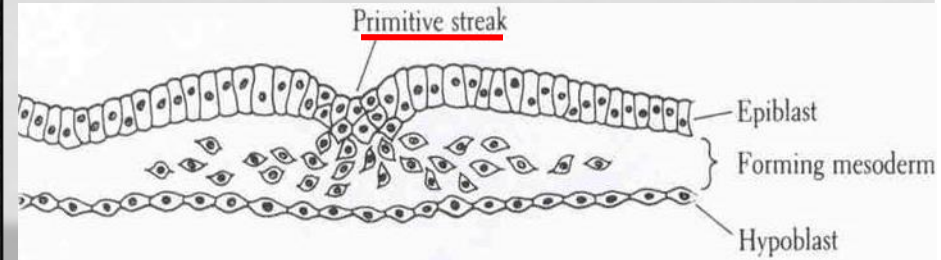
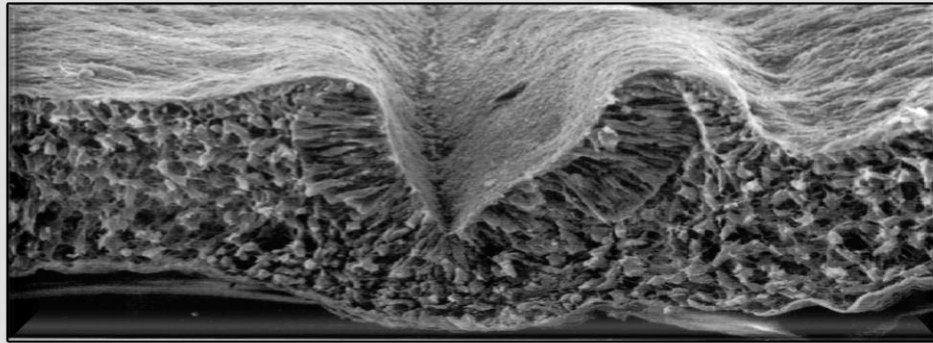
- The three germ layers give rise

- The three layers expand, fold, invaginate to (eventually) form the shape of the organism.
- We will learn more about
 - The primary formation of the nervous system,
 - The formation of somites that will give rise to dermis, skeletal muscle, and vertebrae;
 - The ultimate development of muscle and bone;

