Lecture 3 – 10/22/01
Animal Development

1. Textbook pages that you can skip
   Figs. 43-3, 43-4, 43-6, 43-10, 43-12, 43-14, 43-15 (and the corresponding text)
   Birds & Mammals: fig. 43-16, 43-17 (and the corresponding text)
   Hox genes: fig. 43-20
   Extraembryonic membranes: pp. 767-768
   Pregnancy & birth: pp. 769-771

2. Roadmap of the lecture

   * Fertilization: events; contribution from egg and sperm
   * Rearrangement of cytoplasm after fertilization: definition of poles
   * blastulation:
     • events + definition of blastomere, blastula, blastocoel
     • variation in patterns of cleavage
     • definition of blastocyst, trophoblast
   * gastrulation
     • in sea urchins: events + definition of blastopore, archenterons, primary & secondary mesenchyme, endoderm, protostome, deuterostome, ectoderm, mesoderm
     • in frogs: events + definition of epiboly, notochord, neural plate, body axes
   * fate maps
   * neurulation
     • events + neural tube differentiation + segmentation
   * segmentation

3. Study guide

After studying for this lecture, you should be able to:

- Describe the various steps of fertilization
- Know the definition of: capacitation, acrosomal reaction, polyspermy, cumulus, zona pellucida,
- List the cellular components contributed to the fertilized egg by the sperm cell and the oocyte
- Know the definition of the following terms: gray crescent, blastomere, animal and vegetal poles, blastocoel, blastula, blastocyst, trophoblast, archenteron, blastopore, endoderm, ectoderm, mesoderm, primary and secondary mesenchyme, protostome, deuterostome, epiboly, neural plate, notochord, neural tube, segmentation, somites
- Draw the relative positions of the animal pole, vegetal pole, point of sperm entry and gray crescent in frog embryos
- Compare and contrast the patterns of cleavage in sea urchins, frogs, and chicks, and relate the difference to yolk content and location
• understand why cells of the animal pole are smaller than cells of the vegetal pole
• describe in details the events of gastrulation in sea urchins; be able to redraw the cartoons of Fig. 43-11 showing the relative position of the different embryonic tissues and structures
• understand the origin and future role of the archenteron, and know what tissue it is made of
• describe in details the events of gastrulation in frogs; be able to draw the cartoons of Fig. 43-13 as you describe the events
• understand the origin of the mesoderm in frogs, and compare to the situation in sea urchins
• describe the origin and fate of the notochord and the differentiation of the neural plate
• understand the origin of the 2 main body axes in frogs
• describe the events of neurulation in frogs
• draw the fate map of the frog blastula (fig. 43-9)
• know the fate of the embryonic germ layers (fig. 43.1)
• describe the process and consequence of body segmentation