



Universiteit
Leiden
The Netherlands

Hox in frogs: xenopus reveals novel functions for vertebrate Hox genes

Bardine, N.

Citation

Bardine, N. (2008, December 3). *Hox in frogs: xenopus reveals novel functions for vertebrate Hox genes*. Retrieved from <https://hdl.handle.net/1887/13306>

Version: Not Applicable (or Unknown)

License: [Leiden University Non-exclusive license](#)

Downloaded from: <https://hdl.handle.net/1887/13306>

Note: To cite this publication please use the final published version (if applicable).

Selected literature

- Akam M.** (1989) Hox and HOM: homologous gene clusters in insects and vertebrates. *Cell* 57:347-349.
- Afonin B., Ho B., Gustin J.K., Meloty-Kapella C. and Domingo C.R.**(2006) Cell behaviors associated with somite segmentation and rotation in *Xenopus laevis*. *Dev.Dyn.* 236(11):300-319.
- Agathon A., Thisse C. and Thisse B.** (2003) The molecular nature of the zebrafish tail organizer. *Nature* **424**:448-452
- Akin Z.N and Nazareli A.J.** (2005) Hox genes and their candidate downstream targets in the developing central nervous system. *Cell Mol Neurobiol.* **25**(3-4):697-741.
- Amores A, Force A, Yan YL, Joly L, Amemiya C, Fritz A, Ho RK, Langeland J, Prince V, Wang YL, Westerfield M, Ekker M, Postlethwait JH** (1998) Zebrafish hox clusters and vertebrate genome evolution. *Science* 282:1711-1714.
- Amsellen S., Pflumio F., Baridinet D., Izac B., Charneau P., Romeo P.H., Dubart-Kupperschmitt A. and Fichelson S.**(2003). Ex vivo expansion of human hematopoietic stem cells by direct delivery of the HOXB4 hemeoprotein. *Nat. Med.* **9**:1423-1427.
- Aubert J., Dunstan H., Chambers I. and Smith A.** (2002) Functional gene screening in embryonic stem cells implicates Wnt antagonism in neural differentiation. *Nat. Biotechnol.* **20**(12):1240-1245.
- Aulehla A, Wehrle C., Brand-Saberi B., Kemler R., Gossler A., Kanzler B and Hermann B.G** (2003) Wnt3a plays a major role in the segmentation clock controlling somitogenesis. *Dev Cell* **4**(3):395-406.
- Aulehla A. and Herrmann B.G.**(2004) Segmentation in vertebrates: clock and gradient finally joined. *Dev.Dyn.* 18:2060-2067
- Baker J.C., Beddington R.S. and Harland R.M.** (1999) Wnt signaling in xenopus embryos inhibits bmp4 expression and activates neural development. *Genes Dev.* **13**(23):3149-3159.
- Bel-Vialar S., Itasaki N. and Krumlauf R.** (2002) Initiating Hox expression: in the early chick neural tube differential sensitivity to FGF and RA signaling subdivides the HoxB genes in two distinct groups. *Development* **129**:5103-5115.
- Bessho Y., Sakata R., Komatsu S., Shiota K., Yamada S. and Kageyama R.** (2001) Dynamic expression and essential functions of Hes in somite segmentation. *Genes Dev.* **15**(20):2642-2647.
- Bessho Y. and Kageyama R.** (2003) Oscillations, clocks and segmentation. *Curr Opin Genet Dev.* **13**(4):379-384.

- Blitz I.L. and Cho K.W.** (1995) Anterior neurectoderm is progressively induced during gastrulation: the role of the *Xenopus* homeobox gene *orthodenticle*. *Development* **129**:993-1004.
- Boncinelli E., Simeone A., Acampora D. and Mavilio F.** (1991) HOX gene activation by retinoic acid. *Trends Genet* **7**:329-334.
- Brade T., Gessert S., Kühl M. And Pandur P.** (2007) The amphibian second heart field: *Xenopus* *islet-1* is required for cardiovascular development. *Dev Biol.* **311**:297-310.
- Bradley LC, Snape A, Bhatt S, Wilkinson DG.** (1993) The structure and expression of the *Xenopus* *Krox-20* gene: conserved and divergent patterns of expression in rhombomeres and neural crest. *Mech Dev* **40**:73-84.
- Brand-Saberi B. and Christ B.** (2000) Evolution and development of distinct cell lineages derived from somites. *Curr.Top.Dev.Biol.* **48**:1-42.
- Briscoe J., Sussel L., Serup P., Hartigan O'Connor D., Jessell T.M. et al.** (1999) Homeobox gene *Nkx2.2* and specification of neuronal identity by graded sonic hedgehog signalling. *Nature* **398**:622-627.
- Briscoe J., Pierani A., Jessell T.M. and Ericson J.** (2000) A homeodomain protein code specifies progenitor cell identity and neuronal fate in the ventral neural tube. *Cell* **101**:435-445.
- Briscoe J. and Wilkinson D.G.** (2004) Establishing neuronal circuitry: Hox genes make the connection. *Genes Dev.* **18**:1643-1648.
- Brunet I., Weinl C., Trembleau A., Volovitch M., Harris W., Prochiantz A. and Holt C.** (2005). The transcription factor *Engrailed-2* guides retinal axons. *Nature* **438**(7064):94-98.
- Buckingham M.**(2006) Myogenic progenitor cells and skeletal morphogenesis in vertebrates. *Curr.Opin.Genet.Dev.* **16**:525-532.
- Burke A.C., Nelson C.E., Morgan B.A. and Tabin C.** (1995) Hox genes and the evolution of vertebrate axial morphology. *Development* **121**(2):333-346.
- Cao Y., Knöchel S., Donow C., Miethe J., Kaufmann E. And Knöchel W.**(2004). The POU factor *Oct-25* regulates the *Xvent-2B* gene and counteracts terminal differentiation in *Xenopus* embryos. *J Biol Chem* **279**(42):43735-43743.
- Carapuço M., Nóvoa A., Bobola N. and Moisés M.** (2005) Hox genes specify vertebral types in the presomitic mesoderm. *Genes Dev.* **19**:2116-2121.
- Carpenter E.M., Goddard J.M., Davis A.P., Nguyen T.P. and Capecchi M.R.** (1997) Targeted disruption of *Hoxd-10* affects mouse hindlimb development. *Development* **124**(22):4505-4514.

