4061 Midterm 1 hr
2 from 3 (1 is compulsory)

1) Discuss the regulation of the Hunchback gene during Drosophila embryogenesis

2) Give examples of inducing centers that control gene expression and morphogenesis during development. Illustrate your answer with a description of an experiment that elucidates the type of control you have described.

3) A null mutation in the Staufen gene leads to a failure in Anterior posterior axis development. Based on your knowledge of the properties of the Staufen protein explain the molecular basis of why this phenotype occurs.

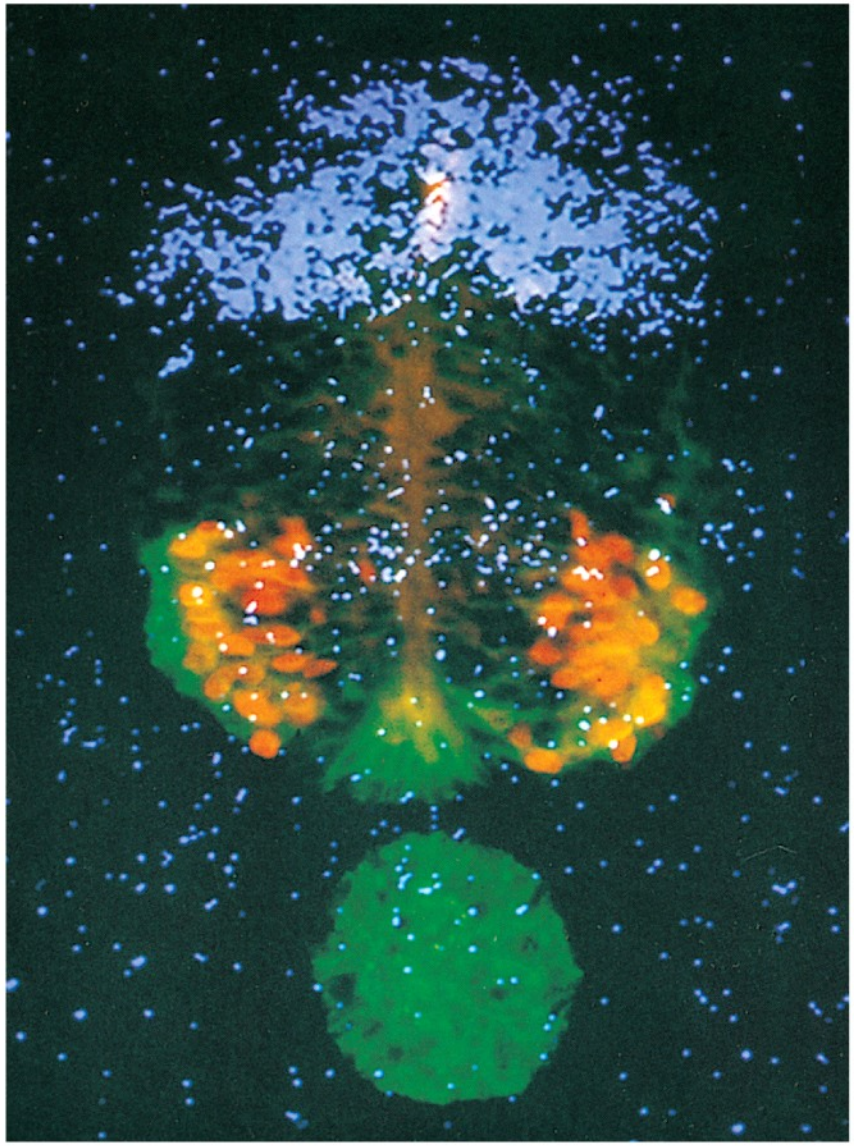
Neurulation

Ch 13, pp 413-437 in 11e

Ch 10, pp333-343 in 10e

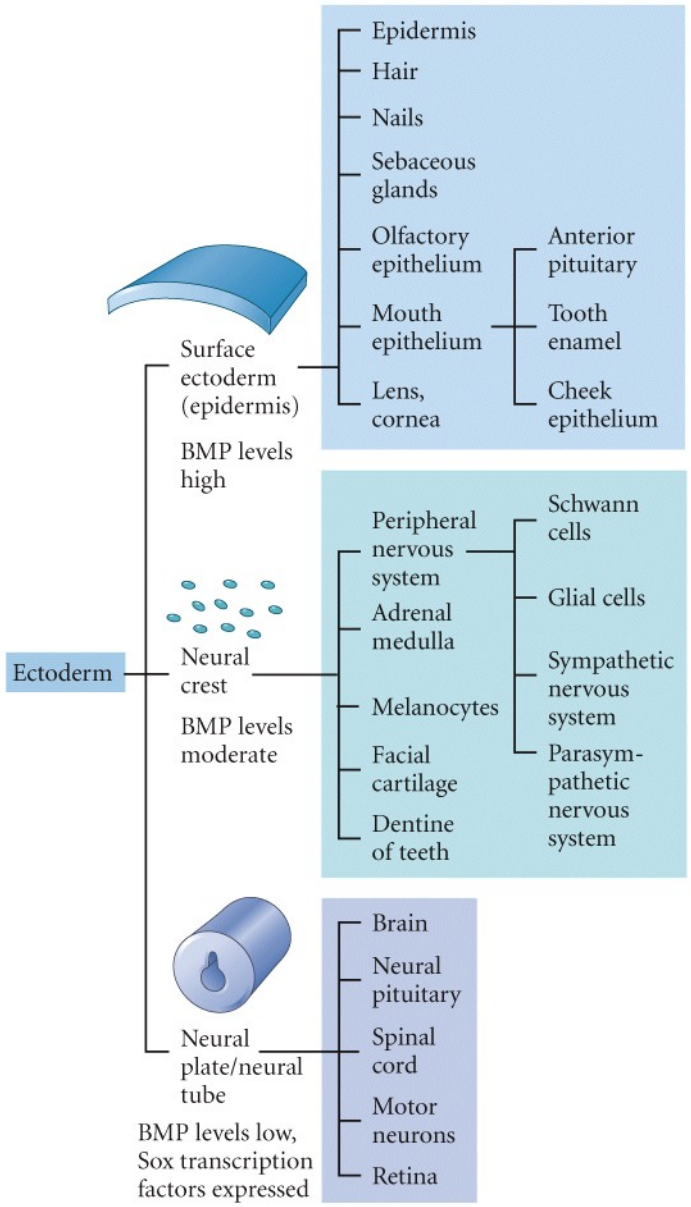
Or ch9 pp333-345 in 9th edition

(E)



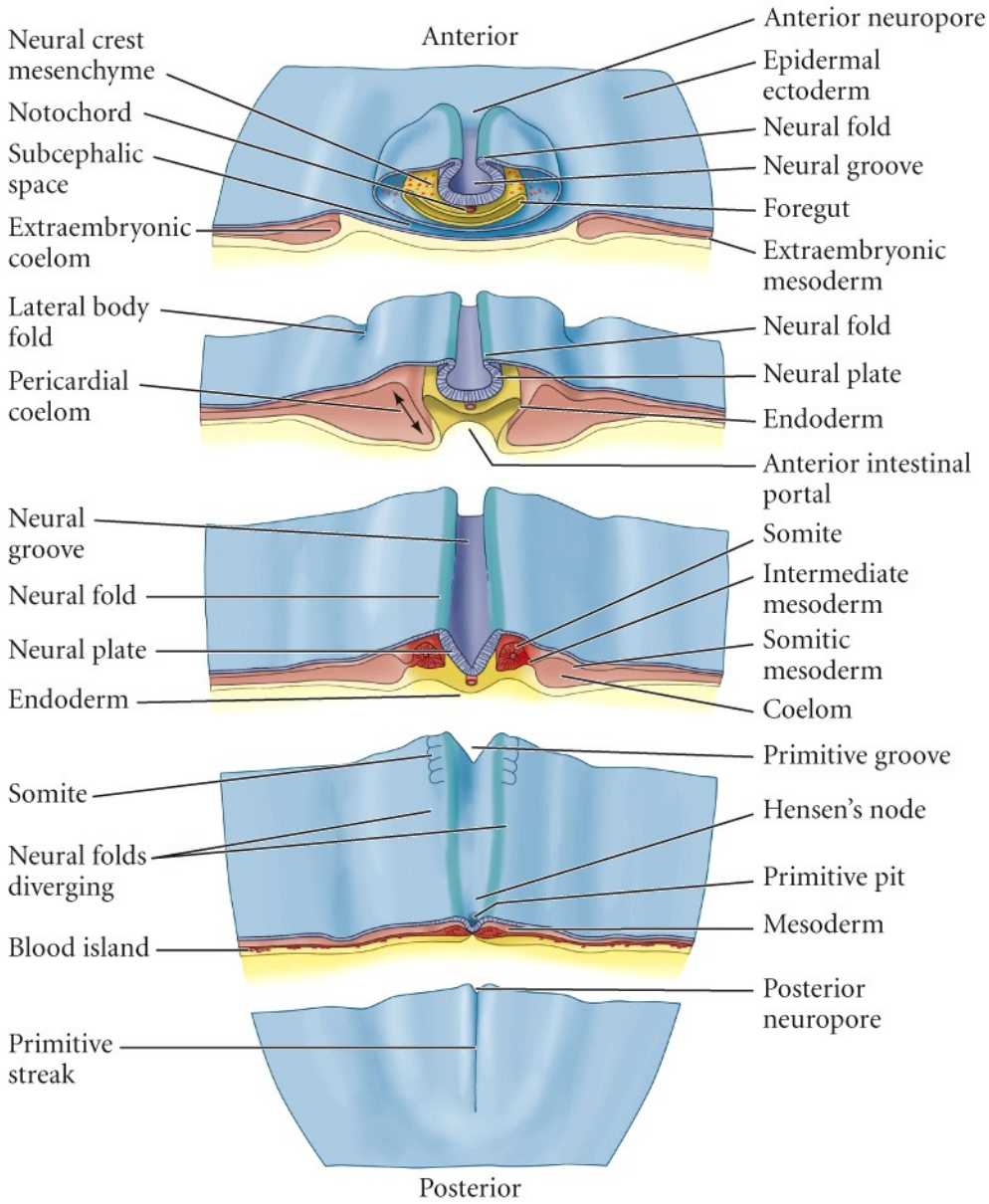
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.13 (Part 2)**

Figure 10.1 Major derivatives of the ectoderm germ layer



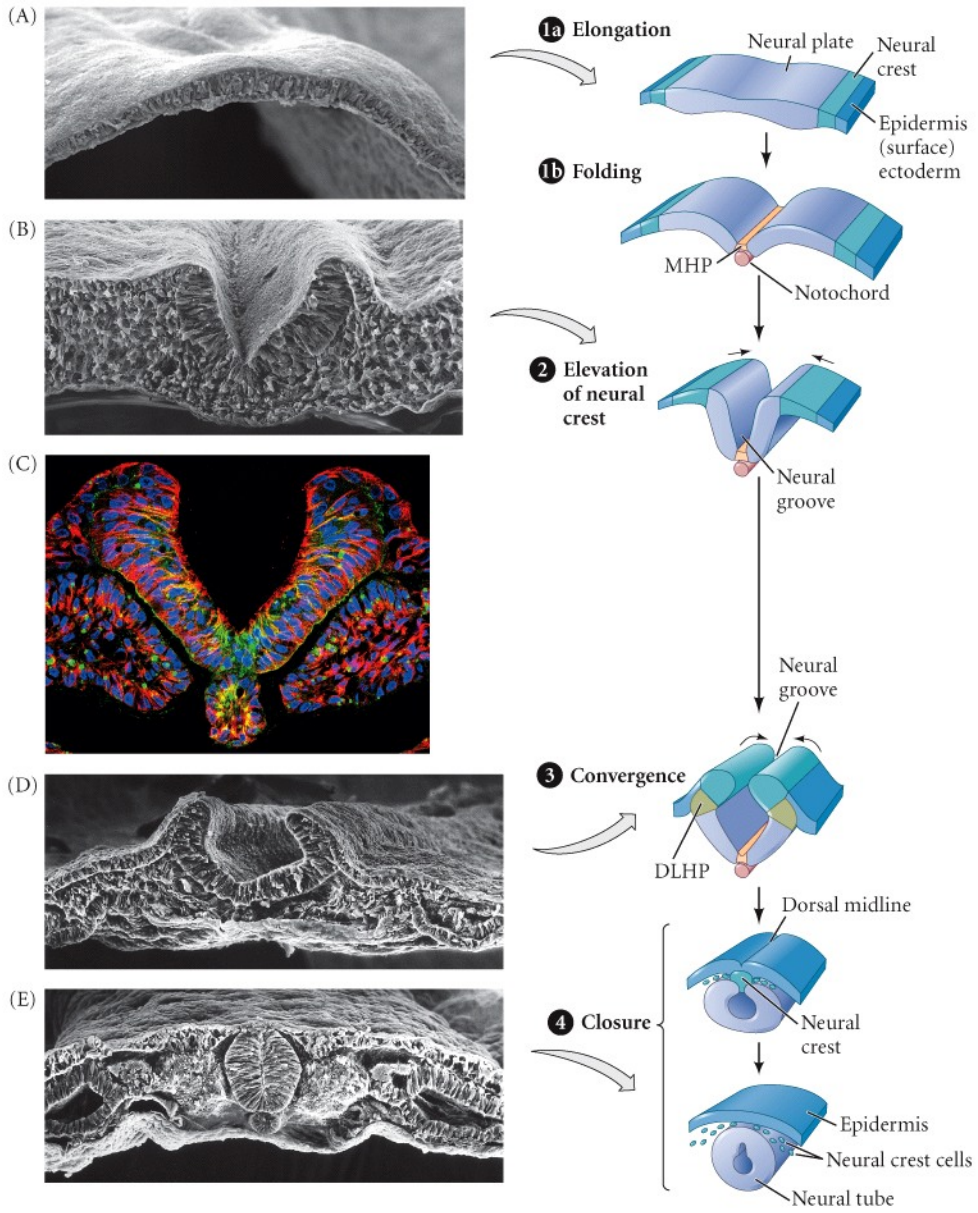
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.1**