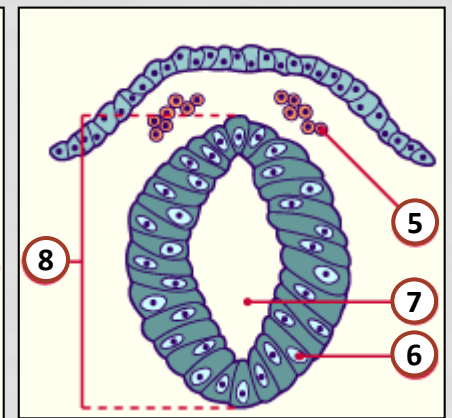
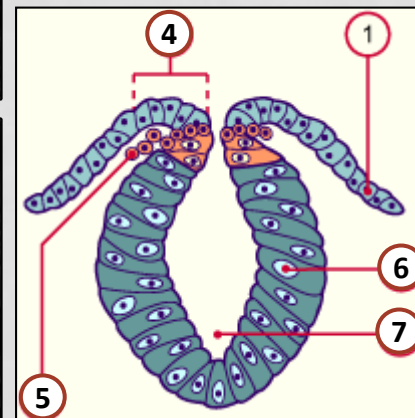
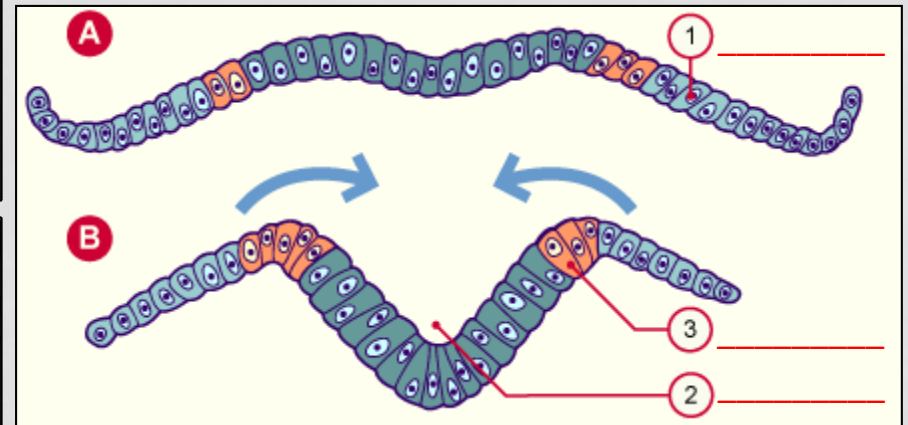
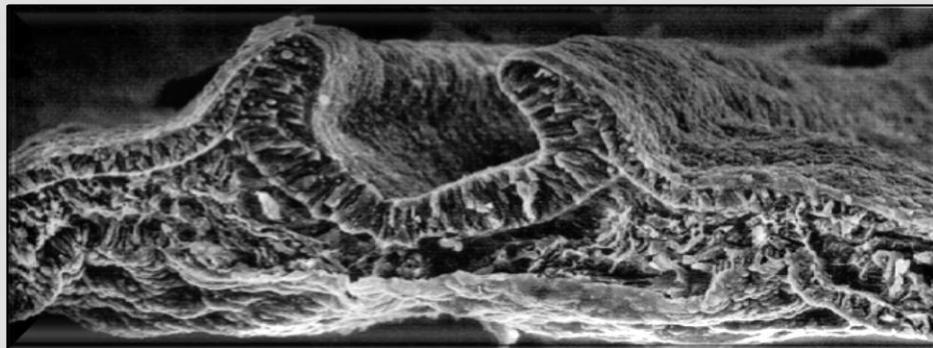
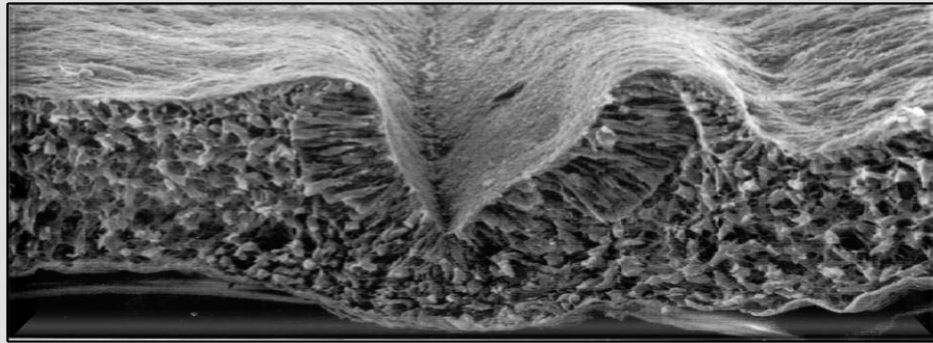
FORMATION OF THE NEURAL PLATE AND NEURAL TUBE



[HTTP://WWW.YOUTUBE.COM/WATCH?V=QISRNX3QJUG&FEATURE=RELATED](http://www.youtube.com/watch?v=QISRNX3QJUG&feature=related)



