

Module 4: Function and Expression (ZFIN)

i - How Do I Determine Gene Function?

Aims

- Introduce gene ontology and gene expression data available in ZFIN
- Describe how to find these data

Introduction

Gene Ontology (GO, <http://www.geneontology.org/>) annotations and gene expression data offer powerful insights for understanding of biological processes and gene function. GO terms are associated with genes by literature curation and by automated computational means. These terms are defined by members of the GO consortium, including ZFIN, to describe biological processes, cellular components and molecular functions of gene products. These terms can be used to describe gene products in any organism thus promoting cross-species studies.

Finding GO annotations

GO annotations are located in the **Gene Products** section of a ZFIN gene page. Locate this information using our Genes/Markers/Probes query form, <http://zfin.org/cgi-bin/webdriver?Mival=aa-newmrkrselect.apg>. Search by specifying your gene of interest.

The screenshot shows the ZFIN search page. At the top is the ZFIN logo and navigation links: Home, Mutants / Transgenics, Wild-Types, Anatomy Publications People Labs Companies Acc#, Genes / Markers / Clones, and Expression. Below this is a search bar with the text "Search for Genes / Markers / Clones" and a "Your Input Welc" label. The search bar contains "Name / Symbol:" followed by a dropdown menu set to "contains" and an empty text input field. To the right of the input field is an "Accession Number:" label and another empty text input field. Below the search bar is a "Types:" section with the instruction "(Choose one or more)". A dropdown menu is open, showing options: All, Gene, Pseudogene, Morpholino, EST, cDNA, BAC, PAC, BAC_END, PAC_END, RAPD, SSLP, and STS. To the right of the types menu is an "LG:" dropdown menu set to "any" and a "Display results in groups of 20" label. At the bottom of the search area are buttons for "SEARCH", "BEST MATCH", and "RI". Below the search area is a footer with navigation links: Home, Email ZFIN, About ZFIN, Helpful Hints, and Citing ZFIN. Copyright information for the University of Oregon (1994-2005) and ZFIN logo design by Kari Pape is also present.

Enter gene symbol

Click on the search button or hit the "enter" key

Scroll down to the **Gene Products** section of the gene page.

GENE PRODUCTS:

Gene Ontology

Ontology	GO Term
Molecular Function	growth factor activity
Biological Process	determination of ventral identity (<i>more</i>)
Cellular Component	extracellular region
All GO Terms (6)	

Click here to view all GO annotations available for this gene

The *bmp2b* gene page shows a representative term for each of the three ontologies. To view all terms click on 'All GO terms' link. The *bmp2b* GO details page displays all annotations for *bmp2b*.

ZFIN

Home Mutants / Transgenics Wild-Types Anatomy Publications People Labs Companies Acc# Genes / Markers / Clones Expression

ZFIN ID: ZDB-GENE-980526-474

GO Details

Gene Name: *bone morphogenetic protein 2b*
Gene Symbol: *bmp2b* Your Input Welco

Ontology	GO Term	Evidence	Inferred From	Reference(s)
Molecular Function	growth factor activity	IEA		2
Biological Process	cell-cell signaling involved in cell fate commitment	IMP		1
	determination of ventral identity	IDA		1
	determination of ventral identity	IGI	twsg1b	1
	determination of ventral identity	TAS		1
	dorsal/ventral pattern formation	IEP		1
Cellular Component	dorsal/ventral pattern formation	IMP	swr^{tc300a}	1
	growth	IEA		1
	extracellular region	IEA		1

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Click here for GO term definition

Click here for GO evidence code definition

Click here for publications providing supporting evidence

You may get additional information regarding a term by following the term link. Evidence codes supporting the annotation are provided. Evidence codes are

standardized by the GO consortium and allow you to determine the confidence you may want to have in each GO term association. Again you may click on the evidence code for a description. The reference supporting the annotation is also provided.

Making a GO based gene query

As members of the GO consortium, we routinely make our annotations available to the centralized database maintained by the consortium. This allows you to use the GO term search engine, AmiGO <http://www.godatabase.org/cgi-bin/amigo/go.cgi>, made available by the GO consortium, to search for zebrafish genes and genes of other organisms that are annotated with a specified GO term.

Gene expression data

ZFIN also incorporates large datasets of high quality annotated images from laboratories performing large scale *in situ* hybridization screens, gene expression data submitted by individual investigators and gene expression data from the literature. See Module 4 ii for a complete discussion.

Morpholinos

Morpholinos, antisense oligonucleotides, have become an important method for evaluating gene function in zebrafish. ZFIN curates morpholino data from published literature and is working with the Stephen Ekker laboratory to include data from their morpholino screen. See Module 4 ii for a detailed discussion.

Exercises

- What are possible ways to infer function for my gene?
- What molecular function has been attributed to *fgf8*?
- In what biological processes is *fgf8* involved?
- With what cellular components is *fgf8* associated?
- What supporting evidence is available?