Figure 10.2 The neurulating chick embryo (dorsal view) at about 24 hours



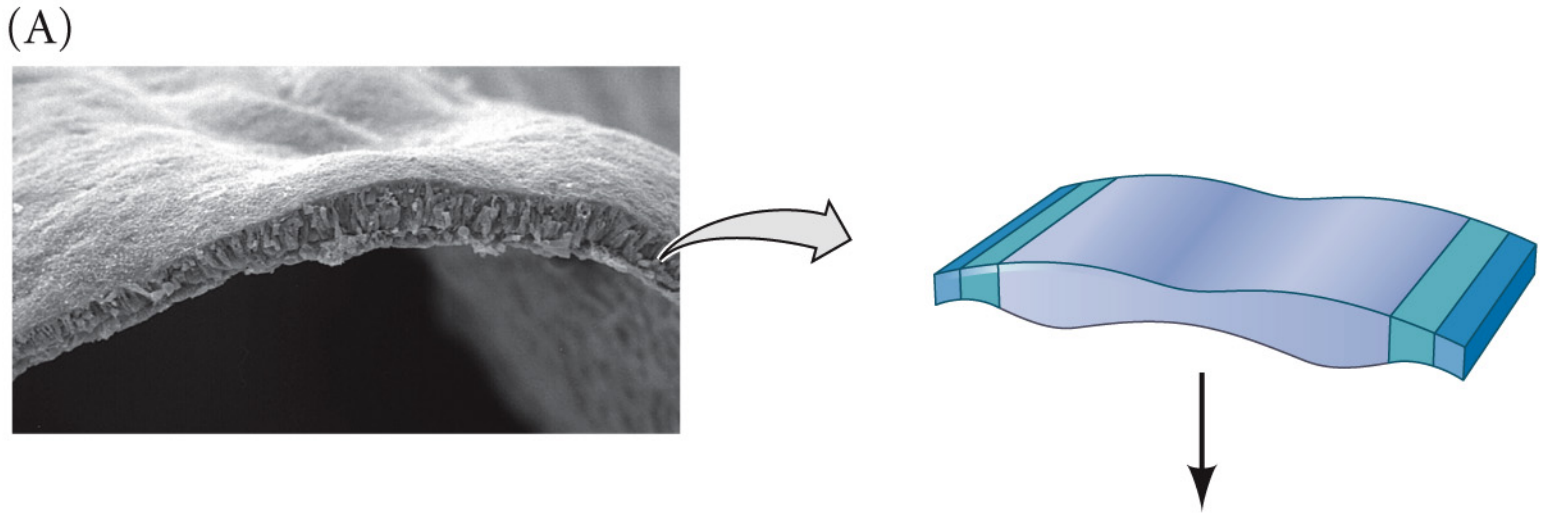
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.2**

Figure 10.4 Primary neurulation: neural tube formation in the chick embryo



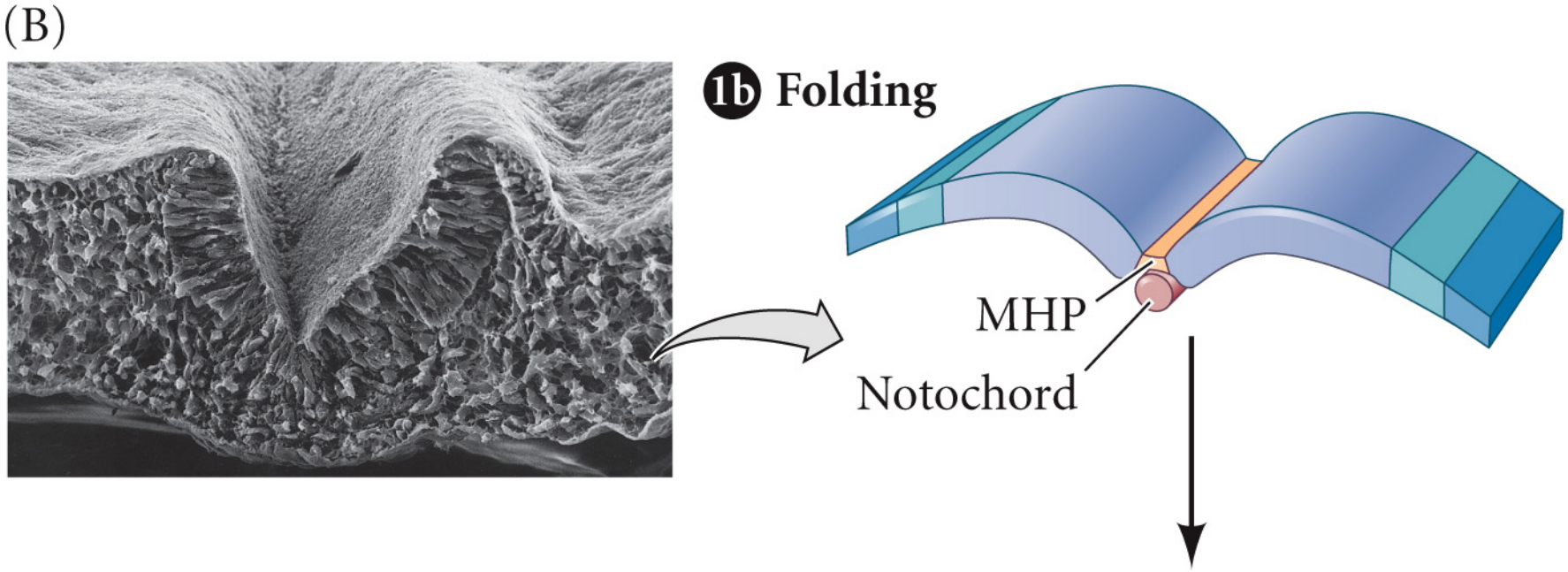
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.4**

Figure 13.6 Primary neurulation: neural tube formation in the chick embryo (Part 1)



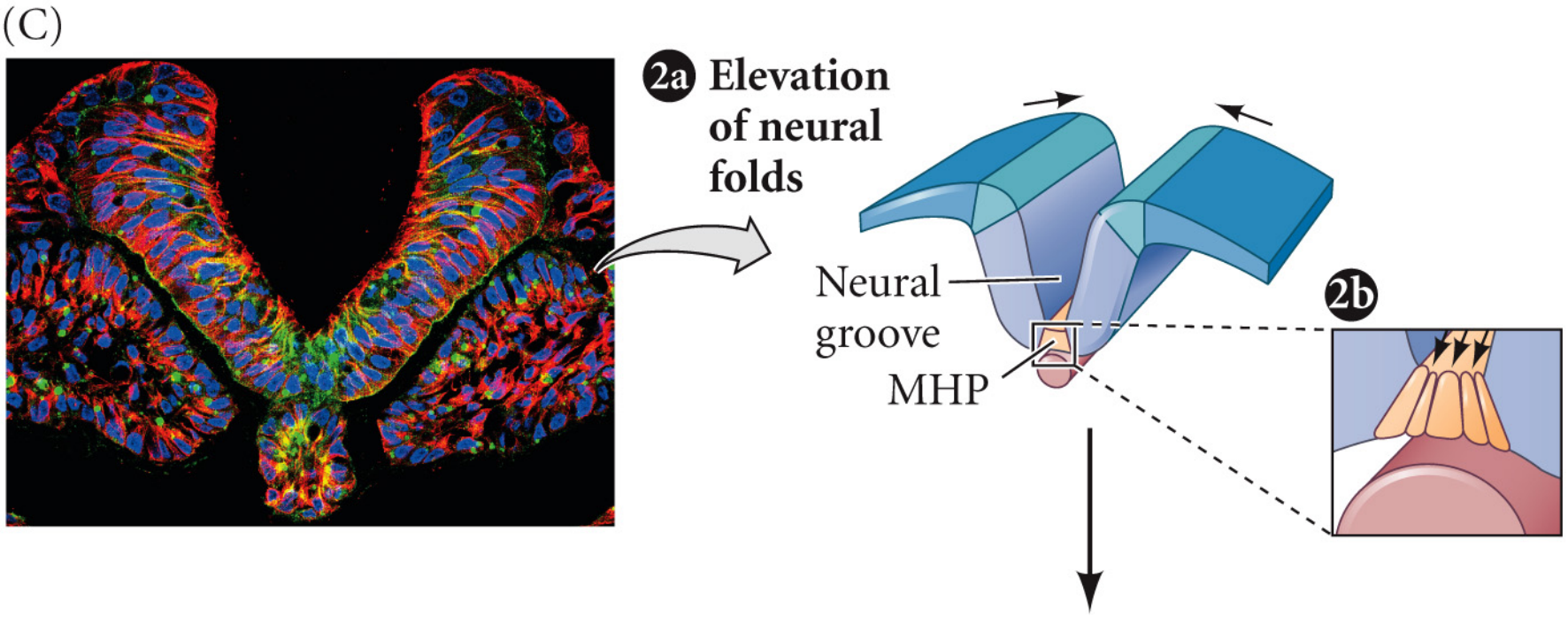
DEVELOPMENTAL BIOLOGY 11e, Figure 13.6 (Part 1)

Figure 13.6 Primary neurulation: neural tube formation in the chick embryo (Part 2)



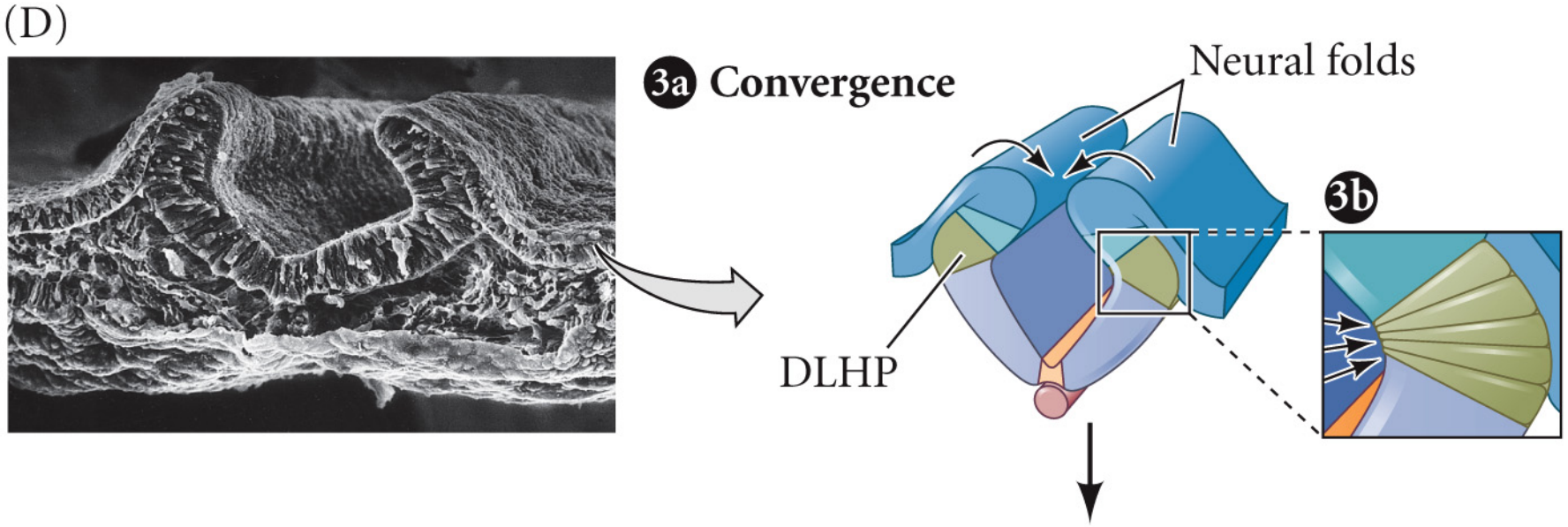
DEVELOPMENTAL BIOLOGY 11e, Figure 13.6 (Part 2)

Figure 13.6 Primary neurulation: neural tube formation in the chick embryo (Part 3)



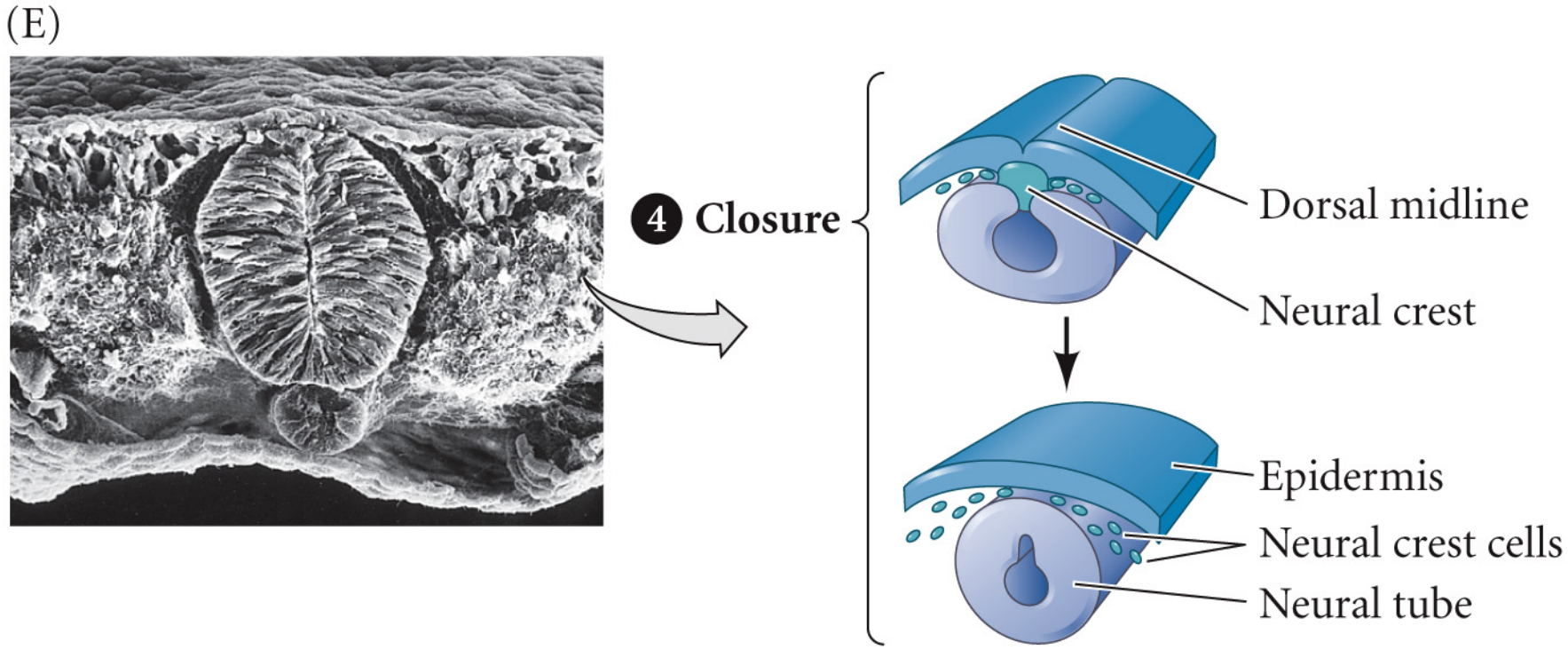
DEVELOPMENTAL BIOLOGY 11e, Figure 13.6 (Part 3)