FORMATION OF THE NEURAL PLATE AND NEURAL TUBE





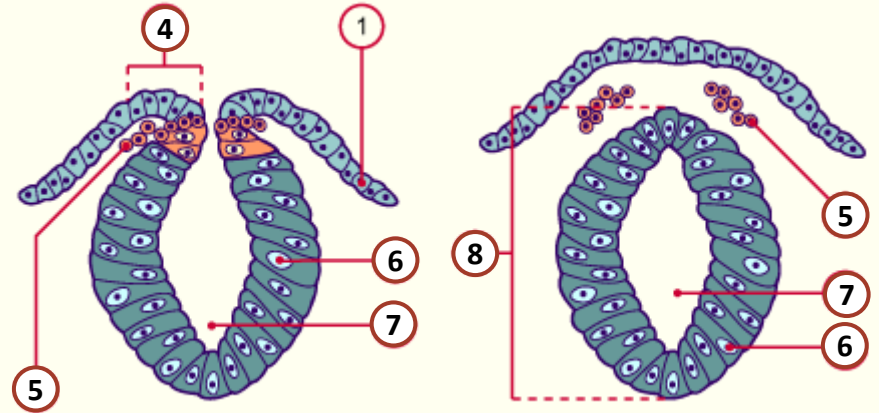
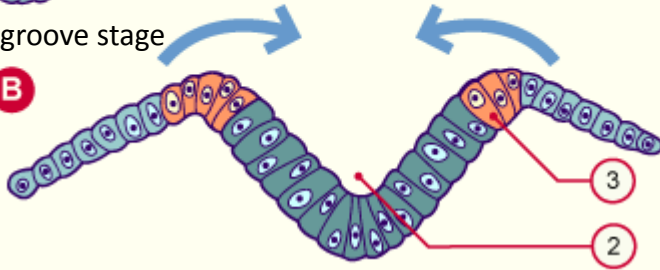
Neural plate stage

A



Neural groove stage

B



1. Epiblast/ _____
2. _____
3. _____
4. Neural fold
5. Migrating neural crest cells
6. Neuroepithelium (Neuroectoderm)
7. Central canal
8. _____

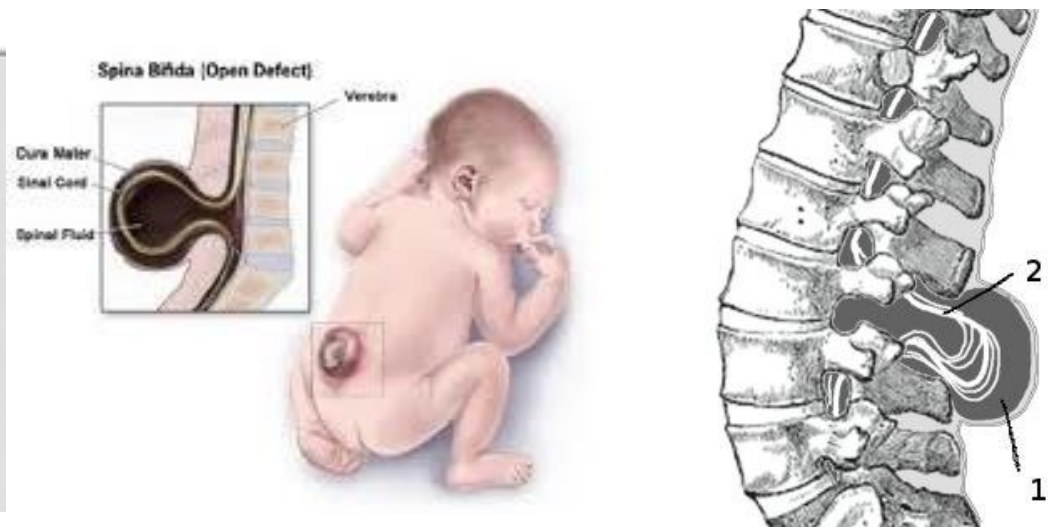
Some _____ migrate and later form the peripheral nerve cells.

WHAT HAPPENS IF IT DOESN'T WORK?

