Retinoic Acid (RA) and the Formation of Neurons

- RA is necessary for proper embryonic patterning & cell differentiation
- RA promotes eye and brain development in zebrafish
- Together with its receptor, RA acts as a transcription factor

Computational Approach and Results

1. Wrote a motif-finding Python program to find all RARE-containing zebrafish genes

   ![Motif-finding diagram]

   **RARE motif = DR1 - DR5 motifs**
   **Input = 65,171 zebrafish genes’ 5kb upstream region**
   **Output: RARE-containing genes and their tandem repeat motif sequences**
   **Parameters: Motif must match logo, be spaced 1-5 bp apart to be a DR**

2. Refined list by cross-referencing gene expression data from ZFIN

   ![Gene expression data]

   **Examples of Candidate Genes**
   - fgf24: fibroblast growth factor
   - cyp26a1: RA metabolizing enzyme
   - rarab: retinoic acid receptor
   - shha: sonic hedgehog signaling molecule a
   - aldha1a: aldehyde dehydrogenase
   - rdha8: retinol dehydrogenase

3. Generated DR5 RARE motif frequency plot using the program-identified zebrafish RAREs

   ![Motif frequency plot]

Future Work: Experimental Evaluation of Candidate Genes

Likely candidates can be assayed for expression after treatment with translation blocker and RA agonist

![Experimental setup diagram]

Extant RNA-seq data using the same drug treatments can be analyzed further with reference to RARE-containing genes

Conclusion

112 zebrafish RARE genes were identified that are observed in the early stages of zebrafish eye development

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Literature Cited