Figure 13.6 Primary neurulation: neural tube formation in the chick embryo (Part 4)



DEVELOPMENTAL BIOLOGY 11e, Figure 13.6 (Part 4)

Figure 13.6 Primary neurulation: neural tube formation in the chick embryo (Part 5)

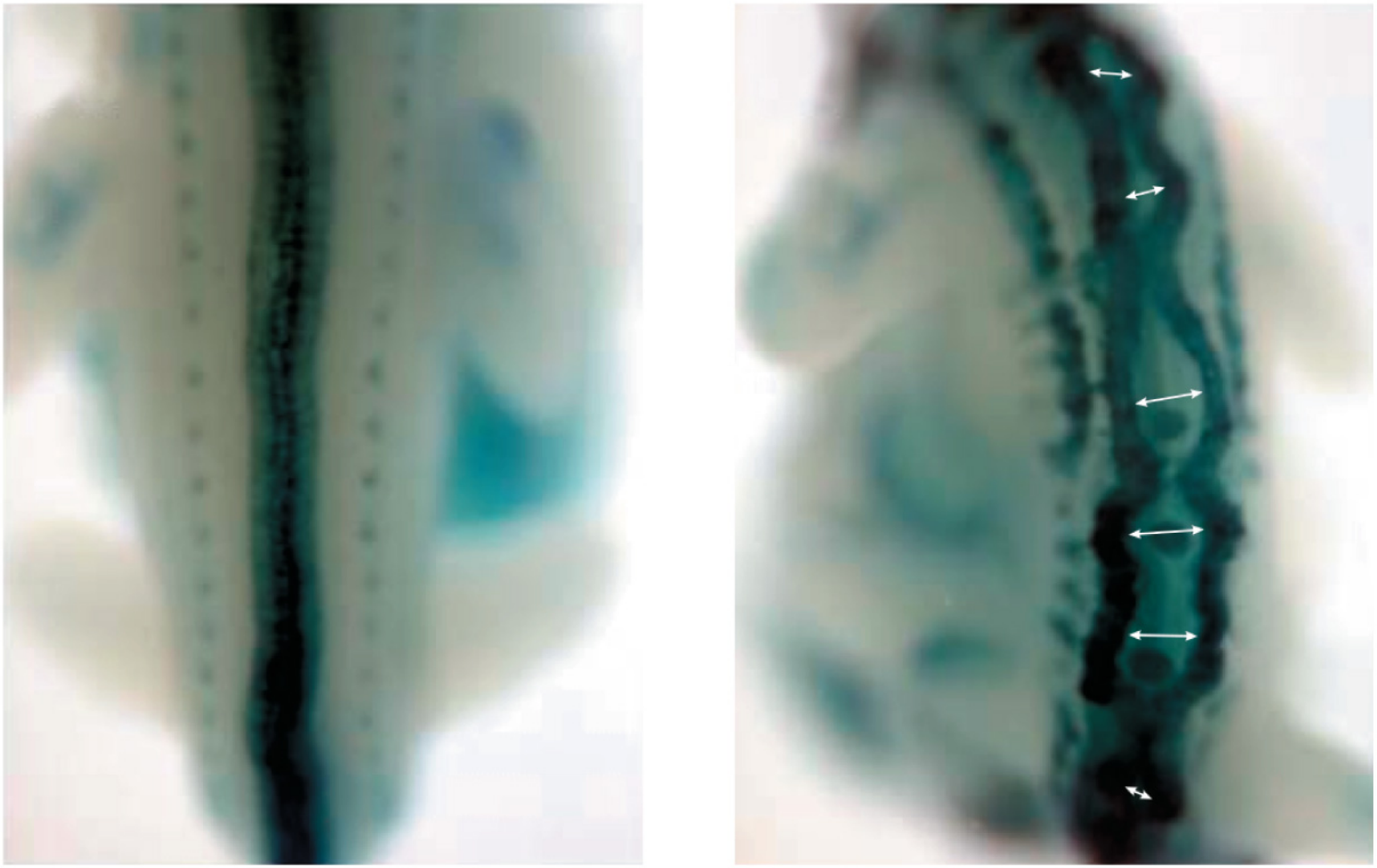


DEVELOPMENTAL BIOLOGY 11e, Figure 13.6 (Part 5)

Figure 13.7 Activated BMP signaling leads to neural tube defects

(A) Wild-type

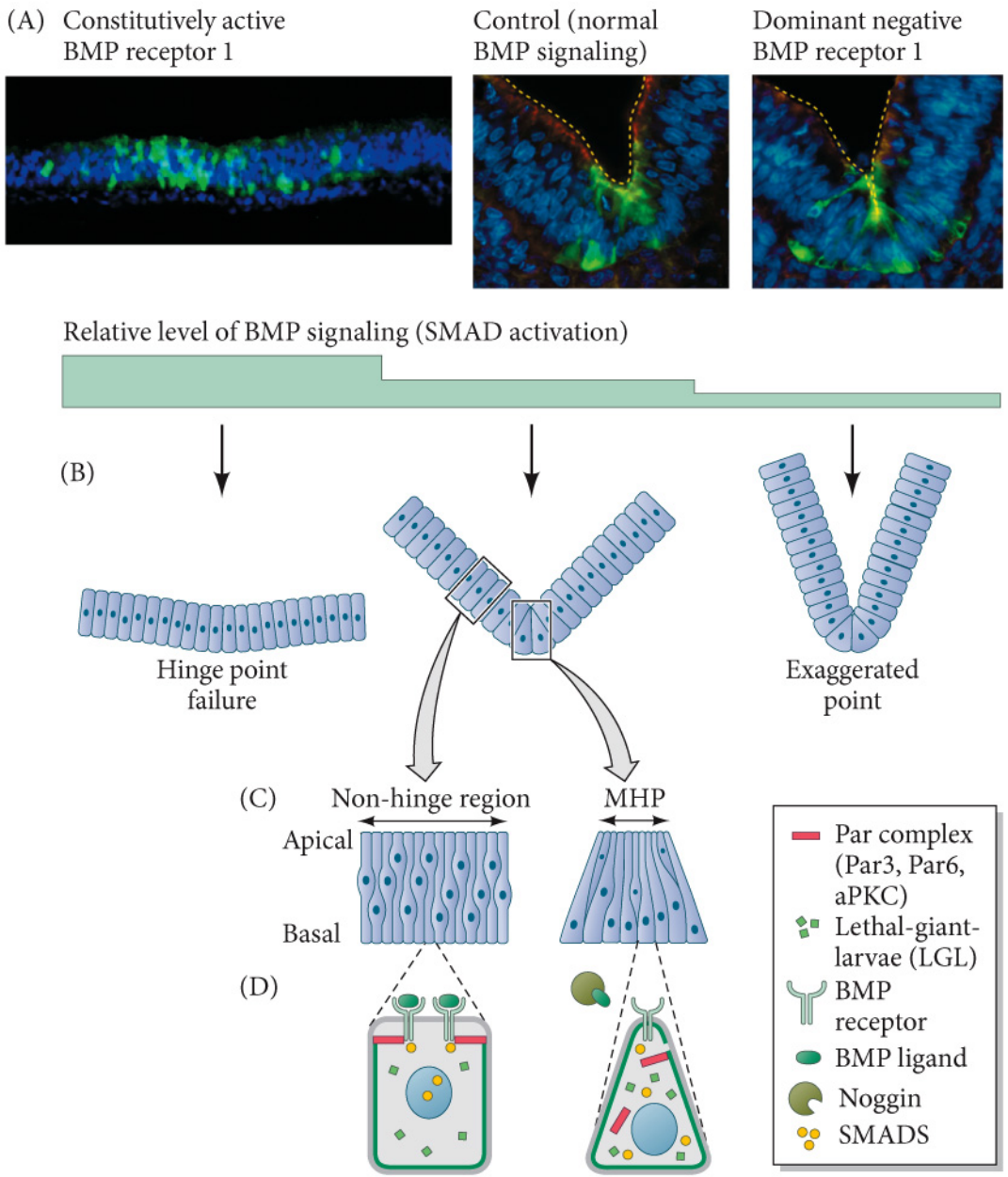
(B) *Noggin*$^{-/-}$



Noggin expressed;
neural tube closure

BMPs hyperactive,
neural tube fails to close

Figure 13.8 BMP prevents MHP formation by regulating apical-basal polarity



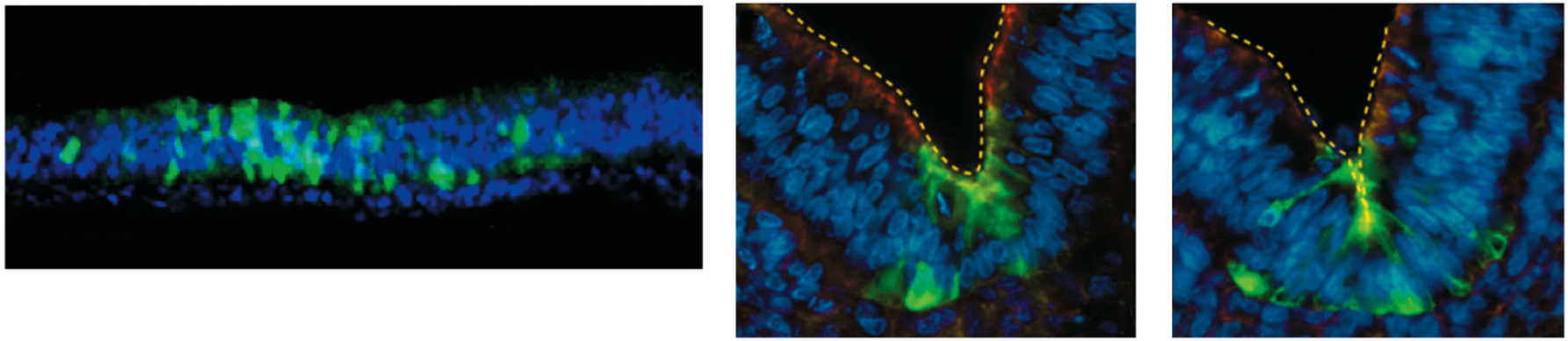
DEVELOPMENTAL BIOLOGY 11e, Figure 13.8

Figure 13.8 BMP prevents MHP formation by regulating apical-basal polarity (Part 1)

(A) Constitutively active BMP receptor 1

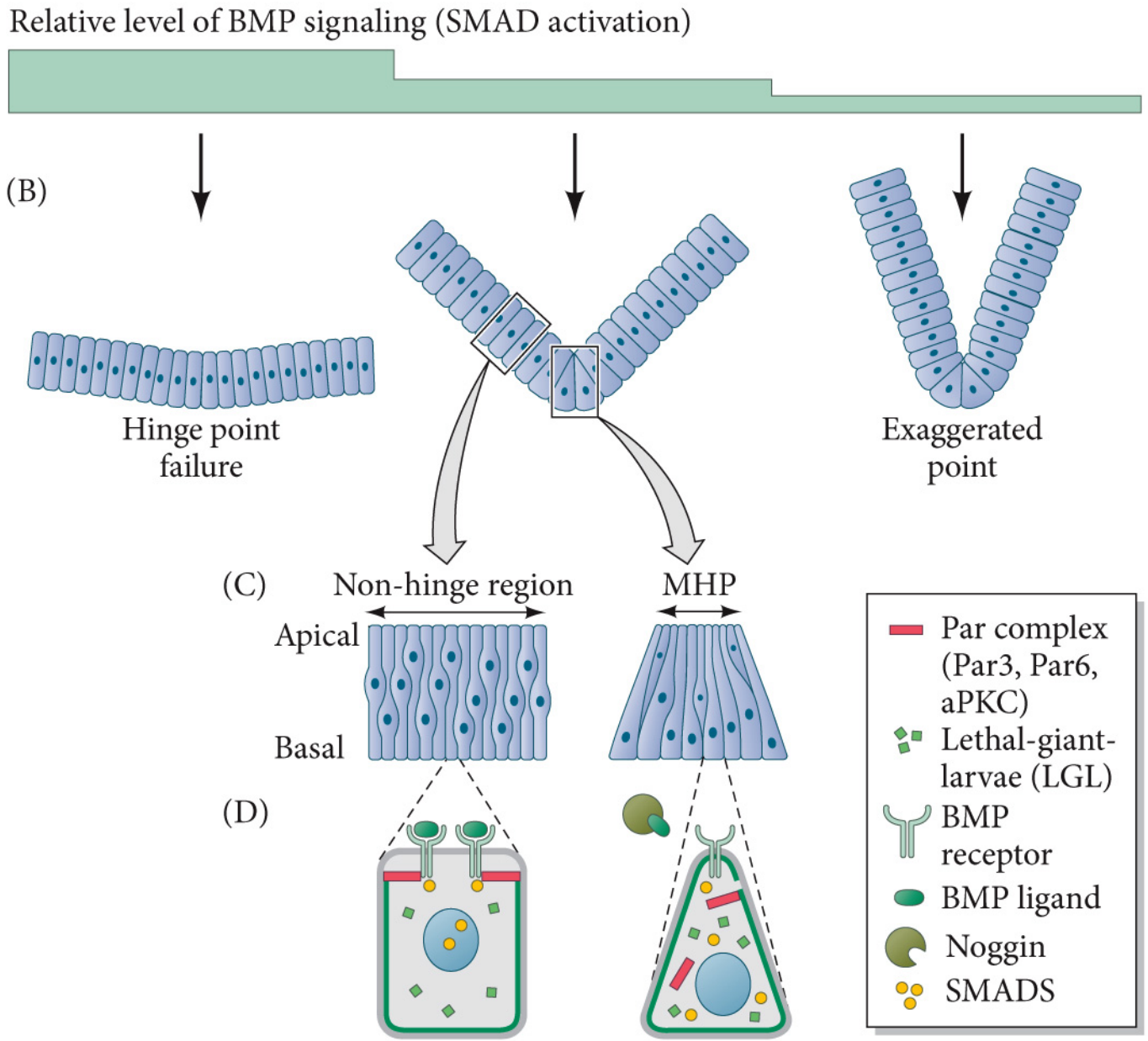
Control (normal BMP signaling)