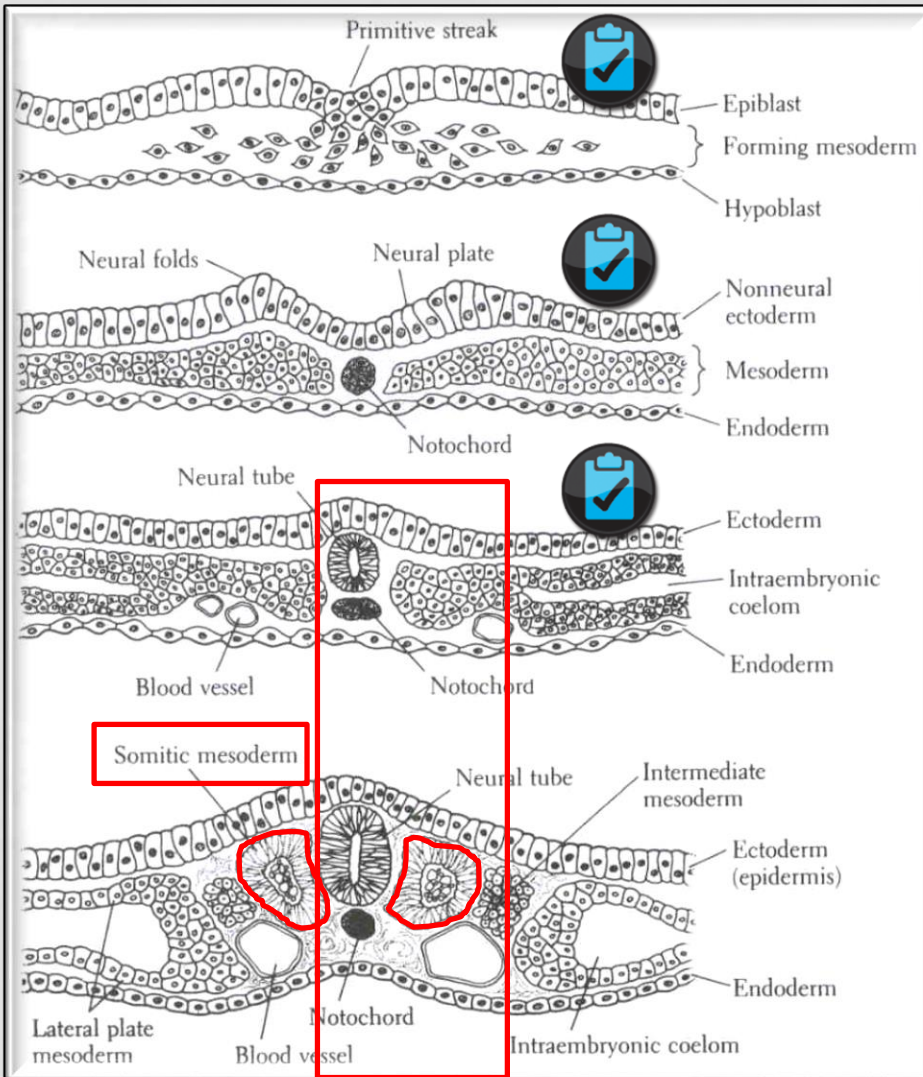


Pathology related to the neural tube

1. Spinal dysraphia: unsuccessful closure of the neural tube
 - a) Spina bifida
 - More or less strongly pronounced opening of the vertebral canal
 - Various degrees of closure determines clinical significance