- Carrasco A.E., Malacinski G.M.** (1987) Localization of *Xenopus* homoeo-box gene transcripts during embryogenesis and in the adult nervous system. *Dev Biol* **121**:69-81.
- Carrasco A.E., McGinnis W., Gehring W.J. and De Robertis E.M.** (1984) Cloning of an *X. laevis* gene expressed during early embryogenesis coding for a peptide region homologous to *Drosophila* homeotic genes. *Cell* **37**:409-414.
- Chan T.C., Takahashi S. and Asashima M.** (2000) A role for Xlim-1 in pronephros development in *Xenopus laevis*. *Dev Biol.* **228**:256-269.
- Chariot A. and Gielen J.** (1998) The HOXC6 homeodomain-containing proteins. *Int J Biochem Cell Biol* **30**:651-655.
- Chatelin L., Volovitch M., Joliot A., Perez F. and Prochiantz A.** (1996). Transcription factor Hoxa-5 is taken up by cells in culture and conveyed to their nuclei. *Mech. Dev.* **55**:111-117.
- Chen Y., Hollemann T., Pieler T. And Grunz H.** (2000). Planar signaling is not sufficient to generate a specific anterior/posterior neural pattern in pseudoexogastrula explants from *Xenopus* and *Triturus*. *Mech Dev.* **90**(1):53-63.
- Chitnis A. and Kintner C.** (1995). Neural induction and neurogenesis in amphibian embryos. *Perspect Dev Neurobiol* **3**:3-15.
- Cho K.W., Goetz J., Wright C.V., Fritz A., Hardwicke J. And De Robertis E.M.** (1988). Differential utilization of the same reading frame in a *Xenopus* homeobox gene encodes two related proteins sharing the same DNA-binding specificity. *EMBO J* **7**:2139-2149.
- Christ B., Jacob H.J. and Jacob M.** (1974) Origin of wing musculature. Experimental studies on quail and chick embryos. *Experientia.* **30**(12):1446-1449.
- Cinquin O.** (2007) Understanding the somitogenesis clock: what's missing? *Mech Dev.* **124**(7-8):501-517.
- Coffman C., Harris W. and Kintner C.** (1990). Xotch, the *Xenopus* homolog of *Drosophila* notch. *Science* **249**:1438-1441.
- Coletta PL, Shimeld SM, Chaudhuri C, Müller U, Clarke JP, Sharpe PT.** (1991). Characterisation of the murine Hox-3.3 gene and its promoter. *Mech Dev.* **35**:129-142.
- Cooke J. and Zeeman E.C.** (1976) A clock and wavefront model for control of the number of repeated structures during animal morphogenesis. *J.Thor.Biol.* **58**:455-7612.

- Cordes R., Schuster-Gossler K., Serth K. and Gossler A.** (2004) Specification of vertebral identity is coupled to Notch signalling and the segmentation clock. *Development* **131**:1221-1233.
- Couly G.F., Coltey P.M. and Le Douarin N.M.** (1992) The developmental fate of the cephalic mesoderm in quail-chick chimeras. *Development* **114**:1-15.
- Cox W.G. and Hemmati-Brivanlou A.** (1995). Caudalization of neural fate by tissue recombination and bFGF. *Development* **101**:93-105.
- Dale K.J. and Pourquié O.** (2000) A clock-work somite. *Bioessays*. **22**(1):72-83.
- Dasen J.S., Liu J.P. and Jessell T.M.** (2003) Motor neuron columnar fate imposed by sequential phases of Hox-c activity. *Nature* **425**(6961):926-933.
- Dasen J.S., Tice B.C., Brenner-Morton S. and Jessell T.M.** (2005) A Hox regulatory network establishes motor neuron pool identity and target-muscle connectivity. *Cell* **123**(3):477-491
- Davidson L.A and Keller R.E.** (1999) Neural tube closure in *Xenopus laevis* involves medial migration, directed protrusive activity, cell intercalation and convergent extension. *Development* **126**(20):4547-4556.
- Dawid I.B.** (2004) Organizing the vertebrate embryo—a balance of induction and competence. *PLoS Biol.* **2**(5):E127
- De La Cruz C.C., Der-Avakian A., Spyropoulos D.D., Tieu D.D. and Carpenter E.M.** (1999) Targeted disruption of Hoxd9 and Hoxd10 alters locomotor behavior, vertebral identity, and peripheral nervous system development. *Dev.Biol.* **216**(2):595-610.
- De Robertis E.M., Larrain J., Oelgeschläger M. and Wessely O.** (2000) The establishment of Spemann's organizer and patterning of the vertebrate embryo. *Nat Rev. Genet.* **1**(3):171-181
- De Robertis E.M. and Kuroda H.** (2004) Dorsal-ventral patterning and neural induction in *Xenopus* embryos. *Annu. Rev. Cell Dev. Biol.* **20**:285-308.
- De Robertis E.** (2008) Evo-devo: variations on ancestral themes. *Cell* **132**(2):185-195.
- Derossi D., Joliot A.H., Chassing A. and Prochiantz A.** (1994). The third helix of the Antennapedia homeodomain translocates through biological membranes. *J. Biol. Chem.* **269**:10444-10450.
- Deschamps J., van den Akker E., Florani S., De Graaff W., Oosterveen T., Roelen B. And Roelfsema J.** (1999) Initiation, establishment and maintenance of Hox genes expression patterns in the mouse. *Int.J.Dev.Biol.* **43**:635-650.
- Deschamps J. and van Nes J.** (2005) Developmental regulation of the Hox genes during axial morphogenesis in the mouse. *Development* **132**:2931-2942.
- Deschamps J.** (2007). Ancestral and recently recruited global control of the Hox genes in development. *Curr Opin Genet Dev* **17**:422-427.

Developmental dynamics June 2007.

Dibner C., Elias S. and Frank D. (2001) XMeis3 protein activity is required for proper hindbrain patterning in *Xenopus laevis* embryos. *Development* **132**:2931-2942.

Diez del Corral R., Storey K.G. (2001) Markers in vertebrate neurogenesis. *Nat Rev Neurosci.* **2**:835-839.

Diez del Corra R., Olivera-Martinez I., Goriely A., Gale E., Maden M. and Storey K. (2003) Opposing FGF and retinoid pathways control ventral neural pattern, neuronal differentiation, and segmentation during body axis extension. *Neuron* **40**:65-79.

Di Sanguinetto S.A., Dasen J. and Arber S. (2008) Transcriptional mechanisms controlling motor neuron diversity and connectivity. *Curr Opin Neurobiol.* **18**(1):36-43.

Doniach T. (1993). Planar and vertical induction of anteroposterior pattern during the development of the amphibian central nervous system. *J Neurobiol.* **24**(10):1256-1275.

Duboule D. (2007) The rise and the fall of Hox gene clusters. *Development* **134**:2549-2560.

Duboule D, Morata G. (1994). Colinearity and functional hierarchy among genes of the homeotic complexes. *Trends Genet* **10**:358-364.

Dubrulle J. And Pourquié O. (2001) FGF signaling controls somite boundary position and regulates segmentation clock control of spatiotemporal Hox gene activation. *Cell* **106**(2):219-232.

Dubrulle J. and Pourquié O. (2004) Fgf8 mRNA decay establishes a gradient that couples axial elongation to patterning in the vertebrate embryo. *Nature* **427**:419-422.

Duester G. (2007) Retinoic acid regulation of the somitogenesis clock. *Birth Defects research (part C)* **81**:84-92

Dunwoodie S.L., Clement M., Sparrow D.B., Sa X., Conlon R.A. and Beddington R.S. (2002) Axial skeletal defects caused by mutation in the spondylocostal dysplasia/pudgy gene *Dll3* are associated with disruption of the segmentation clock within the presomitic mesoderm. *Development* **129**(7):1795-1806.