Dominant negative BMP receptor 1



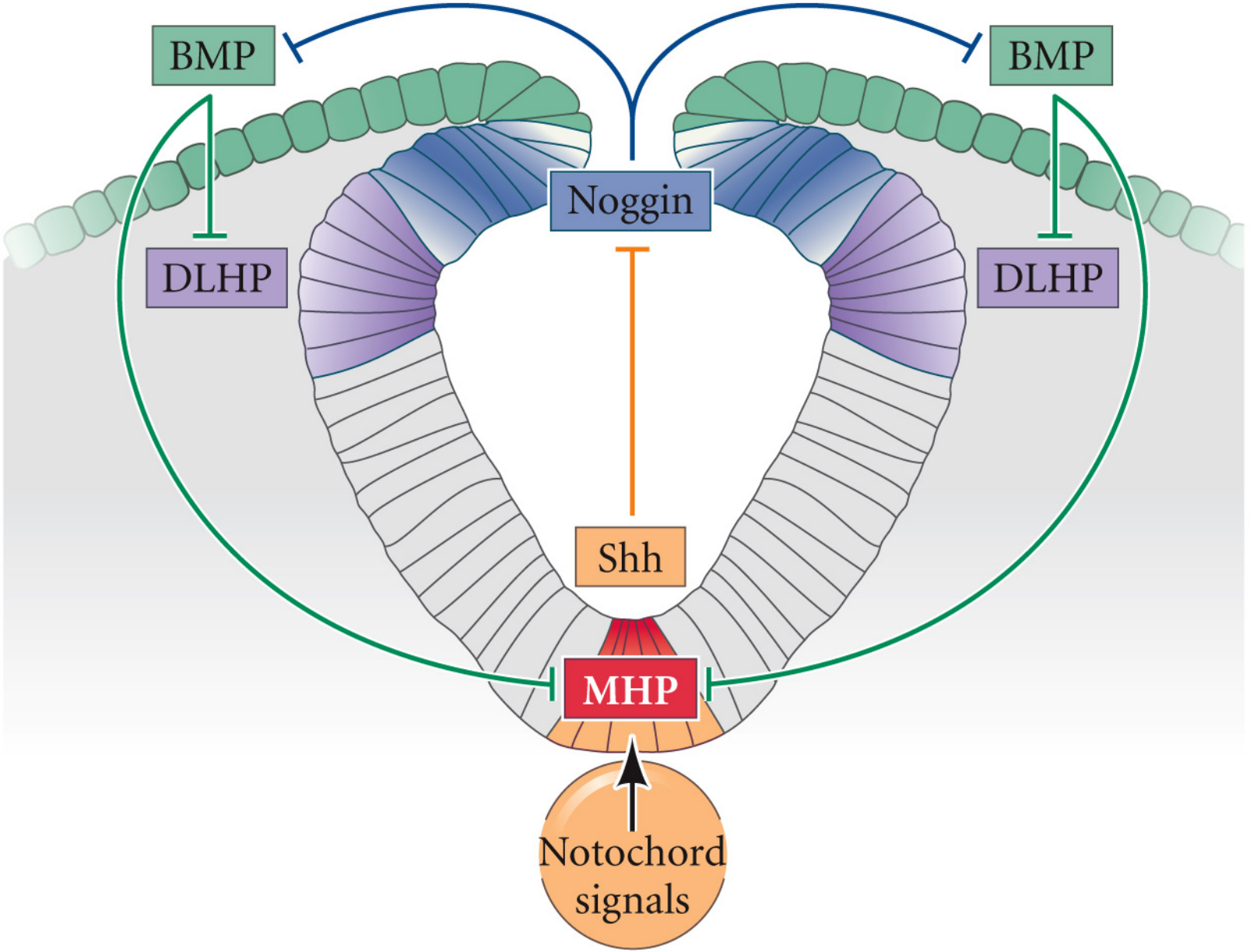
DEVELOPMENTAL BIOLOGY 11e, Figure 13.8 (Part 1)

Figure 13.8 BMP prevents MHP formation by regulating apical-basal polarity (Part 2)



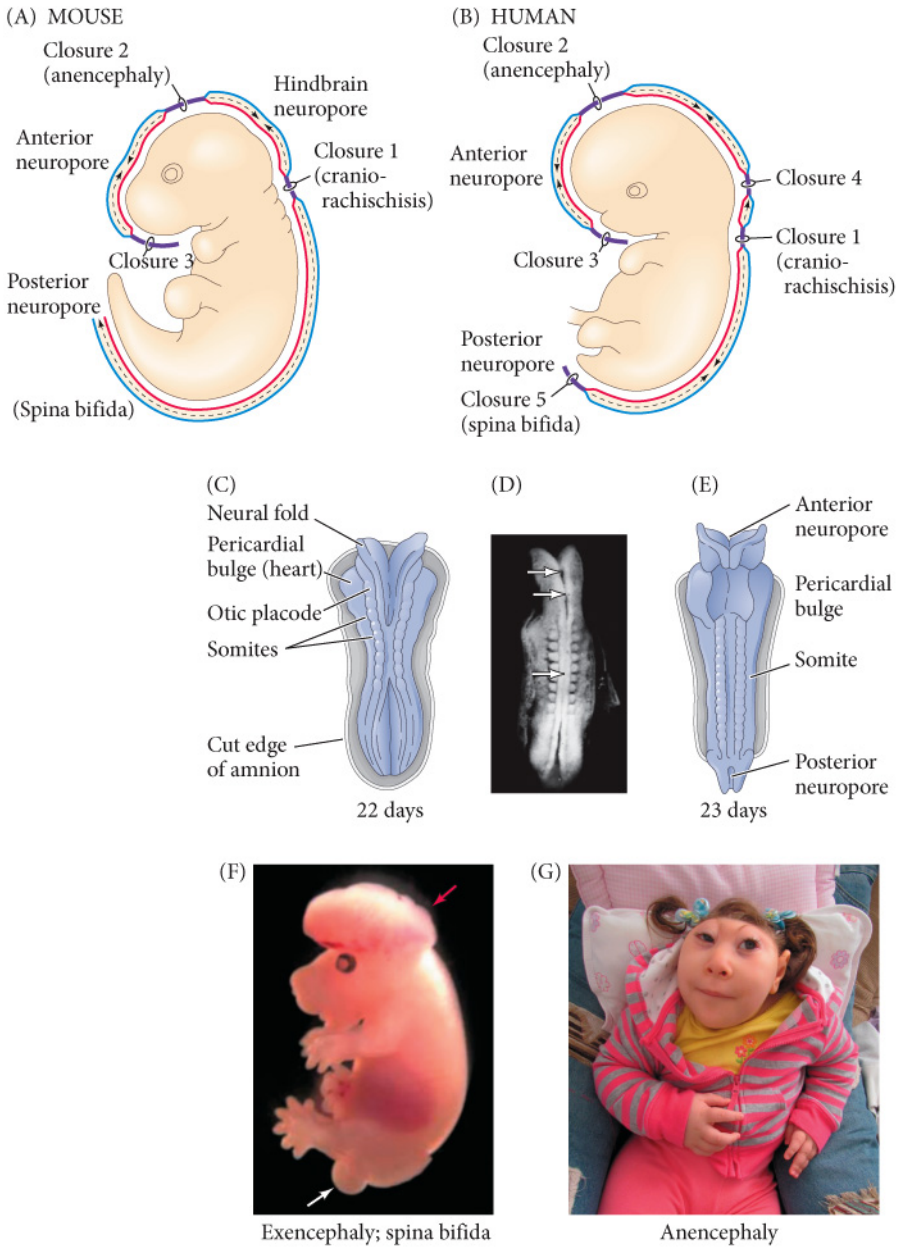
DEVELOPMENTAL BIOLOGY 11e, Figure 13.8 (Part 2)

Figure 13.9 Morphogen regulation of hinge point formation



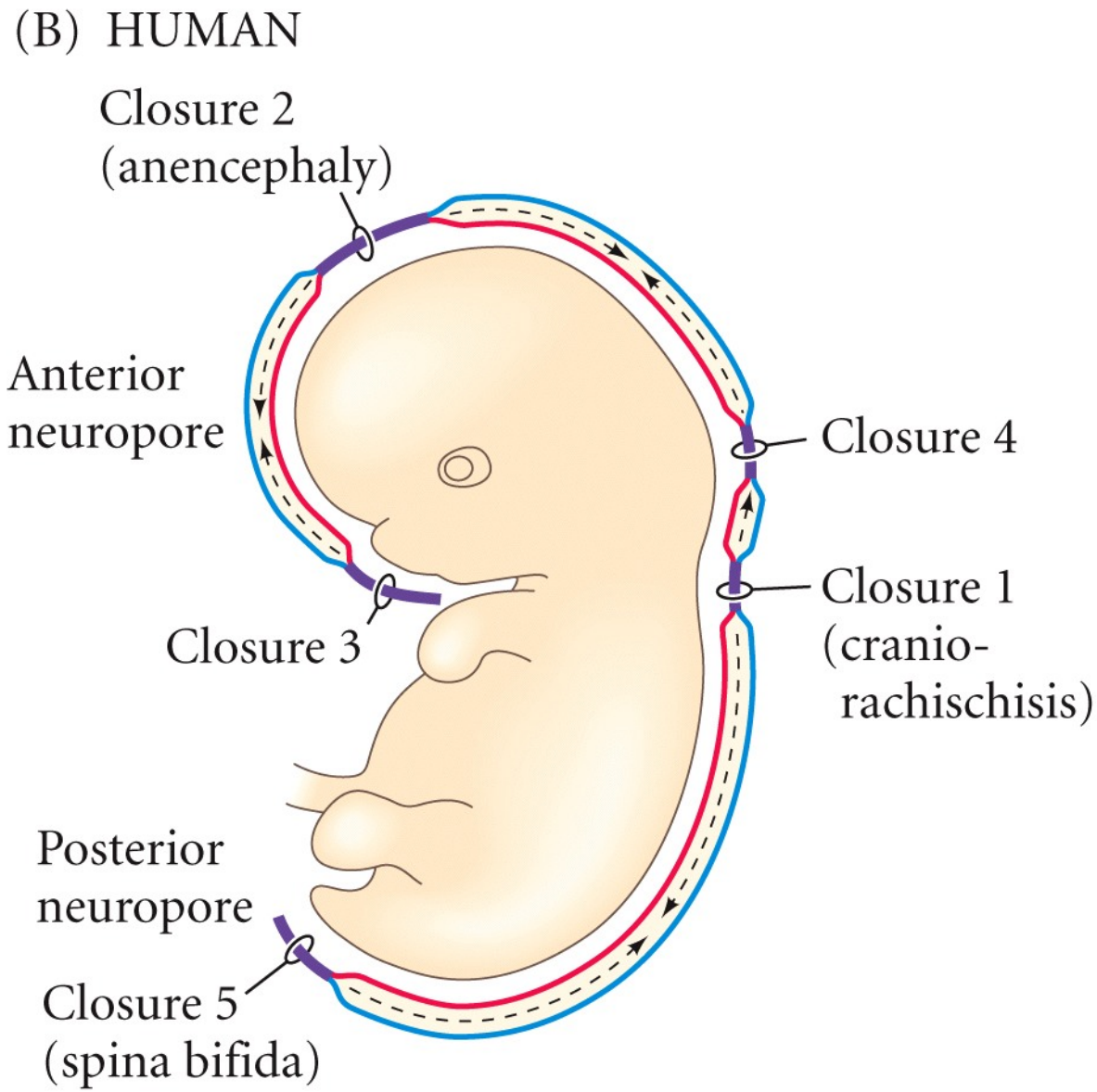
DEVELOPMENTAL BIOLOGY 11e, Figure 13.9

Figure 13.10 Neural tube closure in the mammalian embryo



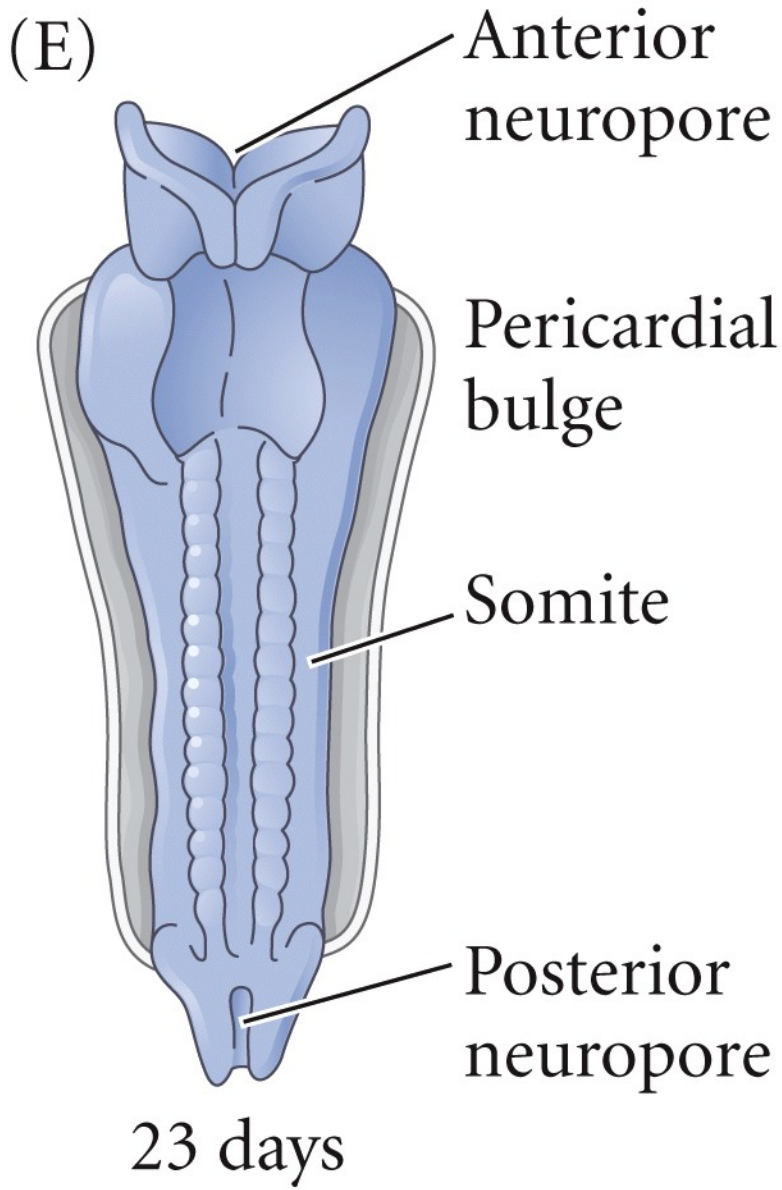
DEVELOPMENTAL BIOLOGY 11e, Figure 13.10

Figure 10.5 Neurulation in the mammalian embryo (Part 2)



