

**Stony Brook University
The Graduate School**

Doctoral Defense Announcement

Abstract

The Role of FGF signaling in neural and mesodermal fate choice in the zebrafish

By

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The ectoderm gives rise to both neural and epidermal tissues. An important step in the specification of the neural plate is the inhibition of bone morphogenetic proteins (BMP) in the dorsal ectoderm. Extracellular BMP antagonists originating from the organizer play an important role in neural induction. Even in the absence of the organizer, zebrafish embryos still develop well-patterned neural tissue suggesting that other signals are involved in neural tissue. Here, the role of fibroblast growth factor (FGF) signaling is examined in zebrafish neural development. FGF signaling is shown to first act during blastula stages to inhibit transcription of *bmp* mRNAs, but later during gastrulation, FGF signals induce Chordin gene expression. These results show a clear role for FGF in formation of the neural plate. In addition to neural induction, FGF signaling has long been known to be essential in patterning of the mesoderm. Since both neural and mesodermal patterning are occurring in similar time and space to each other raises question of how the two functions of FGF signaling is regulated. Recent insights into the regulation of FGF signaling came with the identification of the FGF regulated transcription factor *churchill* (*chch*). Examination of *chch*'s function reveals that it is required to limit mesoderm formation and regulate cell movements. Through the use of cell transplantation experiments, *chch* inhibited cells exhibit an increased migratory behavior. Furthermore, these cells migrate out of the epiblast and into the germ ring, but blocking Nodal signaling prevents this cell movements. Additionally, *chch* limits the transcriptional response to Nodal signals. These results suggest that *chch* is functioning to regulate both cell movements and mesodermal gene expression. The mechanism of *chch*'s function may come through the Smad interacting protein 1 (*Sip1*) gene. *Sip1* has been shown to have roles in inhibiting TGF- β signaling, induction of neural gene expression and inhibition of mesodermal gene expression and regulating cell movements. Taken together, the results presented here show the regulation of FGF signaling neural and mesodermal patterning.

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