Durst A.J., Tommermans J.P., Hage W.J., Hendriks H.F., de Vries N.J., Heideveld M. and Nieuwkoop P.D. (1989) Retinoic acid causes an anteroposterior transformation in the developing central nervous system. *Nature* **340**:140-146.

Edlund T. and Jessell T.M. (1999) Progression from extrinsic to intrinsic signaling in cell fate specification: a view from the nervous system. *Cell* **96**(2):211-224.

Feller J., Schneider A., Schuster-Gossler K. and Gossler A. (2008) Noncyclic Notch activity in the presomitic mesoderm demonstrates uncoupling of somite compartmentalization and boundary formation. *Genes Dev.* **22**(16):2166-2171.

Forsberg H., Crozet F. and Brown N.A. (1998) Waves of mouse Lunatic fringe expression, in four-hour cycles at two-hour intervals, precede somite boundary formation. *Curr.Biol.* **8**:1027-1030.

Fujii H., Nagai T., Shirasawa H., Doi J.Y., Nishimatsu S., Takeda H. and Sakai M. (2002). Anteroposterior patterning in *Xenopus* embryos: egg fragment assay system reveals a synergy of dorsalizing and posteriorizing embryonic domains. *Dev Biol.* **252**(1):15-39.

Garcia-Gasca A. and Spyropoulos D.D. (2000) Differential mammary morphogenesis along the anteroposterior axis in *Hoxc6* gene targeted mice. *Dev Dyn.* **219**(2):261-276.

Gaufo G.O., Thomas K.R. and Capecchi M.T. (2003) Hox genes coordinate mechanisms of genetic suppression and activation in the generation of branchial and somatic motoneurons. *Development* **130**:5191-5201.

Gaunt S.J. (2000) Evolutionary shifts of vertebrate structures and Hox expression up and down the axial series of segments: a consideration of possible mechanisms. *Int.J.Dev.Biol.* **44**:109-117.

Gerhart J., Danilchik M., Doniach T., Roberts S., Rowing B. and Stewart R. (1989) Cortical rotation of the *Xenopus* egg: consequences for the anteroposterior pattern of embryonic dorsal development. *Development.* **107 Suppl**, 37-51.

Gerhart J. (2001) Evolution of the organizer and the chordate body plan. *Int J Dev.Biol.* **45**(1):133-153.

Gilbert S.F. (2006) *Developmental Biology*. Sinauer Associates, Inc.

Glinka A., Wu W., Onichtchouk D., Blumenstock C. and Niehrs C.(1997) Head induction by simultaneous repression of Bmp and Wnt signaling in *Xenopus*. *Nature* **389**:517-519.

Glover J.C., Renaud J.S. and Rijli F.M.(2006) Retinoic acid and hindbrain patterning. *J.Neurobiol.* **16**:5-12.

Godsave S.F., Dekker E.J., Holling T., Pannese M., Boncinelli E. and Durston A.J. (1994) Expression patterns of *Hoxb* genes in *Xenopus* embryo suggest roles in anteroposterior specification of the hindbrain and in dorsoventral patterning of the mesoderm. *Dev. Biol.* **166**:465-476

Godsave S.F., Koster C.H., Getahum A., Mathu M., Hooiveld M., van der Wees J., Hendriks J. And Durston A.J. (1998) Graded retinoid responses in the developing hindbrain. *Dev Dyn.* **213**(1):39-49

Gomez C., Ozbudak E.M., Wunderlich J., Baumann D., Lewis J. And Pourquié O.(2008) Control of segment number in vertebrate embryos. *Nature* **18**

- Goodman F.R.** (2003) Congenital abnormalities of body patterning: embryology revisited. *Lancet* **362** (9384):651-662.
- Gould S.E. and Grainger R.M.** (1997) Neural induction and antero-posterior patterning in the amphibian embryo: past, present and future. *Cell Mol. Life Sci.* **53**(4):319-338.
- Gould A., Itasaki N. and Krumlauf R.** (1998). Initiation of rhombomeric Hoxb4 expression requires induction by somites and a retinoic pathway. *Neuron* **21**:39-51.
- Grapin-Botton A., Bonnin M.A. and Le Douarin N.M.** (1997). Hox gene induction in the neural tube depends on three parameters: competence, signal supply and paralogue group. *Development* **124**(4):849-859.
- Grunz H. and Tacke L.** (1998) Neural differentiation of *Xenopus laevis* ectoderm takes place after disaggregation and delayed reaggregation without inducer. *Cell Differ.Dev.* **28**:211-217.
- Guidato S., Prin F. and Guthrie S.** (2003) Somatic motoneurone specification in the hindbrain: the influence of somite-derived signals, retinoic acid and Hoxa3. *Development* **130**:2981-2986.
- Gurdon J.B. and Bourillot P-Y.** (2001) Morphogen gradient interpretation. *Nature* **413**:797-803.
- Guthrie S.** (2004) Neuronal development: putting motor neurons in their place. *Curr Biol.* **14**:R166-R168.
- Guthrie S.** (2007) Patterning and axon guidance of cranial motor neurons. *Nat.Rev.Neurosci.* **8**(11):858-871.
- Harland R. and Gerhart J.** (1997) Formation and function of Spemann's organizer. *Annu Rev Cell Dev Biol* **13**:611-667.
- Harland R.M.** (1991) In situ hybridization: an improved whole-mount method for *Xenopus* embryos. *Methods. Cell. Biol.* **36**:685-695.
- Hartenstein V.** (1993). Early pattern of neuronal differentiation in the *Xenopus* embryonic brainstem and spinal cord. *J Comp Neurol* **328**:213-231.
- Harvey R.P. and Melton D.A.** (1988) Microinjection of synthetic Xhox-1A homeobox mRNA disrupts somite formation in developing *Xenopus* embryos. *Cell* **53**:687-697.
- Hawley S.H., Wünnenberg-Stepleton K., Hashimoto C., Laurent M.N., Watabe T., Blumberg B.W. and Cho K.W.** (1995) Disruption of BMP signals in embryonic *Xenopus* ectoderm leads to direct neural induction. *Genes Dev.* **9**(23):2923-2935.
- Hayward P., Kalmar T. and Arias A.M.** (2008) Wnt/Notch signaling and information processing during development. *Development* **135**(3):411-424.