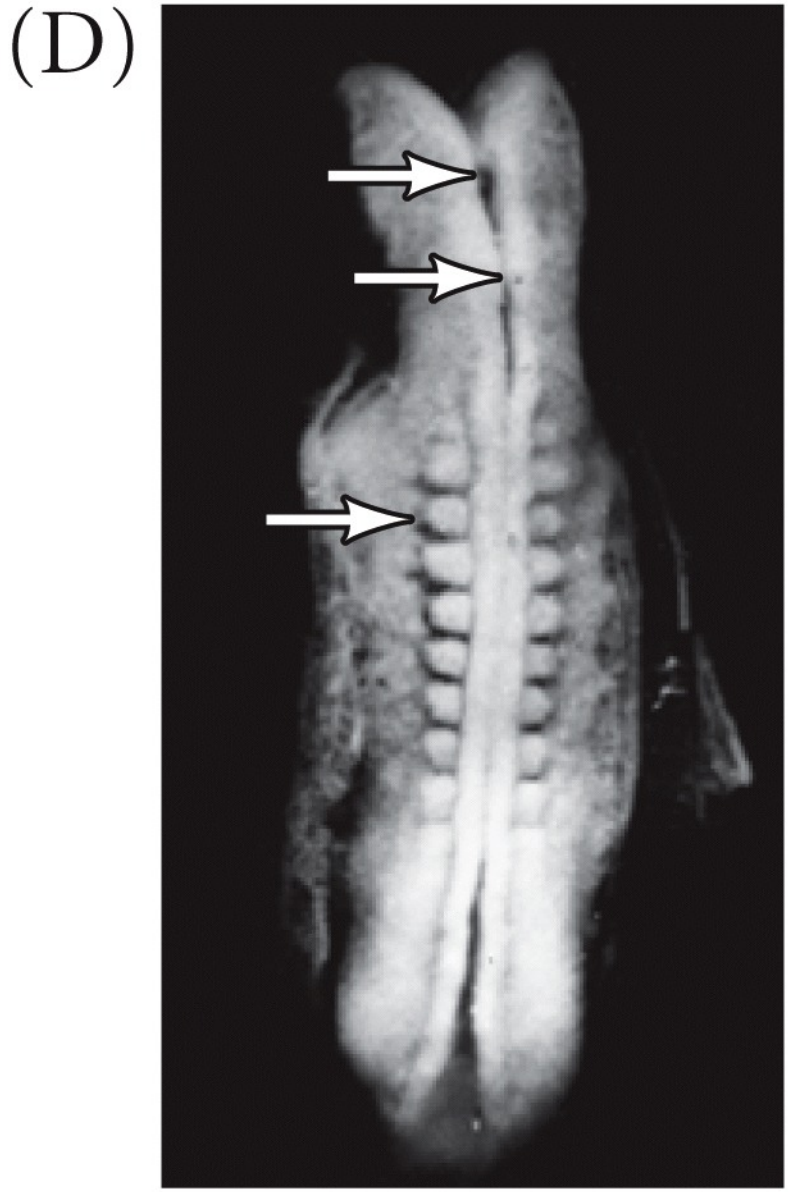
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.5 (Part 2)**

Figure 10.5 Neurulation in the mammalian embryo (Part 5)



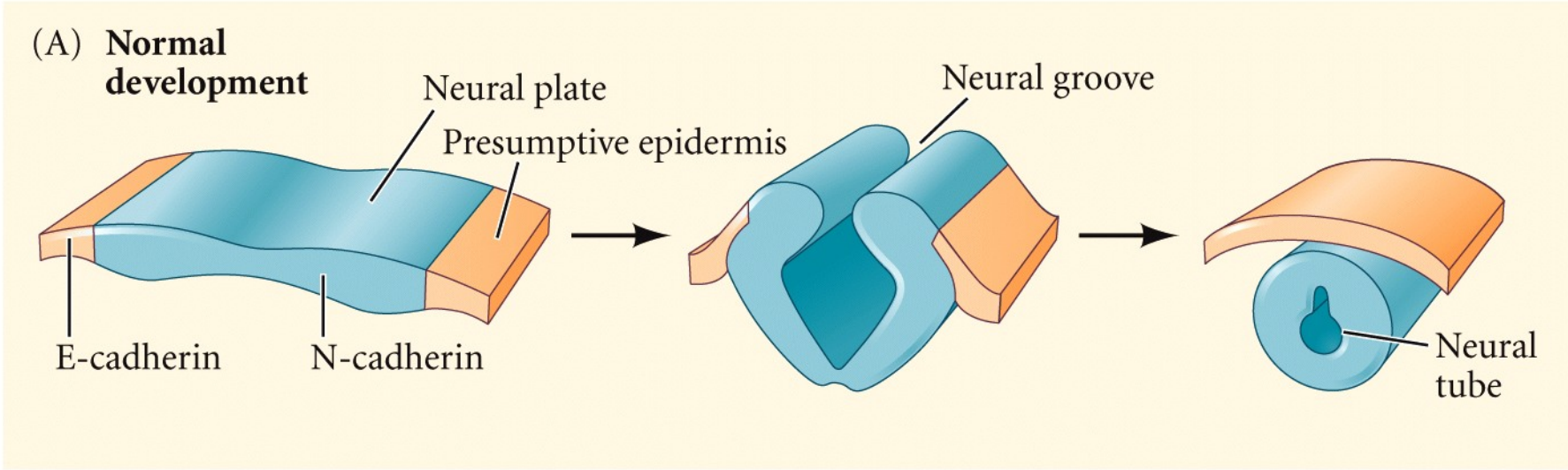
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.5 (Part 5)**

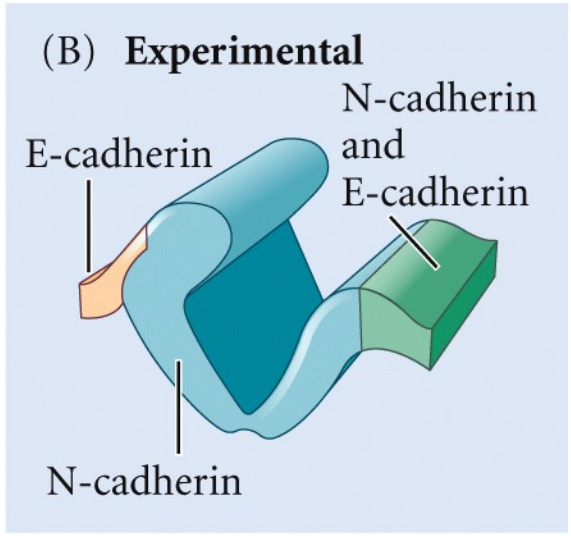
Figure 10.5 Neurulation in the mammalian embryo (Part 4)



***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.5 (Part 4)**

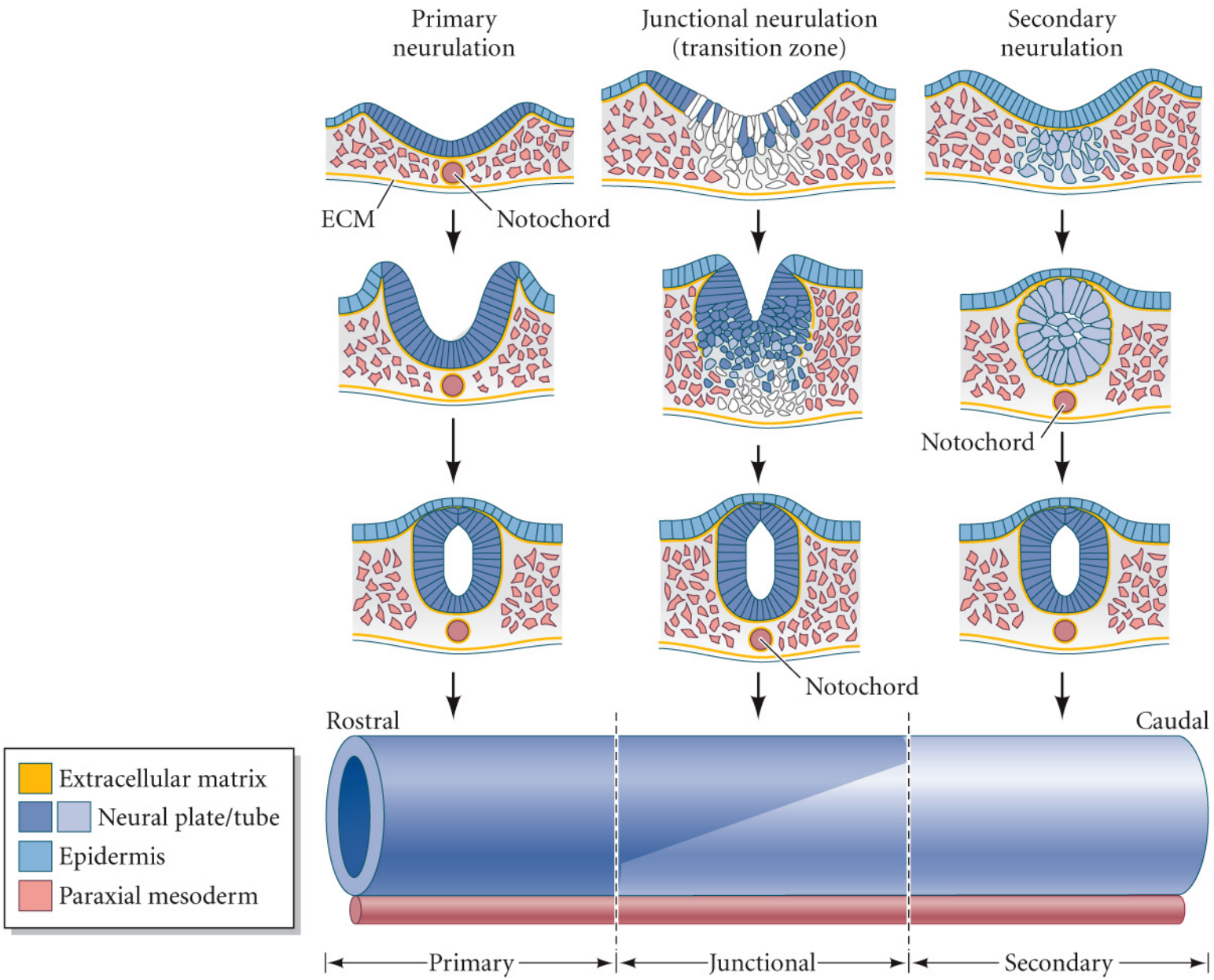
Figure 10.7 Expression of N- and E-cadherin adhesion proteins during neurulation in *Xenopus*





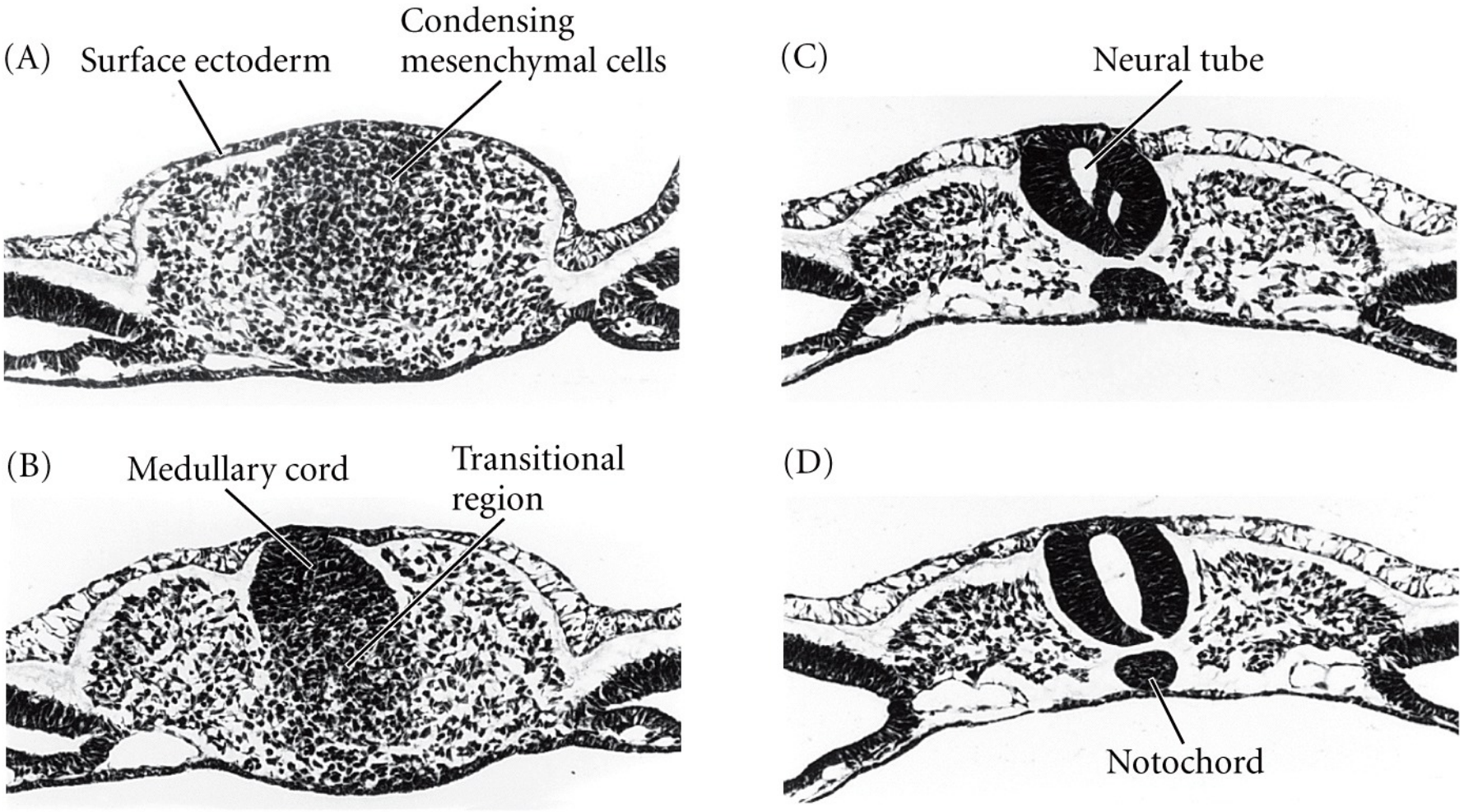
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.7**

