Determining the Location of GABA Receptor mRNA Transcripts in *Danio rerio*

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**Introduction**

γ-aminobutyric acid (GABA) is a neurotransmitter that has been shown to be present in the inner ear. GABA binds to two classes of GABA receptors (GABARs): GABA_A Rs are pentameric ion channels (isoforms include: α 1-6, β 1-3, γ 1-3, δ, ζ, and π); GABA_B Rs are G-protein coupled receptors (isoforms include: 1a, 1b, and 2). Studies have shown that GABA_A Rs and GABA_B Rs transcripts are located in the inner ear but their function is not yet fully understood. This is in part due to access to the inner ear being very limited. Our experiments are designed to further our understanding of the role of GABA in the inner ear.

To get around the limited access to the inner ear, we use zebrafish lateral line sensory tissue as a model because the sensory hair cells of the lateral line are closely related to the hair cells of the mammalian inner ear. Neuromasts containing hair cells and are distributed over the head and the trunk of zebrafish. Hair cells communicate with the central nervous system through connections with afferent and efferent neurons.

**Hypothesis**

Because hair cells of the mammalian inner ear and the zebrafish lateral line are closely related, we hypothesize that lateral line cells express GABA receptors and will be a useful model that can be utilized to study the function of GABA in the inner ear.

**Experimental Methods**

We first performed reverse transcription followed by polymerase chain reaction (RT-PCR) to determine which GABARs would be good candidates to look for in the lateral line. We have now begun to determine if candidate GABAR mRNA transcripts are located in the lateral line by performing in situ hybridization.

**Conclusions**

Our preliminary data support our hypothesis that lateral line cells express GABARs. Of the candidate GABAR genes tested so far, gabbr1a is the only one to exhibit any lateral line staining. gabbr1a is expressed in anterior and posterior lateral line ganglia (aLLg, pLLg), which is relevant because these ganglia contain the cell bodies of afferent neurons that innervate the lateral line. gabbr1a encodes the GABA_A R subunit B1a, and our data suggest that there may be postsynaptic GABA_A Rs expressed in the lateral line.

**Future directions**

Our preliminary RT-PCR data suggested that there are several GABAR candidates that could be localized in the lateral line (Fig. 2). In the future, the rest of these GABAR subunits need to be located by performing in situ hybridization. Once the locations of these GABAR mRNA transcripts are discovered, then we can determine if the lateral line is a sufficient model to study GABA signaling in the inner ear.

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