- Hemmati-Brivanlou A, de la Torre JR, Holt C, Harland RM.** (1991). Cephalic expression and molecular characterization of *Xenopus* En-2. *Development* **111** :715-724.
- Hemmati-Brivanlou A.** (2000) La morphogenèse du système nerveux chez les vertébrés. *Médecine/Sciences* **16**:150-158.
- Hibi M., Hirano T. and Dawid I.B.** (2002) Organizer formation and function. *Results Probl Cell Differ.* 40:48-71.
- Holley S.A., Geisler R. and Nusslein-Volhard C.** (2000) Control of *her1* expression during zebrafish somitogenesis by a delta-dependent oscillator and an independent wave-front activity. *Genes Dev.* **14**:1678-1690.
- Holloway G. and Currie P.**(2005) Vertebrate myotome development. *Birth Defects Res C Embryo Today* **75**:172-179
- Hongo I., Kengaku M. and Okamoto H.** (1999) FGF signaling and the anterior neural induction in *Xenopus*. *Dev. Biol.* **216**(2):561-581.
- Hooiveld M.H., Morgan R., In der Rieden O., Houtzager E., Pannese M., Damen K., Boncinelli E. And Durston A.J.** (1999) Novel interactions between vertebrate Hox genes. *Int J Dev Biol.* **43**:665-674.
- Hopwood ND, Pluck A, Gurdon JB.** (1989). MyoD expression in the forming somites is an early response to mesoderm induction in *Xenopus* embryos. *EMBO J* **8**:3409-3417.
- Horan G.S., Ramirez-Solis R., Featherstone M.S., Wolgemuth D.J., Bradley A. And Behringer R.R.** (1995a) Compound mutants for the paralogous *hoxa4*, *hoxb4* and *hoxd4* genes show more complete homeotic transformations and a dose-dependent increase in the number of vertebrae transformed. *Genes Dev.* **9**:1667-1677.
- Horan G.S., Kovács E.N., Behringer R.R. and Featherstone M.S.** (1995b). Mutations in paralogous Hox genes result in overlapping homeotic transformations of the axial skeleton: evidence for unique and redundant function. *Dev Biol.* **169**(1):359-372.
- Houliston E. and Elinson R.P.**(1991) Patterns of microtubule polymerization relating to cortical rotation in *Xenopus laevis* eggs. *Development* **112**(1):107-117
- Houlinson E. and Elinson R.P.** (1992) Microtubules and cytoplasmic reorganization in the frog egg. *Curr.Top.Dev.Biol.* **26**:53-70.
- Huang R., Zhi Q., Ordhal C.P. and Christ B.** (1997) The fate of the first avian somite. *Anat.Embryol (Berl)*. 195:435-449.
- Iimura T. and Pourquié O.** (2007) Hox genes in time and space during vertebrate body formation. *Dev Growth Differ.* **49**(4):265-75

- Irving C. and Mason I.** (2000) Signalling by FGF8 from the isthmus patterns anterior hindbrain and establishes the anterior limit of Hox gene expression. *Development* **127**:177-186.
- Itasaki N., Sharpe J., Morrison A. and Krumlauf R.** (1996). Reprogramming Hox expression in the vertebrate hindbrain: influence of paraxial mesoderm and rhombomeres transposition. *Neuron* **16**(3):487-500.
- Jansen H.J., Wacker S.A., Bardine N. and Durston A.J.** (2007) The role of Spemann organizer in anterior-posterior patterning of the trunk. *Mech. Dev.* **124**, 668-81.
- Jen W.C., Wettstein D., Turner D., Chitnis A. and Kintner C.** (1997) The Notch ligand, X-Delta-2, mediates segmentation of the paraxial mesoderm in *Xenopus* embryos. *Development*. **124**:1169-1178.
- Jessell T.M.** (2000) Neuronal specification in the spinal cord: inductive signals and transcriptional codes. *Nat rev Genet.* **1**(1):20-29.
- Jiang Y.J., Aerne B.L., Smithers L., Haddon C., Ish-Horowicz D. and Lewis J.** (2000) Notch signaling and the synchronization of the somite segmentation clock. *Nature* **408**:475-479.
- Joliot A., Pernelle C., Deagostini-Bazin A. and Prochiantz A.** (1991). Antennapedia homeobox peptide regulates neural morphogenesis. *Proc. Natl. Aca. Sci. U.S.A.* **88**:1864-1868
- Joliot A., Maizel A., Rosenberg D., Trembleau A., Dupas S., Volovitch M. and Prochiantz A.** (1998). Identification of a signal sequence necessary for the unconventional secretion of Engrailed homeoprotein. *Curr Biol.* **8**(15):856-863
- Joliot A. and Prochiantz A.** (2004). Transduction peptides: from technology to physiology. *Nat. Cell Biol.* **6**:189-196.
- Jonas EA, Snape AM, Sargent TD.** (1989). Transcriptional regulation of a *Xenopus* embryonic epidermal keratin gene. *Development* **106**:399-405.
- Jones FS, Holst BD, Minowa O, De Robertis EM, Edelman GM.** (1993). Binding and transcriptional activation of the promoter for the neural cell adhesion molecule by Hoxc6 (Hox-3.3). *Proc Natl Acad Sci U S A* **90**:6557-6561.
- Joubin K. and Stern C.D.** (2001) Formation and maintenance of the organizer among the vertebrates. *Int J Dev Biol* **45**(1):165-75
- Joseph E.M. and Cassetta L.A.** (1999) Mespo: a novel basic helix-loop-helix gene expressed in the presomitic mesoderm and posterior tailbud of *Xenopus* embryos. *Mech Dev.* **82**(1-2):191-194.

- Jouve C., Palmeirim I., Henrique D., Beckers J., Gossler A., Ish-Horowicz D. and Pourquié (2000)** Notch signaling is required for cyclic expression of the hairy-like gene HES1 in the presomitic mesoderm. *Development* **127**:1421-1429.
- Kageura H. (1997)** Activation of dorsal development by contact between the cortical dorsal determinant and the equatorial core cytoplasm in eggs of *Xenopus laevis*. *Development* **124**, 1543-1551.
- Kaneda T., Miyazaki K., Kudo R., Goto K., Sakaguchi K., Matsumoto M., Todaka S., Yoshinaga K. and Suzuki A.S. (2002)**. Regional specification of the head and trunk-tail organizers of a urodele (*Cynops pyrrhogaster*) embryo is patterned during gastrulation. *Dev. Biol.* **244**:66-74.
- Kania A, Jessell TM. (2003)**. Topographic motor projections in the limb imposed by LIM homeodomain protein regulation of ephrin-A interactions. *Neuron* **38**:581-596.
- Kawakami Y., Raya A., Raya R.M., Rodriguez-esteban C. And Belmonte J.C. (2005)** Retinoic acid signalling links left-right asymmetric patterning and bilaterally symmetric somitogenesis in the zebrafish embryo. *Nature* **435**(7039):165-171.
- Kessel M. and Gruss P. (1991)** Homeotic transformations of murine vertebrae and concomitant alteration of *Hox* codes induced by retinoic acid. *Cell* **67**:89-104.
- Kessel M. (1994)** *Hox* genes and the identity of motor neurons in the hindbrain. *J Physiol Paris* **88**:105-109.
- Khokha M.K., Yeh J., Grammer T.C. and Harland R.M. (2005)** Depletion of three BMP antagonists from Spemann's organizer leads to a catastrophic loss of dorsal structures *Dev Cell* **8**(3):401-411.
- Kiecker C. and Niehrs C. (2001)**. A morphogen gradient of Wnt/beta-catenin signalling regulates anteroposterior neural patterning in *Xenopus*. *Development* **128**:4189-4201.
- Kikkawa M., Takano K. and Shinagawa A. (1996)** Location and behavior of dorsal determinants during first cycle in *Xenopus* eggs. *Development* **122**, 3687-3696.
- Kim S-H., Jen W-C., De Robertis E.M. and Kintner C. (2000)** The protocadherin PAPC establishes segmental boundaries during somitogenesis in *Xenopus* embryos. *Curr Biol.* **10**:821-830.
- Kintner CR, Melton DA. (1987)**. Expression of *Xenopus* N-CAM RNA in ectoderm is an early response to neural induction. *Development* **99**:311-325.
- Kmita M. And Duboule D. (2003)** Organizing axes in time and space; 25 years of colinear tinkering. *Science* **301**(5631):331-333.
- Kolm P.J., Apekin V. and Sive H. (1997)**. *Xenopus* hindbrain patterning requires retinoid signaling. *Dev. Biol.* **192**:1-16.