Figure 13.4 Primary and secondary neurulation and the transition zone between them



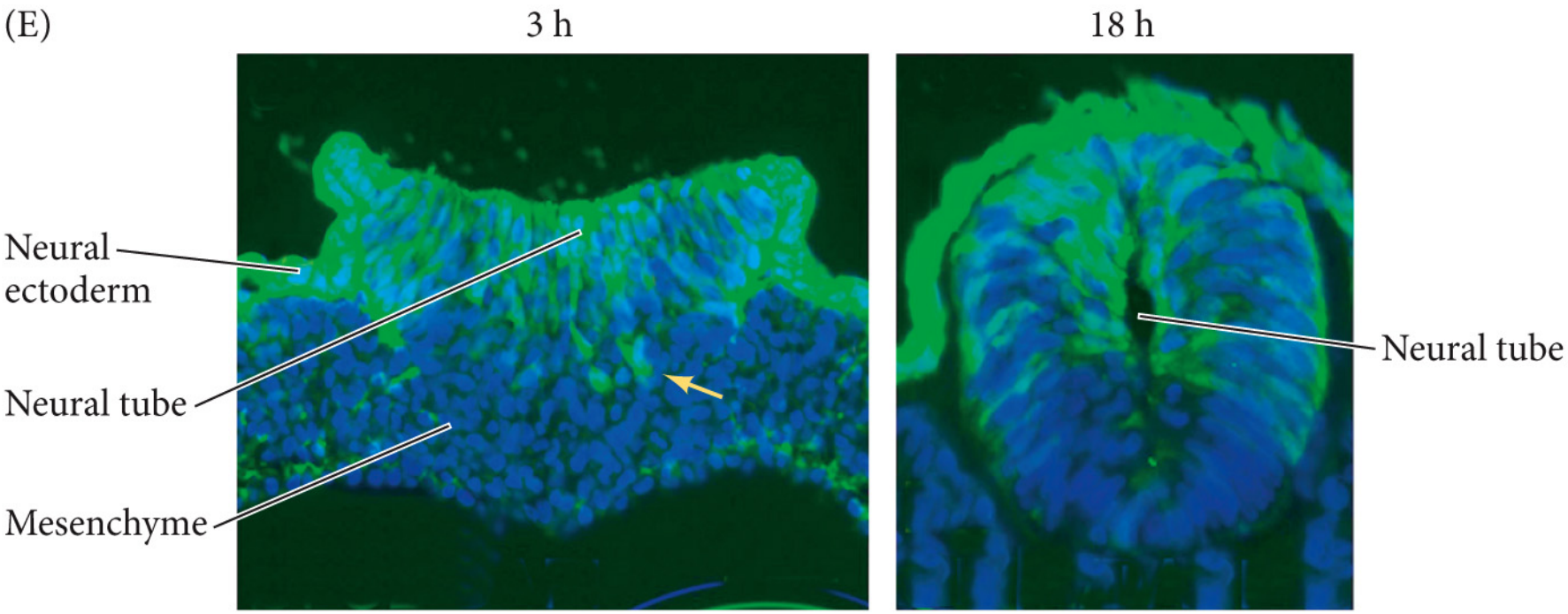
DEVELOPMENTAL BIOLOGY 11e, Figure 13.4

Figure 10.8 Secondary neurulation in the caudal region of a 25-somite chick embryo



***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.8**

Figure 13.15 Secondary neurulation in the caudal region of a chick embryo (Part 2)



DEVELOPMENTAL BIOLOGY 11e, Figure 13.15 (Part 2)

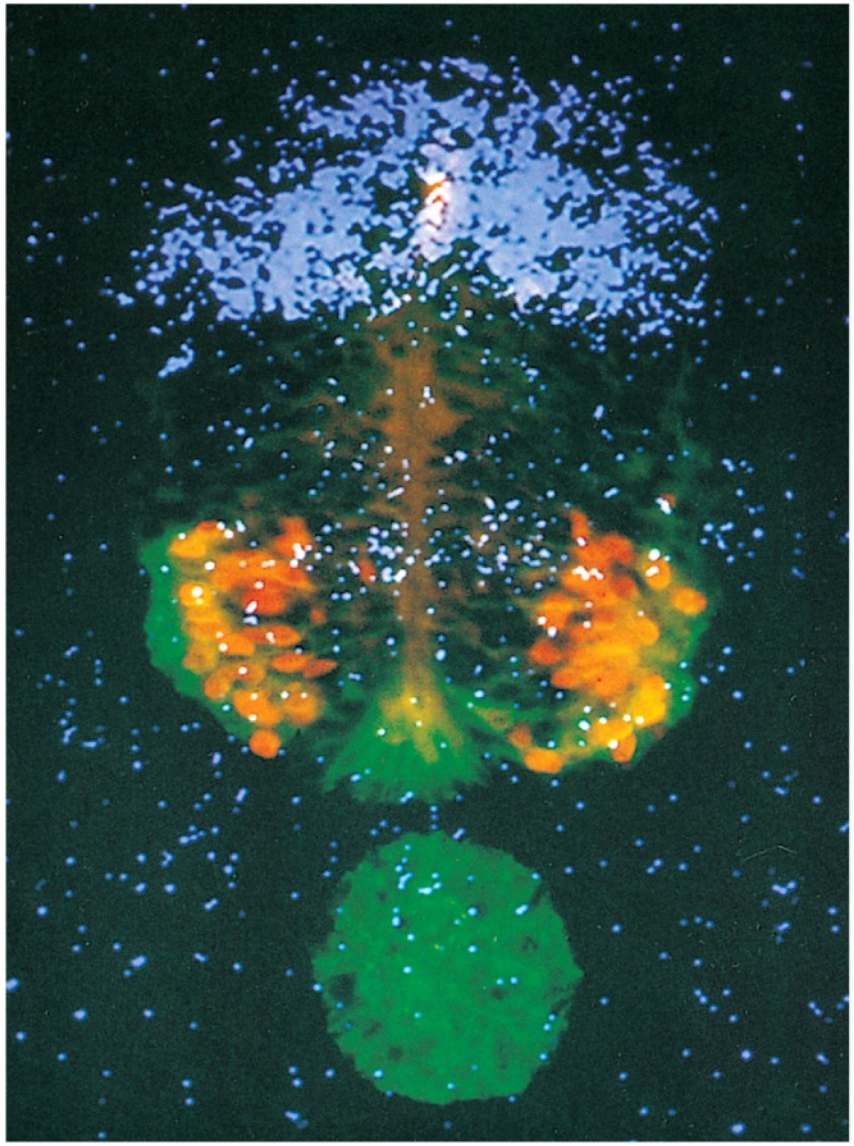
Patterning the CNS

Ch 13, pp 428-437 in 11e

Ch 10, pp333-343 in 10e

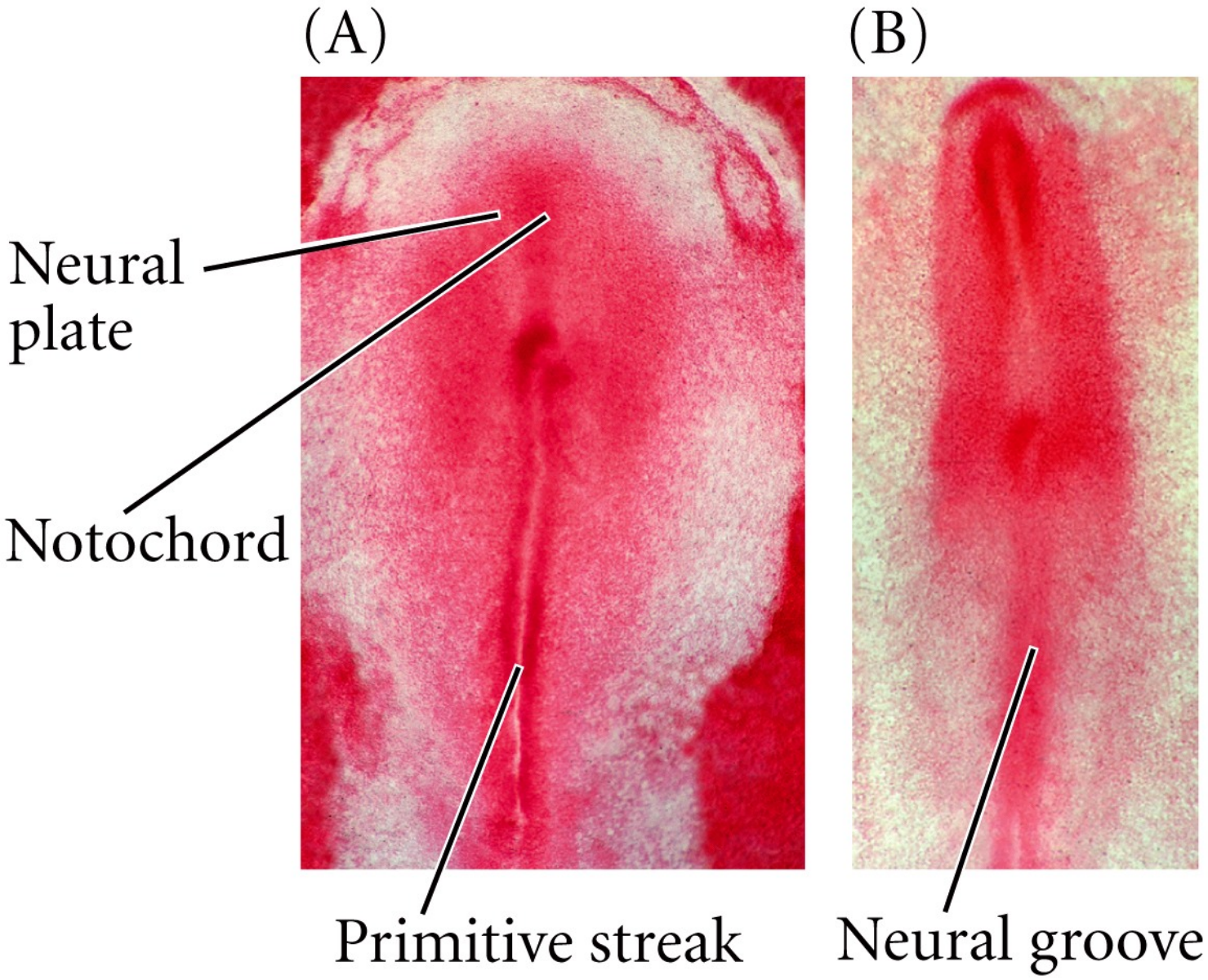
Or ch9 pp333-345 in 9th edition

(E)



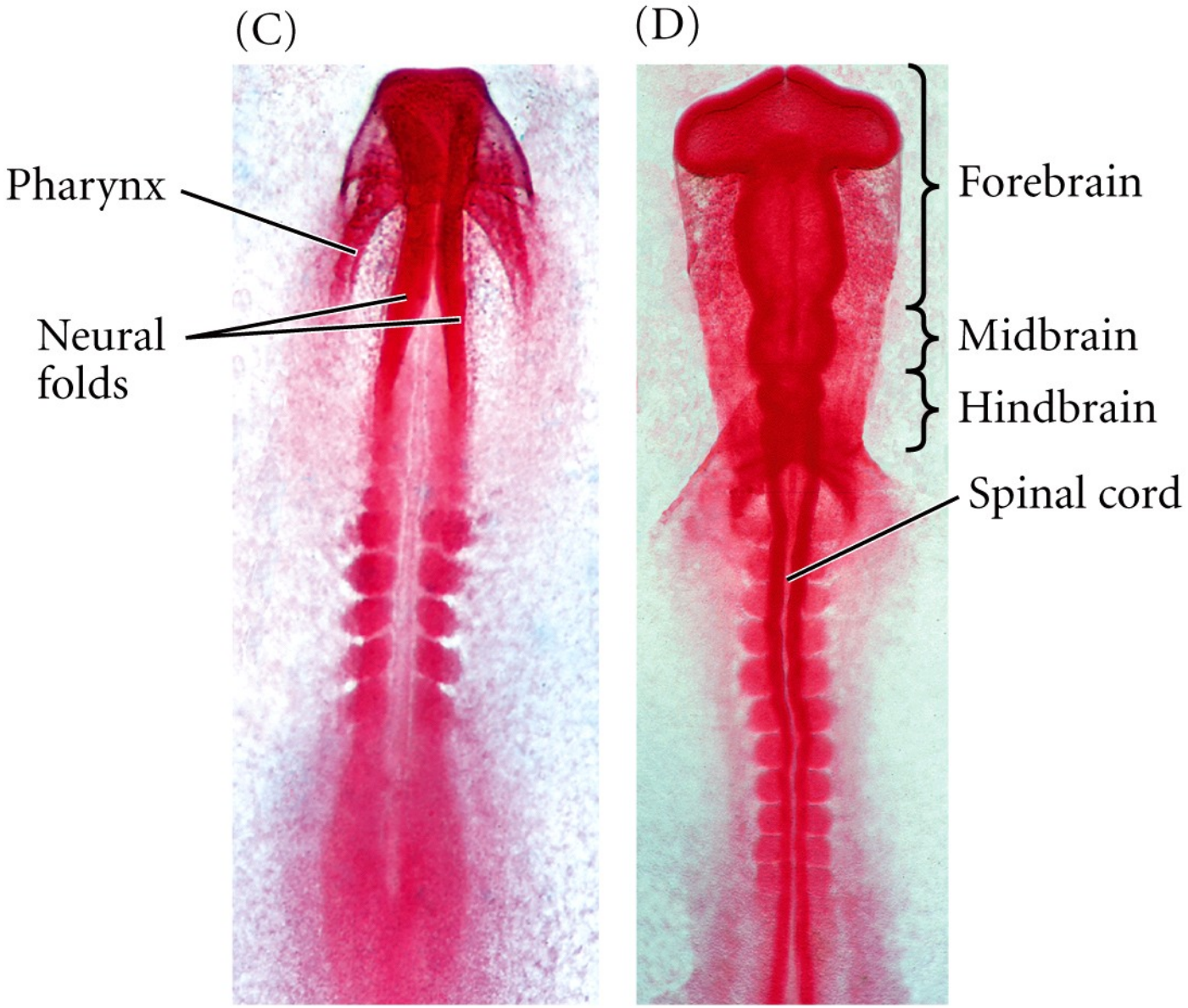
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.13 (Part 2)**

