

PAX3

Orthologs

In chick, notochord transplantation experiments showed that signals from the notochord and floorplate inhibit PAX3 expression, thus preventing ventral neural tube expression and restricting it to dorsal regions (Goulding et al., 1993).

The ascidian *Halocynthia roretzi* (Sea squirt) expresses genes homologous to vertebrate *Mitf* (*HrMitf*) and *Pax3* (*HrPax3/7*). Overexpression of *HrPax3/7* induced expression of tyrosinase enzyme activity, suggesting that **the Pax3-Mitf-Tyr pathway is conserved in ascidian pigment cell development** (Yajima et al., 2003).

In chick, PAX3 is expressed in melanocyte precursors prior to expression of KIT, and later in development PAX3 is downregulated upon pigment formation. Of note, PAX7 and PAX3 are both expressed in dorsal neural tube, premigratory and early migrating neural crest in chick, while in mouse only PAX3 is expressed in these cells. Chick melanoblasts continue to express *PAX7* in a manner similar to that of *PAX3* (Lacosta et al., 2005).

Comprehensive analysis of zebrafish *pax3* during neural crest development showed *pax3* is expressed by neural crest precursors, then downregulated in migrating neural crest. Loss of *pax3* by knockdown caused a complete loss of enteric neurons and xanthoblasts, while melanoblasts showed initial reduction in numbers and a delay in migration; subsequently, however, melanoblast migration returned to normal levels and melanophore number was increased. These results suggest that **in zebrafish, *pax3* functions to specify xanthoblasts at a stage prior to melanoblast or xanthoblast differentiation, in a multipotent precursor to the chromatoblast lineage. This dual function of Pax3, to both specify xanthoblasts and inhibit melanoblasts, suggests that originally there was an ancestral form of pigment cells that did not require Pax3 function.** The second form of pigment cells, requiring Pax3 and represented by xanthoblasts, arose later in evolution. **The authors hypothesize that this duality could be preserved to some degree in mammals, thus explaining the retention of a small population of melanoblast precursors in *Sp/Sp* homozygous mutants.** Theoretically *Pax3* mutants would retain the genetically "old," Pax3-independent melanoblasts, while losing the genetically "new," Pax-3 dependent, xanthoblast-like melanoblasts that require Pax3 function (Minchin and Hughes, 2008).

Embryonic pigment gene expression, including that of PAX3, was examined in two chicken pigment mutants, the hyperpigmented Silky Fowl and hypopigmented White Leghorn (Li et al., 2010).