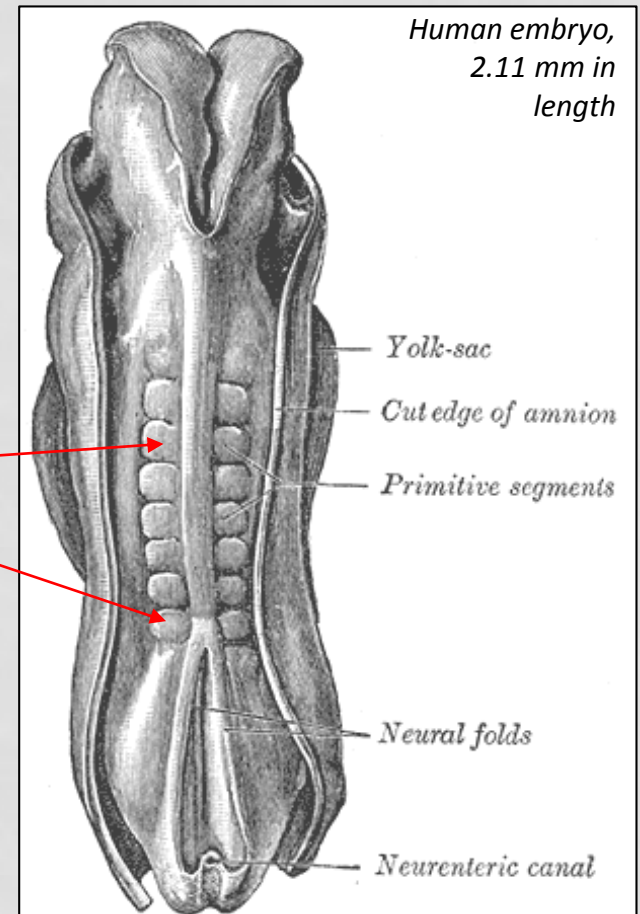
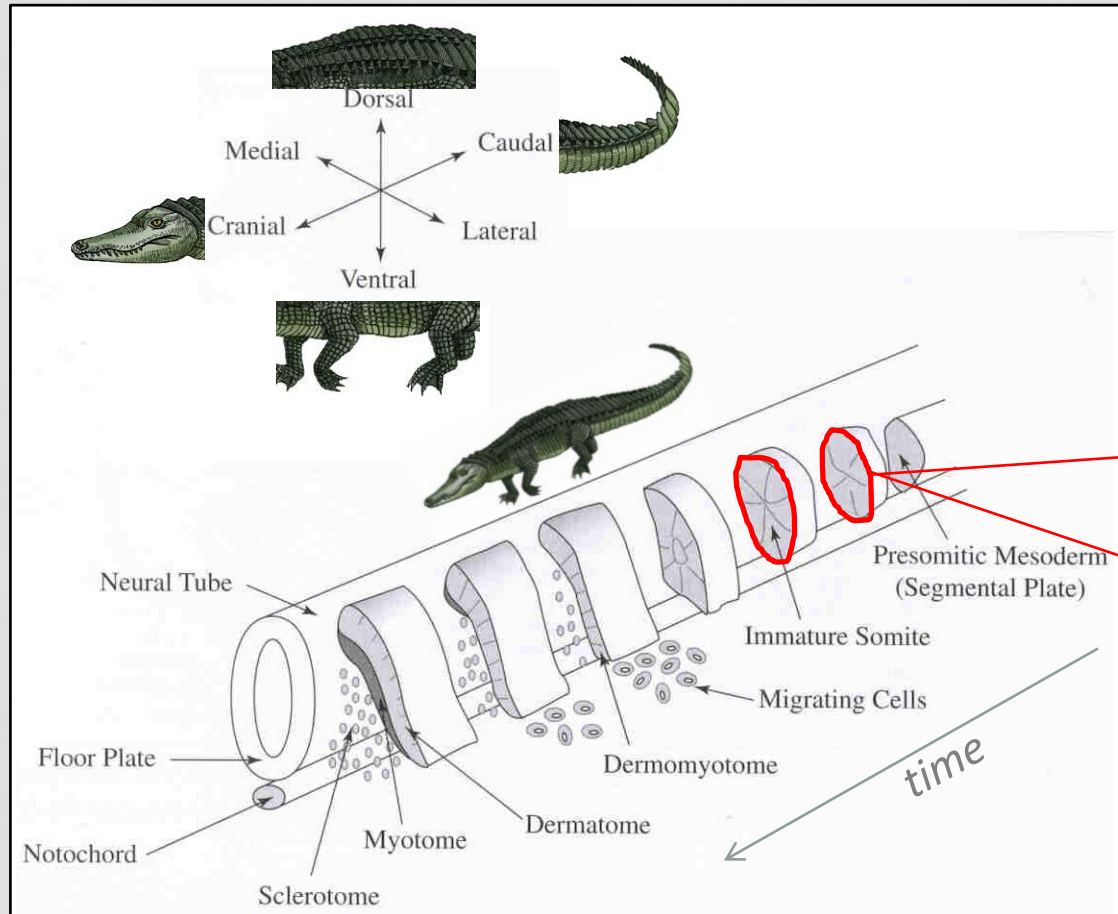
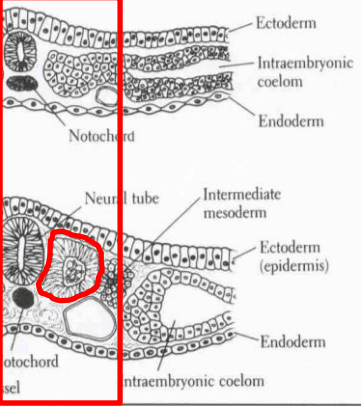


