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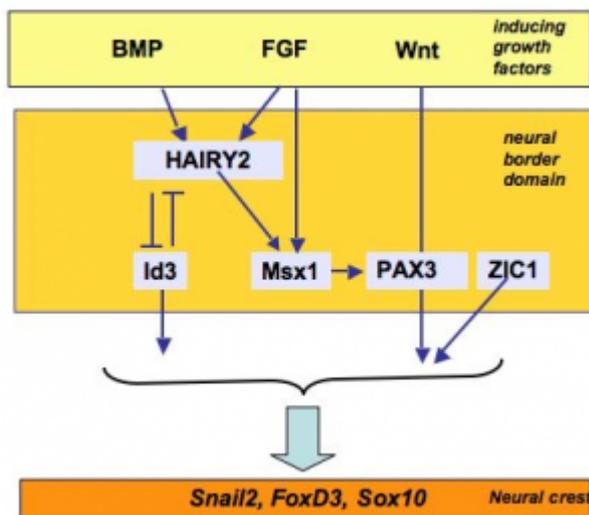


Figure 1 : Genetic network acting upstream of neural crest induction (modified from Monsoro-Burq et al., 2005 and Nichane et al. 2008).

During embryogenesis, the epithelial-to-mesenchymal transition (EMT) is an essential morphogenetic process allowing epithelial cells to become separate migratory cells. This process is also activated when epithelial tumours develop metastases. In both cases, common gene activities such as Snail1 or Snail2 gene activation are involved. While the molecular mechanisms of Snail-induced EMT begin to be elucidated at the cellular level, little is known about the upstream regulation of these genes. To address this major challenge in developmental as well as cancer biology, the overall aim of our research is to understand how a combination of diffusible signalling molecules, multiple signal transduction pathways and their transcriptional responses are integrated and regulate Snail1/2 and other EMT-regulating factors, in normal and pathological contexts.

The neural crest is a key embryonic cell population undergoing EMT. Despite a wide interest for the early steps of development of these cells and the identification of many secreted factors and genes involved in neural crest induction, our knowledge of how these signals are integrated and how these genes are organised into an epistatic cascade is poorly documented. Our aim is to provide a comprehensive understanding of the genetic network controlling early neural crest formation during development, from its induction to EMT. We focus on the genes (transcription factors mainly) and growth factors that control Snail1 and Snail2 induction, or the genes that cooperate with Snail 1/2 to complete the EMT process. By taking advantage of the multiple ways of manipulating embryogenesis in amphibian and avian embryos, we have provided the first epistatic and functional cascade of regulations upstream of Snail1/2 in neural crest induction. Our findings in amphibian embryos have provided a novel and useful framework, now confirmed in other vertebrate species. These findings will provide critical novel clues to understand neural crest formation and control of EMT on a fundamental point of view and will also identify new molecular candidates for a precocious diagnosis of tumour progression and potential therapeutic targets.

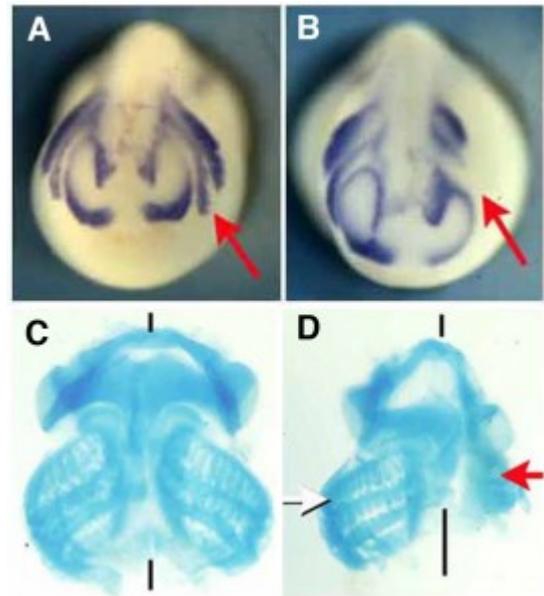


Figure 2: Amphibian embryos (*Xenopus laevis*) develop externally and are very amenable to experimental manipulations. A, C: normal expression of Twist gene marks the migrating neural crest (A), which develops into derivatives such as craniofacial cartilage (C) (controls). B, D: These processes are altered if network gene activities (figure 1) are blocked. Red arrows indicate injected side.

## Key publications

### Year of publication 2018

Méghane Sittewelle, Anne H Monsoro-Burq (2018 Jun 4)

**AKT signaling displays multifaceted functions in neural crest development.**

*Developmental biology* : S144-S155 : [DOI : S0012-1606\(17\)30660-7](https://doi.org/10.1016/j.ydbio.2018.06.007)

Patrick Pla, Anne H Monsoro-Burq (2018 Jun 1)

**The neural border: Induction,**

**specification and maturation of the territory that generates neural crest cells.**

*Developmental biology* : S36-S46 : [DOI : S0012-1606\(18\)30136-2](#)

Caroline Borday, Karine Parain, Hong Thi Tran, Kris Vleminckx, Muriel Perron, Anne H Monsoro-Burq (2018 Apr 20)

**An atlas of Wnt activity during embryogenesis in *Xenopus tropicalis*.**

*PloS one* : e0193606 : [DOI : 10.1371/journal.pone.0193606](#)

**Year of publication 2017**

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Jean-Louis Plouhinec, Sofía Medina-Ruiz, Caroline Borday, Elsa Bernard, Jean-Philippe Vert, Michael B Eisen, Richard M Harland, Anne H Monsoro-Burq (2017 Oct 20)

**A molecular atlas of the developing ectoderm defines neural, neural crest, placode, and nonneural progenitor identity in vertebrates.**

*PLoS biology* : e2004045 : [DOI : 10.1371/journal.pbio.2004045](#)

Ana Leonor Figueiredo, Frédérique Maczkowiak, Caroline Borday, Patrick Pla, Meghane Sittewelle, Caterina Pegoraro, Anne H Monsoro-Burq (2017 Oct 18)

**PFKFB4 control of AKT signaling is essential for premigratory and migratory neural crest formation.**

*Development (Cambridge, England)* : 4183-4194 : [DOI : 10.1242/dev.157644](#)

**Year of publication 2013**

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Jean-Louis Plouhinec, Daniel D Roche, Caterina Pegoraro, Ana Leonor Figueiredo, Frédérique Maczkowiak, Lisa J Brunet, Cécile Milet, Jean-



Signaling and Neural Crest Development  
**UMR 3347/U1021 - Signaling, Radiobiology and Cancer**

Philippe Vert, Nicolas Pollet, Richard M Harland,  
Anne H Monsoro-Burq (2013 May 30)

**Pax3 and Zic1 trigger the early neural crest gene regulatory network by the direct activation of multiple key neural crest specifiers.**

*Developmental biology* : 461-72 : [DOI :](#)

[10.1016/j.ydbio.2013.12.010](https://doi.org/10.1016/j.ydbio.2013.12.010)