- Kolm P.J. and Sive H.** (1997). Retinoids and posterior neural induction: a reevaluation of Nieuwkoop's two-step hypothesis. *Cold Spring Harb Symp Quant Biol.* **62**:511-521.
- Köster M, Dillinger K, Knöchel W.** (1999). Genomic structure and embryonic expression of the *Xenopus* winged helix factors XFD-13/13'. *Mech Dev.* **88**:89-93.
- Krumlauf R.** (1994) Hox genes in vertebrate development. *Cell* **78**(2):191-201.
- Kudoh T., Wilson S.W. and Dawid I.B.** (2004) Distinct roles for Fgf, Wnt and retinoic acid in posteriorizing the neural ectoderm. *Development* **129**:4335-4346.
- Kulesa P.M., Schnell S., Rudolff S., Baker R.E. and Maini P.K.** (2007) From segment to somite: segmentation to epithelialization analyzed within quantitative frameworks. *Dev.Dyn.* **236**(6):1392-1402.
- Kuroda H., Wessely O. and De Robertis E.M.** (2004) Neural induction in *Xenopus*: requirement for ectodermal and mesodermal signals via Chordin, Noggin, beta-Catenin and Cerberus. *PLoS Biol.* **2**(5):E92.
- Kusumi K., Sun E.S., Kerrebrock A.W., Bronson R.T., Chi D.C., Bulotsky M.S., Spencer J.B., Birren B.W., Frankel W.N. and Lander E.S.** (1998) The mouse pudgy mutation disrupts delta homologue Dll3 and initiation of early somite boundaries. *Nat Genet.* **19**:274-278.
- Lamb T.M. and Harland R.M.** (1995). Fibroblast growth factor is a direct neural inducer, which combined with *noggin* generates anterior-posterior neural pattern. *Development* **121**:3627-3636.
- Lance-Jones C., Omelchenko N., Bailis A., Lynch S. and Sharma K.** (2001) Hoxd10 induction and regionalization in the developing lumbosacral spinal cord. *Development* **128**(12):2255-2268.
- Lane M.C. and Keller R.** (1997). Microtubule disruption reveals that Spemann's organizer is subdivided into two domains by the vegetal alignment zone. *Development* **124**:895-906.
- Launay C., Fromentoux V., Shi D.L. and Boucaut J.C.** (1996) A truncated FGF receptor blocks neural induction by endogenous *Xenopus* inducers. *Development* **122**(3):869-880.
- Laurent A., Bihan R., Omilli F., Deschamps S. and Pellerin I.** (2008) PBX proteins : much more than Hox cofactors. *Int J Dev Biol.* **52**(1):9-20.
- Lemons D. and McGinnis W.** (2006). Genomic evolution of Hox gene clusters. *Science* **313**(5795):1918-1922.

- Letoha T., Gaal C., Somlai A., Czajlik A., Perczel A. and Penke B.** (2003). Membrane translocation of penetratin and its derivatives in different cell lines. *J Mol Recognit.* **16**(5):272-279.
- Levine A.J. and Hemmati-Brivanlou A.** (2007) Proposal of a model of mammalian neural induction. *Dev. Biol.* **308**(2), 247-256.
- Lewis E.B.** (1978) A gene complex controlling segmentation in *Drosophila*. *Nature* **276**:565-570.
- Li Y., Fenger U., Niehrs C. and Pollet N.** (2003) Cyclic expression of *esr9* gene in *Xenopus* presomitic mesoderm. *Differentiation* **71**:83-89.
- Li H-Y., Bourdelas A., Carron C., Gomez C., Boucaut J-C. and Shi D-L.** (2006) *FGF8*, *Wnt8* and *Myf5* are target genes of *Tbx6* during anteroposterior specification in *Xenopus* embryo. *Dev Biol.* **290**:470-481.
- Linker C. and Stern C.D.** (2004) Neural induction requires BMP inhibition only as a late step, and involves signals other than FGF and Wnt antagonists. *Development* **131**(22):5671-5681.
- Liu J.P., Laufer E. and Jessell T.M.** (2001) Assigning the positional identity of spinal motor neurons: rostrocaudal patterning of *Hox-c* expression by FGFs, *Gdf11*, and retinoids. *Neuron* **32**(6):997-1012
- Lumsden A.** (2004) Segmentation and compartmentation in the early avian hindbrain. *Mech Dev.* **121**:1081-1088.
- Luther W.H.** (1935) Entwicklungsphysiologische Untersuchungen am Forellenkeim: die Rolle des Organisationszentrums bei der Entstehung der Embryonanlage. *Biol. Zentralb.* **55**:114-137.
- Maconochie M.K., Nonchev S., Studer M., Chan S.K., Popperl H., Sham M.H., Mann R.S. and Krumlauf R.** (1997) Cross-regulation in the mouse *HoxB* complex: the expression of *Hoxb2* in rhombomere 4 is regulated by *Hoxb1*. *Genes Dev.* **11**:1885-1895.
- Maden M., Graham A., Zile M. and Gale E.** (2000) Abnormalities of somite development in the absence of retinoic acid. *Int J Dev Biol.* **44**:151-159.
- Maizel A., Bensaude O., Prochiantz A. and Joliot A.** (1999). A short region of its homeodomain is necessary for engrailed nuclear export and secretion. *Development* **126**(14):3183-3190.
- Mangold O.** (1933) Über die Induktionsfähigkeit der verschiedenen Bezirke der Neurula von Urodelen. *Naturwissenschaften* **21**:761-766.
- Marcus EA, Kintner C, Harris W.** (1998). The role of GSK3 β in regulating neuronal differentiation in *Xenopus laevis*. *Mol Cell Neurosci* **12**:269-280.