Figure 10.10 Early brain development and formation of the first brain chambers (Part 1)



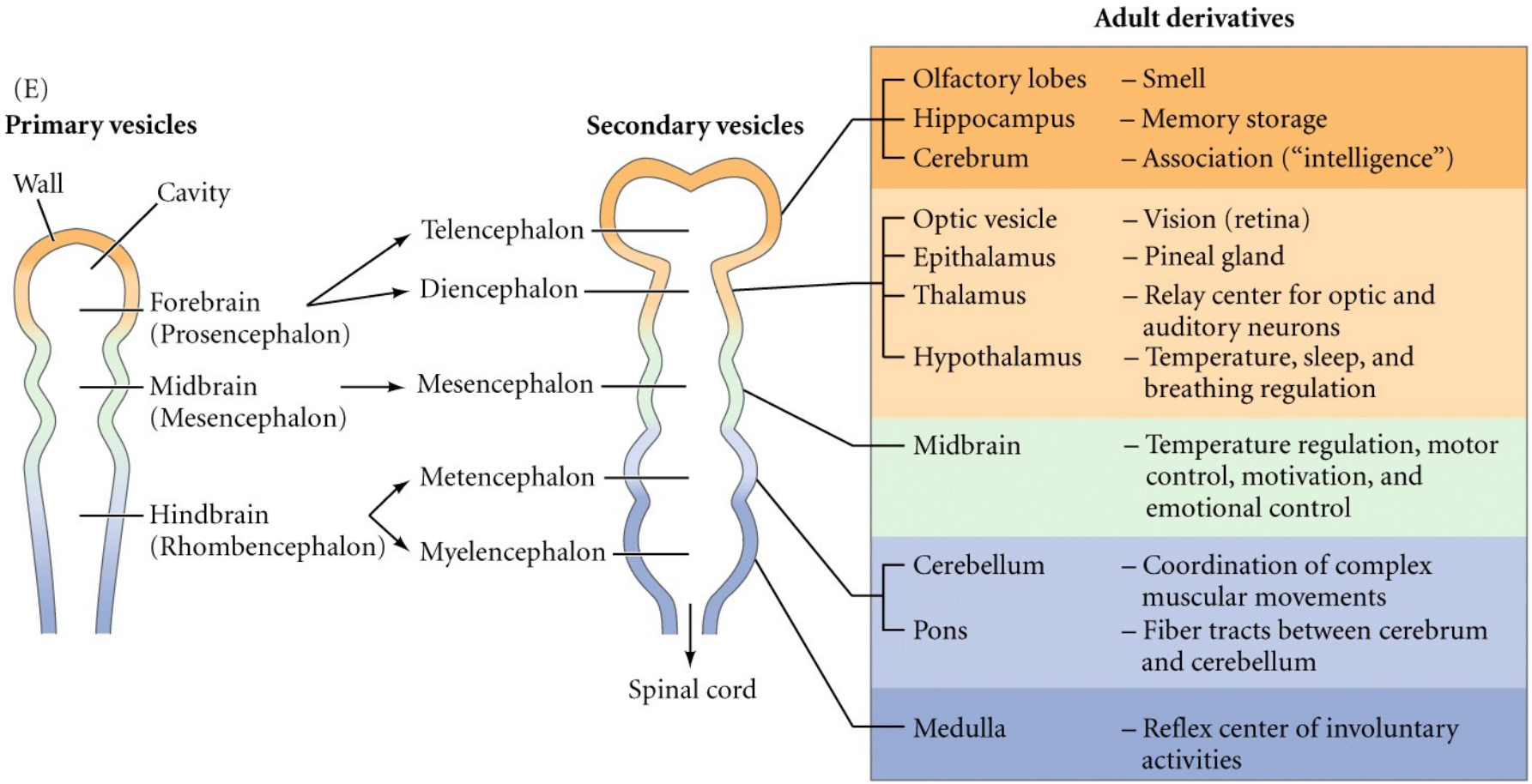
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.10 (Part 1)**

Figure 10.10 Early brain development and formation of the first brain chambers (Part 2)



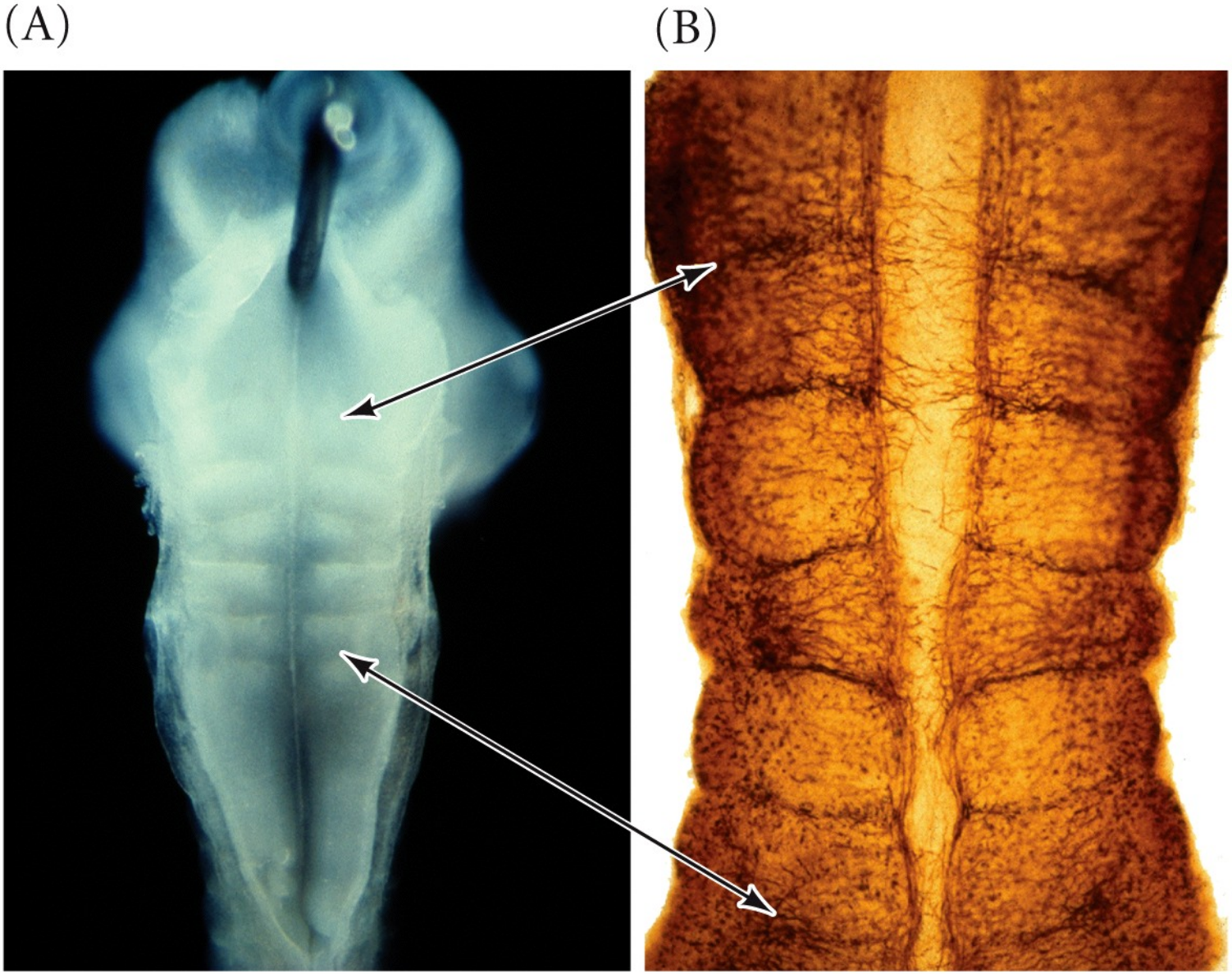
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.10 (Part 2)**

Figure 10.10 Early brain development and formation of the first brain chambers (Part 3)



***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.10 (Part 3)**

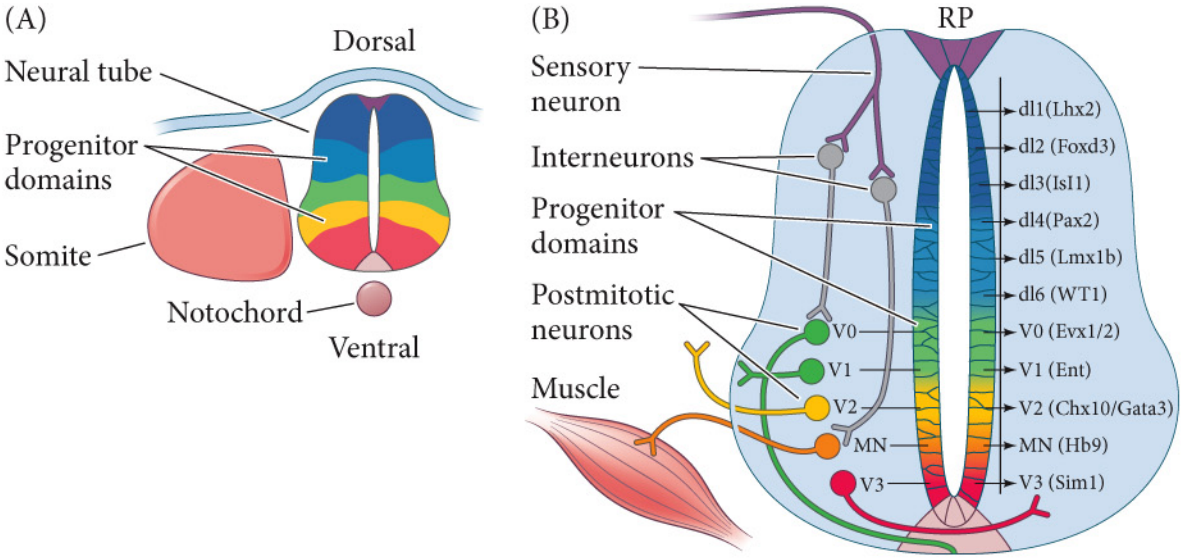
Figure 10.11 Rhombomeres of the chick hindbrain



***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.11**

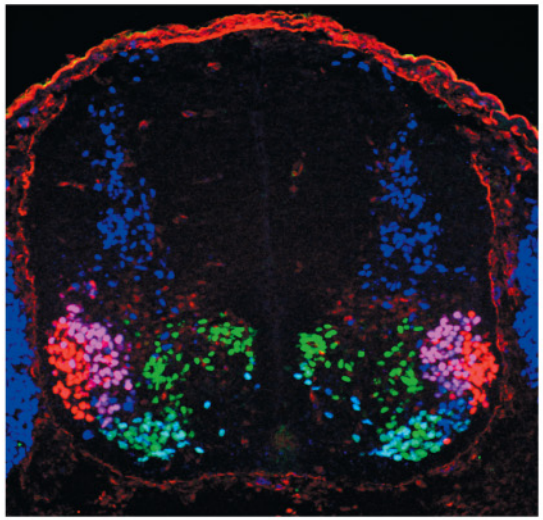
Figure 13.18 Differential expression of transcription factors define progenitor domains and derived cell types along the dorsoventral axis

