

Chapter 47: Animal Development

41. Explain two ways in which gene expression is altered during development.

Determination is the process by which a cell or group of cells becomes committed to a particular fate and differentiation is the resulting specialization in form and function.

42. What does it mean to say that a cell is totipotent?

Totipotent blastomeres (cells formed by the cleavage of a fertilized ovum) can develop into all the different cell types of that species. In mammals, embryonic cells remain totipotent through the eight-cell stage, much longer than in many other animals.

43. Explain why two normal embryos result when the two blastomeres on the left, but not those on the right, are separated. ✍

Blastomeres that received half or all of the material in the gray crescent developed into normal embryos, but a blastomere that received none of the gray crescent gave rise to an abnormal embryo without dorsal structures.

44. What did Spemann and Mangold find to be the organizer that induced a series of events resulting in the formation of a notochord and neural tube?

Spemann and Mangold concluded that the dorsal lip of the blastopore in the early gastrula functions as an “organizer” of the embryo’s body plan, inducing changes in surrounding tissue that direct formation of the notochord, the neural tube, and other organs. Developmental biologists still study the basis of induction by Spemann’s organizer. One major function of the cells of the organizer seems to be to inactivate a growth factor called bone morphogenetic protein 4 (BMP-4) on the dorsal side of the embryo. Inactivation of BMP-4 allows cells on the dorsal side to make dorsal structures, such as the notochord and neural tube. Proteins related to BMP-4 and its inhibitors are also found in other animals, including invertebrates such as the fruit fly, where they also regulate the dorsal-ventral axis.