- Matise M.P. and Lance-Jones C.** (1996) A critical period for the specification of motor pools in the chick lumbosacral spinal cord. *Development* **122**(2):659-669.
- Mayor R, Morgan R, Sargent MG.** (1995). Induction of the prospective neural crest of *Xenopus*. *Development* **121**:767-777.
- McClintock J.M., Kheirbek M. and Prince V.** (2002) Knockdown of duplicated zebrafish *hoxb1* genes reveals distinct roles in hindbrain patterning and a novel mechanism of duplicate gene retention. *Development* **132**:2861-2871.
- McGinnis W. and Krumlauf R.** (1992) Homeobox genes and axial patterning. *Cell* **68**, 283-302.
- McGrew L.L., Lai C.J. and Moon R.T.** (1995). Specification of the anteroposterior neural axis through synergistic interaction of the Wnt signaling cascade with noggin and follistatin. *Dev Biol.* **172**(1):337-342.
- McGrew M.J., Dale J.K., Fraboulet S. and Pourquié O.** (1998) The lunatic fringe gene is a target of the molecular clock linked to somite segmentation in avian embryos. *Curr.Biol.* **8**:979-982.
- McIntyre D.C., Rakshit S., Yallowitz A.R., Jeannotte L., Capecchi M.R. and Wellik D.M.** (2007). Hox patterning the vertebrate rib cage. *Development* **134**:2981-2989.
- McNulty C.L., Peres J.N., Bardine N., van den Akker W.M. and Durston A.J.** (2005) Knockdown of the complete Hox paralogous group 1 leads to dramatic hindbrain and neural crest defects. *Development* **132**(12):2861-2871.
- Meinhardt H.** (1986) Model of segmentation. In: Somites in developing embryos (eds. Bellairs, R, Ede, D.A., and Lash, J.W.), pp. 179-189. New York: Plenum.
- Mizuseki K., Kishi M., Matsui M., Nakanishi S. And Sasai Y.** (1998) *Xenopus* *zic*-related-1 and *Sox2*, two factors induced by chordin, have distinct activities in the initiation of neural induction. *Development* **125**:579-587.
- Moens C.B. and Selleri L.** (2006) Hox cofactors in vertebrate development. *Dev Biol.* **291**(2):193-206.
- Molven A, Wright CV, Bremiller R, De Robertis EM, Kimmel CB.** (1990). Expression of a homeobox gene product in normal and mutant zebrafish embryos: evolution of the tetrapod body plan. *Development* **109**:279-288.
- Montavon T., Le Garrec J.F., Kerszberg M. and Duboule D.** (2008) Modeling Hox gene regulation in digits: reverse colinearity and the molecular origin of thumbness. *Genes Dev.* **22**(3):346-359.
- Moreno T.A. and Kintner C.** (2004) Regulation of segmental patterning by retinoic acid signaling during *Xenopus* somitogenesis. *Dev Cell.* **6**(2):295-218.

- Muhr J., Jessell T.M. and Edlund T.** (1997). Assignment of early caudal identity to neural plate cells by a signal from caudal paraxial mesoderm. *Neuron* **19**(3):487-502.
- Muhr J., Graziano E., Wilson S., Jessell T.M. and Edlund T.** (1999) Convergent inductive signals specify midbrain, hindbrain, and spinal cord identity in gastrula stage chick embryos. *Neuron* **23**:689-702.
- Nedelec S., Foucher I., Brunet I., Bouillot C., Prochiantz A. and Trembleau A.** (2004). Emx2 homeodomain transcription factor interacts with eukaryotic translation initiator factor 4E(eIF4E) in the axons of olfactory sensory neurons. *Proc. Natl. Acad. Sci. U.S.A.* **101**:10815-10820.
- Niederreither K., Subbarayan V., Dollé P. and Chambon P.** (1999) Embryonic retinoic acid synthesis is essential for early mouse post-implantation development. *Nat Genet.* **21**:444-448.
- Niehrs C.** (1999). Head in the WNT: the molecular nature of Spemann's head organizer. *Trends Genet.* **15**(8):314-319.
- Niehrs C.** (2004) Regionally specific induction by the Spemann-Mangold organizer. *Nat Rev Genet.* **5**(6):425-434.
- Nieuwkoop P.D.** (1952). Activation and organization of the central nervous system in amphibians III Synthesis of a new working hypothesis. *J. Exp. Zool.* **120**:83-108.
- Nieuwkoop P.D. and van Nigtevecht G.** (1954). Neural Activation and Transformation in Explants of Competent Ectoderm under the Influence of Fragments of Anterior Notochord in Urodeles. *J. Embryol. Expo. Morph.* **2**:175-193.
- Nieuwkoop P.D. and Faber J.** (1956). Normal table of *Xenopus laevis* (Daudin). Amsterdam: North-Holland Publishing Company.
- Nieuwkoop P.D.** (1997). Short historical survey of pattern formation in the endomesoderm and the neural anlage in the vertebrates: the role of vertical and planar inductive actions. *Cell Mol Life Sci.* **53**(4):305-318.
- Nordström U, Maier E, Jessell TM, Edlund T.** (2006). An early role for WNT signaling in specifying neural patterns of Cdx and Hox gene expression and motor neuron subtype identity. *PLoS Biol* **4**:e252.
- Oliver G., Wright C.V., Hardwicke J. and De Robertis E.M.** (1988) Differential antero-posterior expression of two proteins encoded by a homeobox gene in *Xenopus* and mouse embryos. *EMBO J* **7**:3199-3209.
- Oka C., Nakano T., Wakeham A., de la Pompa J.L., Mori C., Sakai T., Okasaki S., Kawaichi M., Shiota K., Mak T., et al.** (1995) Disruption of the mouse RBP-J kappa gene results in early embryonic death. *Development* **121**:3291-3301.

- Oosterveen T., Niederreither K., Dolle P., Chambon P., Meijlink F. and Deschamps J.** (2003) Retinoids regulate the anterior expression boundaries of 5' Hoxb genes in posterior hindbrain. *EMBO J.* **22**:262-269.
- Oppenheimer J.M.** (1936) Transplantation experiments on developing teleosts (Fundulus and Perca). *J.Exp.Zool.* **72**:409-437.
- Oswald R., Richter K. And Grunz H.** (1991) Localization of a nervous system-specific class II beta-tubulin gene in *Xenopus laevis* embryos by whole-mount in situ hybridization. *Int J Dev Biol.* **35**(4):399-405.
- Palmeirim I., Henrique D., Ish-Horowicz D. and Pourquié O.** (1998) Avian hairy gene expression identifies a molecular clock linked to vertebrate segmentation and somitogenesis. *Cell* **91**:639-648.
- Pata I., Studer M., van Doorninck J.H., Briscoe J., Kuuse S., Engel J.D., Grosveld F. and Karis A.** (1999) The transcription factor GATA3 is a downstream effector of Hoxb1 specification on rhombomeres 4. *Development* **126**:5523-5531.
- Peres J.N. and Durston A.J.** (2006) Role of X-Delta-2 in the early neural development of *Xenopus laevis*. *Dev.Dyn* **235**(3):802-810.
- Peres J.N., McNulty C.L. and Durston A.J.** (2006) Interaction between X-Delta-2 and Hox genes regulates segmentation and patterning of the anteroposterior axis. *Mech Dev.* **132**(4):321-333.
- Placzek M. and Furley A.** (1996) Patterning cascades in the neural tube. Neural development. *Curr Biol.* **6**(5):526-529.
- Ponwall M.E., Tucker A.S., Slack J.M. and Isaacs H.V.** (1996). eFGF, Xcad3 and Hox genes form a molecular pathway that establishes the anteroposterior axis in *Xenopus*. *Development* **105**:119-130.
- Pourquié O.** (2001) Vertebrate somitogenesis. *Annu. Rev. Cell Dev. Biol.* **17**:311-350.
- Pourquié O.** (2003) Vertebrate somitogenesis: a novel paradigm for animal segmentation? *Int J Dev Biol.* **47**(7-8):597-603.
- Poznanski A. and Keller R.** (1997). The role of planar and early vertical signaling in patterning the expression of Hoxb-1 in *Xenopus*. *Dev Biol.* **184**(2):351-366.
- Prince V. And Pickett F.B.** (2002) Splitting pairs: the diverging fates of the duplicated genes. *Nat.Rev.Genet.* **3**:827-837.
- Prochiantz A.** (2000). Messenger proteins: homeoproteins, TAT and others. *Curr. Opin. Cell Biol.* **12**:400-406
- Prochiantz A.** (2003). Protein transduction: from physiology to technology and vice versa. *Adv Drug Deliv Rev* **57**(4):491-493.