Dark Blue is Pax3/7
Red is Nkx6.1
Green is Pax6



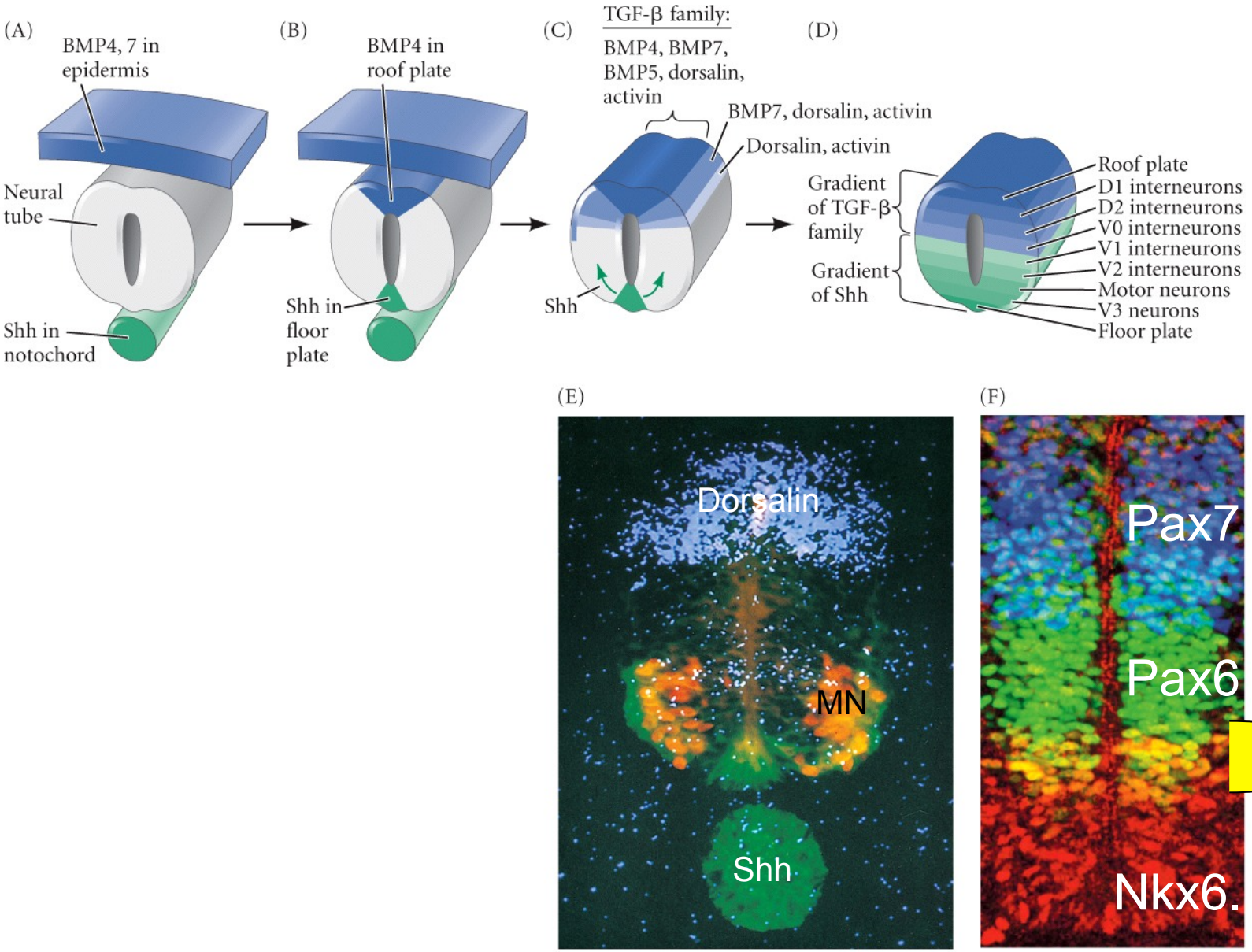
Isl1 is blue
Foxp1 red
Lhx3 green
E12.5d mouse at cervical level

(C)



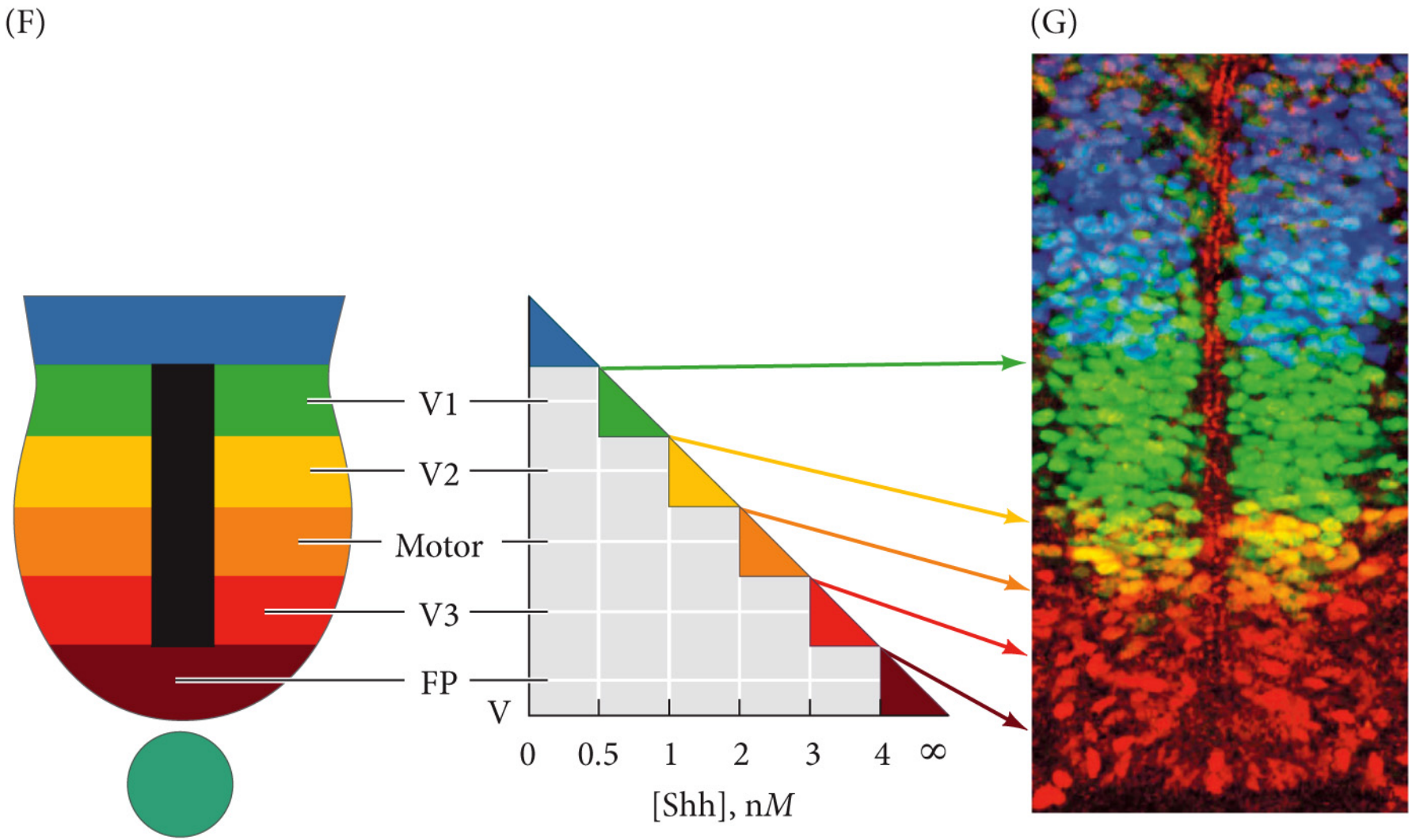
DEVELOPMENTAL BIOLOGY 11e, Figure 13.18

Figure 10.13 Dorsal-ventral specification of the neural tube



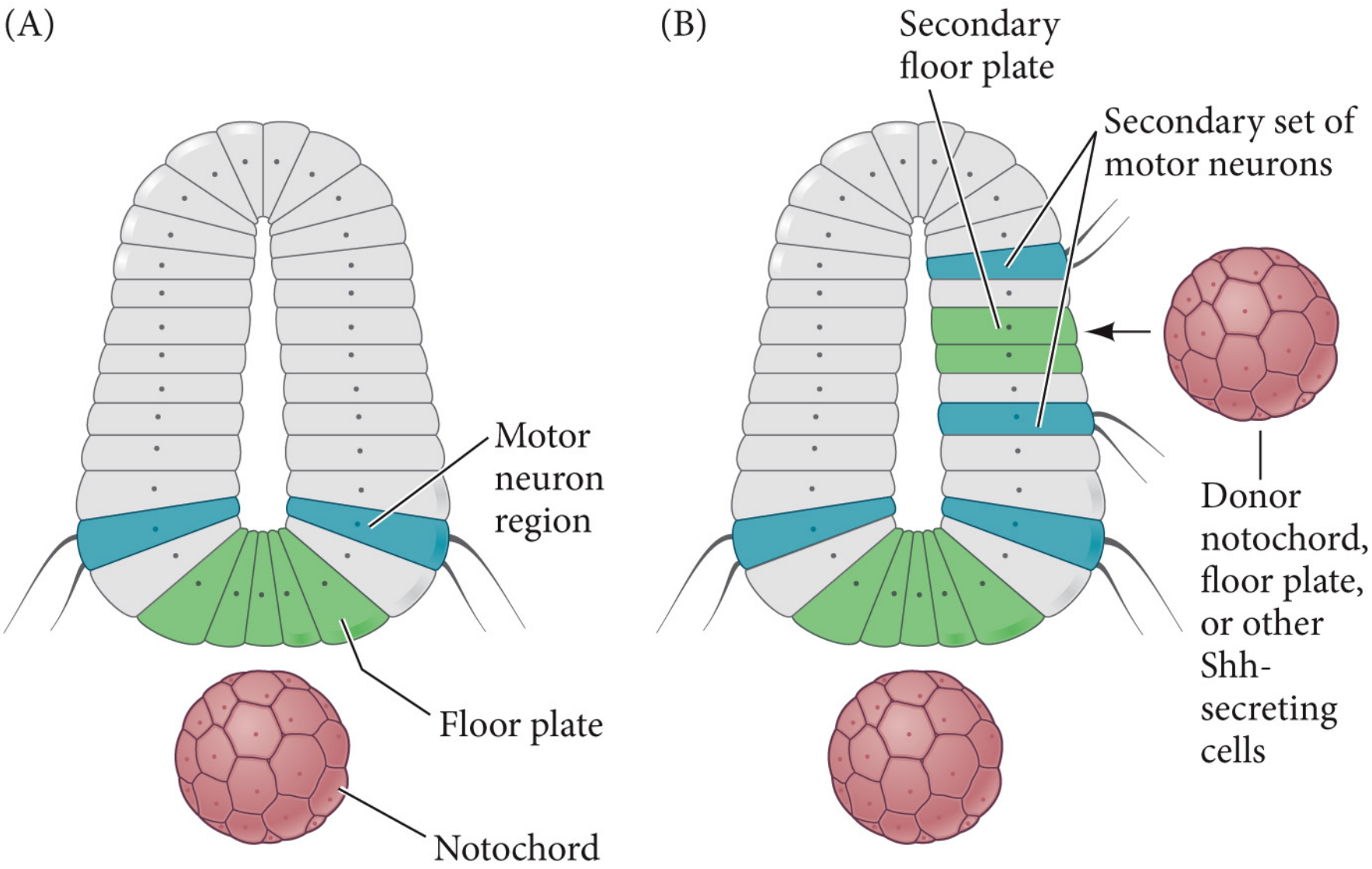
***DEVELOPMENTAL BIOLOGY 10e*, Figure 10.13**

Figure 13.19 Dorsal-ventral specification of the neural tube (Part 3)



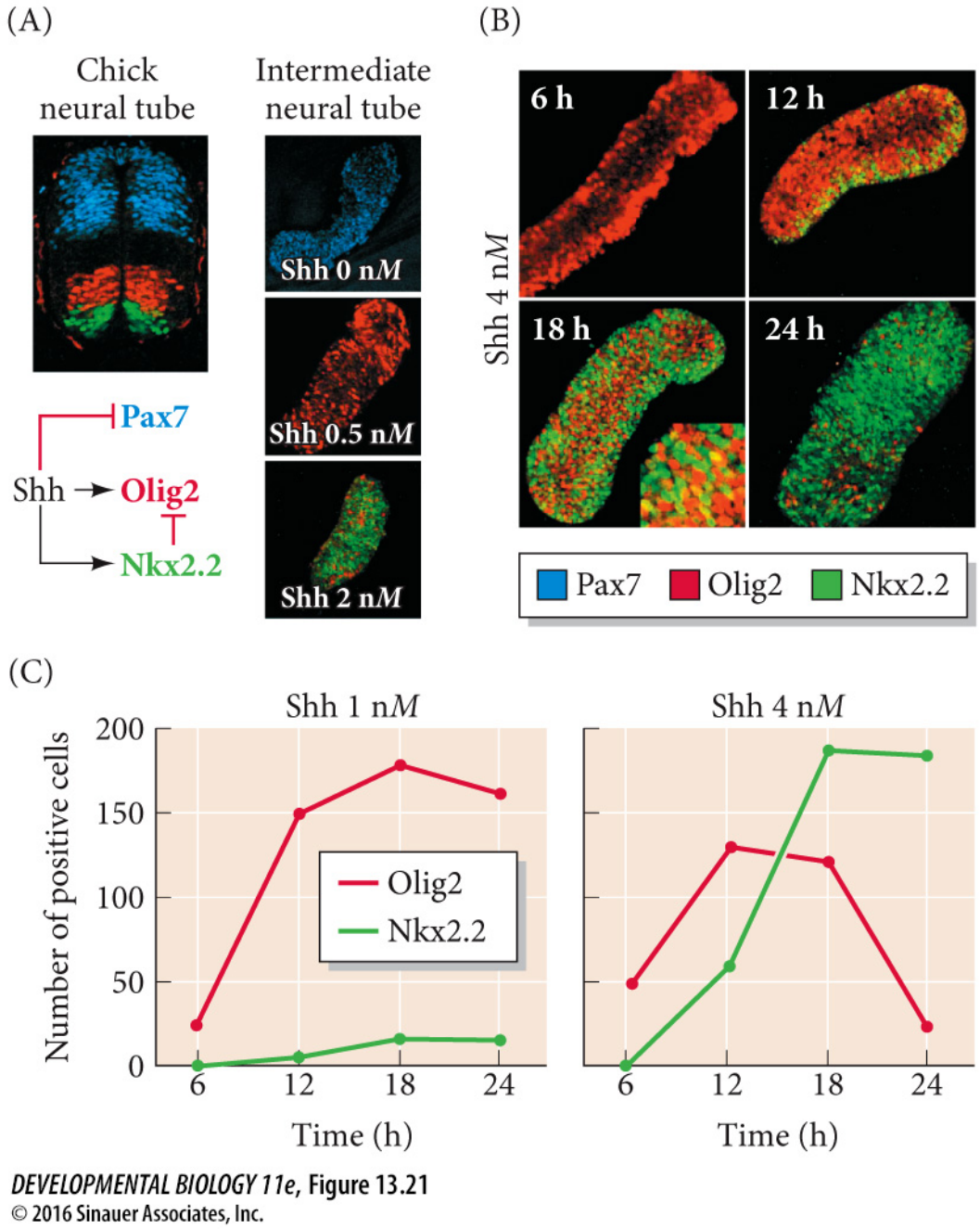
DEVELOPMENTAL BIOLOGY 11e, Figure 13.19 (Part 3)

Figure 13.20 Notochord-derived Shh induces ventral neural tube structures



DEVELOPMENTAL BIOLOGY 11e, Figure 13.20

Figure 13.21 Neural tube gene expression responds to both concentration and duration of Shh



DEVELOPMENTAL BIOLOGY 11e, Figure 13.21