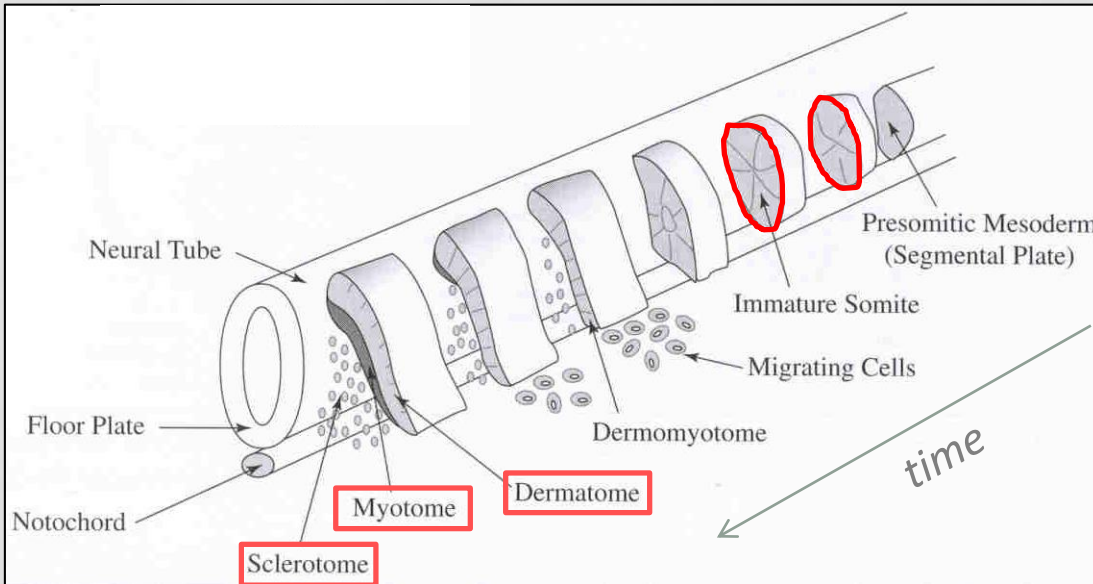
CONCOMITANT STRUCTURE FORMATION



Other events during gastrulation commence around the same time as neurulation, such as:

- ❖ _____: formation of _____, bilaterally paired blocks of mesoderm that form along the anterior-posterior axis of the developing embryo
- ❖ Subsequent development of _____, _____ and _____
- ❖ _____ formation





 : mass of mesoderm distributed bilaterally alongside the neural tube

→ Develop into:

❖ → vertebrae, rib cartilage

❖ → → dermis

❖ → skeletal muscle

OVERVIEW



Pre-Implantation		Implantation	Early Embryogenesis	
Fertilization Proliferation and Early Differentiation			Gastrulation	Neurulation & Embryo Folding *
Zygote		Bilaminar Embryonic Disk	Trilaminar Embryonic Disk (Germ Layers)	Embryo Proper*
Morula				
Blastocyst				