- Prochiantz A. and Joliot A.** (2003). Can transcription factors function as cell-cell signaling molecules? *Nature Rev. Mol. Cell. Biol.* **4**:6-11.
- Prochiantz A.** (2005). Protein transduction : from physiology to technology and vice versa. *Adv Drug Deliv Rev.* **57**(4) :491-493.
- Richter K, Good PJ, Dawid IB.** (1990). A developmentally regulated, nervous system-specific gene in *Xenopus* encodes a putative RNA-binding protein. *New Biol* **2**:556-565.
- Rida P.C., Le Minh N. and Jiang Y.J.** (2004) A Notch feeling of somite segmentation and beyond. *Dev.Biol.* **265**:2-22.
- Rossel M. and Capecchi M.R.** (1999) Mice mutant for both *Hoxa1* and *Hoxb1* show extensive remodeling of the hindbrain and defects in craniofacial development. *Development* **112**:5027-5040.
- Royet J.** (1998). Organisation spatiale des disques imaginaires et des bourgeons de membre. *Médecine/sciences* **14**:1167-1175.
- Ruiz I Altaba A. and Jesell T.M.** (1991) Retinoic acid modifies the pattern of cell differentiation in the central nervous system of neurula stage *Xenopus* embryos. *Development* **112**:945-958.
- Saga Y. and Takada H.** (2001) The making of the somite: molecular events in vertebrate segmentation. *Nat.Rev.Genet* **2**(11):835-845.
- Sakai M.** (1996) The vegetal determinants required for the Spemann organizer move equatorially during the first cell cycle. *Development* **122**, 2207-2214.
- Sasai Y., Lu B., Piccolo S. and De Robertis E.M.** (1996) Endoderm induction by the organizer-secreted factors chordin and noggin in *Xenopus* animal caps. *EMBO J.* **15**(17):4547-4555.
- Sasai Y. and De Robertis E.M.** (1997) Ectodermal patterning invertebrate embryos. *Dev Biol.* **182**(1):5-20.
- Shah V., Drill E. And Lance-Jones C.** (2004). Ectopic expression of *Hoxd10* in thoracic spinal segments induces motoneurons with a lumbosacral molecular profile and axon projections to the limb. *Dev Dyn* **231**:43-56.
- Sharpe P.T., Miller J.R., Evans E.P., Burtenshaw M.D. and Gaunt S.J.** (1988). Isolation and expression of a new mouse homeobox gene. *Development* **102**:397-407.
- Shih J. and Fraser S.E.** (1996) Characterizing the zebrafish organizer: microsurgical analysis at the early-shield stage. *Development* **122**(4):1313-1322.
- Shimeld SM, Gaunt SJ, Coletta PL, Geada AM, Sharpe PT.** (1993). Spatial localisation of transcripts of the *Hox-C6* gene. *J Anat* **183**:515-523.

- Shiotsugu J., Katsuyama Y., Arima K., Baxter A., Koide T., Song J., Chandraratna R.A and Blumberg B.** (2004) Multiple points of interaction between retinoic acid and FGF signalling during embryonic axis formation. *Development* **131**(11):2653-2667.
- Shirasaki R. and Pfaff S.L.** (2002) Transcriptional codes and the control of neuronal identity. *Annu Rev Neurosci.* **25**:251-281.
- Simeone A, Pannese M, Acampora D, D'Esposito M, Boncinelli E.** (1988). At least three human homeoboxes on chromosome 12 belong to the same transcription unit. *Nucleic Acids Res* **16**:5379-5390.
- Simeone A., Acampora D., Arcioni L., Andrews P.W., Boncinelli E. And Mavilio F.** (1990) Sequential activation of HOX2 homeobox genes by retinoic acid in human embryonal carcinoma cells. *Nature* **346**:763-766.
- Sirbu I.O., Gresh L., Barra J. And Duester G.** (2005) Shifting boundaries of retinoic acid activity control hindbrain segmental gene expression. *Development* **132**(11):2611-2622.
- Sirbu I.O. and Duester G.** (2006) Retinoic-acid signalling in node ectoderm and posterior neural plate directs left-right patterning of somitic mesoderm. *Nat Cell Biol.* **8**(3):271-277.
- Sive H.L., Draper B.W., Harland R.M. and Weintraub H.** (1990). Identification of a retinoic acid-sensitive period during primary axis formation in *Xenopus laevis*. *Genes Dev.* **4**(6):932-942.
- Smith J.L. and Schoenwolf G.C.** (1989) Notochordal induction of cell wedging in the chick neural plate and its role in neural tube formation. *J. Exp. Zool* **250**(1):49-62.
- Song J. and Slack J.M.** (1994) Spatial and temporal expression of basic fibroblast growth factor (FGF-2) mRNA and protein in early xenopus development. *Mech Dev.* **48**:141-151.
- Song M.R. and Pfaff S.L.** (2005) Hox genes: the instructors working at motor pools. *Cell* **123**:363-365.
- Souopgui J.** (2002) Identification and functional characterization of novel genes involved in primary neurogenesis in *Xenopus laevis* (thesis).
- Sparrow D.B., Jen W.C., Kotecha S., Towers N., Kintner C. and Melton T.J.** (1998) Thylacine1 is expressed segmentally within the paraxial mesoderm of the *Xenopus* embryo and interacts with the Notch pathway. *Development* **125**:2041-2051.

Spemann H. and Mangold H. (1924) Induction of embryonic primordial by implantation of organizers from different species. In: *Foundations of*

Experimental Embryology (eds. Willier B.H. and Oppenheimer J.M.), pp.144-184. New York: Hafner

Stern C.D. and Vasilias D. (2000) Segmentation: a view from the border. *Curr.Top.Dev.Biol.* **47**:107-129.

Stern C.D. (2001) Initial patterning of the central nervous system: how many organizers? *Nat Rev Neurosci.* **2**(2):92-98

Stern C.D. (2005) Neural induction: old problem, new findings, yet more questions. *Development* **132**(9):2007-2021

Stern C.D., Charité J., Deschamps J., Duboule D., Durston A.J., Kmita M., Nicolas J-F., Palmeirim I., Smith J.C. and Wolpert L. (2006) *Int.J.Dev.Biol.* **50**:3-15.

Storey K.G., Goriely A., Sargent C., Brown J.M., Burns H.D., Abud H.M. and Heath J.K. (1998) Early posterior neural tissue is induced by FGF in the chick embryo. *Development* **125**:473-484.

