mir92a acts to maintain Bmp activity during pharyngeal cartilage formation

Craniofacial malformation is a common congenital birth defect usually associated with abnormal development of pharyngeal arches. Most skeletal elements of the skull, such as bone and cartilage, are derived from cranial neural crest (CNC). CNC cells originate from neural folds, migrate into the craniofacial regions, proliferate to expand chondrogenic progenitors, and then differentiate into chondrocytes. Bmp signaling plays a central role in the specification and migration of CNC cells. Several Bmp ligands and their antagonists are expressed in the pharyngeal arches, but their specific roles in later processes of pharyngeal cartilage development remain unclear.

MicroRNAs (miRNAs) have a critical role in controlling fundamental cellular functions and developmental processes. Although some miRNAs have been found to be implicated in chondrogenesis *in vitro*, few have been shown to be essential for cartilage and bone development at the whole organism level. A research group led by Prof. Wang Qiang and Prof. Meng Anming from the Institute of Zoology, Chinese Academy of Sciences, report that mir-92a is essential for pharyngeal cartilage formation in zebrafish embryos. Noggin3 expressed in the pharyngeal region antagonizes BMP signaling to prevent apoptosis, but noggin3 mRNAs are targeted for degradation by mir-92a to preserve sufficient Bmp activity for the proliferation and differentiation of chondrogenic progenitors (Figure). Through this mechanism, Bmp activity is well balanced in the pharyngeal region.

The Bmp signal activity is well regulated by genetic modulators such as mir-92a and noggin3. If the expression of mir-92a is down- or up-regulated by environmental factors or genetic mutations and so on, the well balanced Bmp activity in the pharyngeal region will be broken, and craniofacial disorders will occur due to cell proliferation and differentiation defects or apoptosis.

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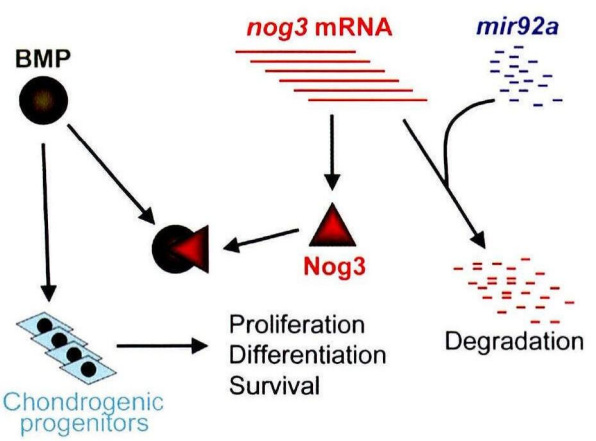

Figure Working model of miR-92a in maintaining Bmp activity during pharyngeal cartilage formation. Pharyngeal expressed noggin3 mRNAs are targeted for degradation by mir-92a to preserve sufficient Bmp activity for the proliferation, differentiation and survival of chondrogenic progenitors.