Stockanathan S. and Jessell T.M. (1998) Motor neuron-derived retinoid signaling specifies the subtype identity of spinal motor neurons. *Cell* **94**(4):503-514.

Svingen T. and Tonissen K.F. (2006) Hox transcription factors and their elusive mammalian gene targets. *Heredity* **97**:88-96.

Sawada A., Fritz A., Jiang Y.J., Yamamoto A., Yamasu K., Kuroiwa A., Saga Y. and Takeda H. (2000) Zebrafish Mesp family genes, mesp-a and mesp-b are segmentally expressed in the presomitic mesoderm, and Mesp-b confers the anterior identity to the developing somites. *Development.* **127**(8):1691-1702.

Tanabe Y. and Jessell T.M. (1996) Diversity and pattern in the developing spinal cord. *Science* **274**:1115-1123.

Tautz D. (2004) Segmentation. *Dev Cell* **7**(3):301-312.

Tiret L., Le Mouellic H., Maury M. and Brûlet P. (1998) Increased apoptosis of motoneurons and altered somatotopic map in the brachial spinal cord of Hoxc-8 deficient mice. *Development* **125**(2):279-291.

Trainor P.A. and Krumlauf R. (2001) Hox genes, neural crest cells and branchial arch patterning. *Curr Opin Cell Biol* **13**(6):698-705.

Tümpel S., Cambronero F., Ferretti E., Blasi F., Wiedemann L.M. and Krumlauf R. (2007) Expression of Hoxa2 in rhombomere 4 is regulated by a conserved cross-regulatory mechanism dependent upon Hoxb1. *Dev.Biol.* **302**:646-660.

- Turner D.L. and Weintraub H.** (1994). Expression of achaete-scute homolog 3 in *Xenopus* embryos converts ectodermal cells to a neural fate. *Genes Dev* **8**:1434-1447.
- Turnpenny P.D., Alman B., Cornier A.S., Giampietro P.F., Offiah A., Tassy O., Pourquié O., Kusumi K. and Dunwoodie S.** (2007) Abnormal vertebral segmentation and the Notch signaling pathway in man. *Dev Dyn.* **236**(6):1456-1474.
- Van den Akker E., Fromental-Ramain C., de Graaff W., Le Mouellic H., Brûlet P., Chambon P. and Deschamps J.** (2001) Axial skeletal patterning in mice lacking all paralogous group 8 Hox genes. *Development* **128**(10):1911-1921.
- Vermot J., Gallego Llamas J., Fraulob V., Niederreither K., Chambon P. And Dollé P.** (2005) Retinoic acid controls the bilateral symmetry of somite formation in the mouse embryo. *Science* **308**(5721):5363-566.
- Vermot J. and Pourquié O.** (2005) Retinoic acid coordinates somitogenesis and left-right patterning in the vertebrate embryo. *Nature* **435**(7039):215-220.
- Vincent J. P., Oster G. F. and Gerhart J. C.** (1986) Kinematics of grey crescent formation in *Xenopus* eggs: the displacement of subcortical cytoplasm relative to the egg surface. *Dev. Biol.* **113**, 484-500.
- Wacker S, Grimm K, Joos T, Winklbauer R.** (2000). Development and control of tissue separation at gastrulation in *Xenopus*. *Dev Biol.* **224**:428-439.
- Wacker S.A., Jansen H.J., McNulty C.L., Houtzager E. And Durston A.J.** (2004a) Timed interactions between the Hox expressing non-organizer mesoderm and the Spemann organizer generate positional information during vertebrate gastrulation. *Dev.Biol.* **268**:207-219.
- Wacker S.A., McNulty C.L. and Durston A.J.** (2004b) The initiation of Hox gene expression in *Xenopus laevis* is controlled by Brachyury and BMP-4. *Dev.Biol.* **266**:123-137.
- Waddington C.H.**(1932). Experiments on the development of chick and duck embryos cultivated in vitro. *Philos.Trans.R.Soc.lond.B.Biol.Sci.* **221**:179-230.
- Waddington C.H.**(1936). Organizers in mammalian development. *Nature* **138**:125.
- Waddington C.H.**(1937). Experiments on determination of the rabbit embryo. *Arch.Biol.* **48**:273-290.
- Wahba G.M., Hostikka S.L. and Carpenter E.M.** (2001) The paralogous Hox genes *Hoxa10* and *Hoxd10* interact to pattern the mouse hindlimb peripheral nervous system and skeleton. *Dev. Biol.* **231**(1):87-102
- Weaver C. and Kimelman D.** (2004) Move it or lose it: axis specification in *Xenopus*. *Development* **131**(5):3491-4399

- Weinstein D.C. and Hemmati-Brivanlou A.** (1997) Neural induction in *xenopus laevis*: evidence for the default model. *Curr Opin Neurobiol* **7**(1):7-12.
- Wellik D.M. and Capecchi M.R.** (2003) Hox10 and Hox11 genes are required to globally pattern the mammalian skeleton. *Science* **301**(5631):363-367.
- Wilson P.A. and Hemmati-Brivanlou A.** (1995) Induction of epidermis and inhibition of neural fate by Bmp-4. *Nature* **376**(6538):331-333.
- Winklbauer R.** (1990) Mesodermal cell ingression during *Xenopus* gastrulation. *Dev Biol.* **142**:155-168.
- Wolpert Lewis** (2005). Principles of Development. Online resource centre.
- Woltering J.M., Vonk F.J., Müller H., Bardine N., de Bakker M.A.G., Durston A.J. and Richardson M.K** (*submitted*) Alternative interpretation of the *Hox* code in snakes and caecilians.
- Woltering J.** (2007) Hox, microRNAs and evolution: new insights into the patterning of the body axis.
- Woo K. and Fraser S.E.** (1997). Specification of the zebrafish nervous system by nonaxial signals. *Science* **277**(5323):254-257.
- Wright CV, Cho KW, Hardwicke J, Collins RH, De Robertis EM.** (1989). Interference with function of a homeobox gene in *Xenopus* embryos produces malformations of the anterior spinal cord. *Cell* **59**:81-93.
- Wu Y., Wang G., Scott S.A. and Capecchi M.R.** (2008) Hoxc10 and Hoxd10 regulate columnar, divisional and motor pool identity of lumbar motoneurons. *Development* **135**(1):171-182.
- Yu H.M., Jerchow B., Sheu T.J., Liu B., Costantini F., Puzas J.E., Birchmeier W. and Hsu W.** (2005) The role of Axin2 in calvarial morphogenesis and craniosynostosis. *Development* **132**(8):1995-2005.
- Zákány J., Kmita M., Alarcon P., de la Pompa J.L and Duboule D.** (2001) Localized and transient transcription of Hox genes suggests a link between patterning and the segmentation clock. *Cell* **106**(2):207-217.
- Zoltewicz J.S. and Gerhart J.C.** (1997). The Spemann organizer of *Xenopus* is patterned along its anteroposterior axis at the earliest gastrula stage. *Dev Biol.* **192**(2):482-491.

