

# GUDMAP

## AN ONLINE GENITOURINARY RESOURCE



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### Introduction

The **GenitoUrinary Development Molecular Anatomy Project (GUDMAP)** is a consortium of laboratories working to provide the scientific and medical community with gene expression data and tools to facilitate research ([www.gudmap.org](http://www.gudmap.org)).

### GUDMAP Gene Expression Data

The data provided by GUDMAP include **large in situ screens** and **expression microarray analysis** of components of the developing mouse urogenital system. The **Gene Strip** interface allows users to access these datasets easily.

### Disease Resource

A searchable database of associations between genes, OMIM diseases (with GU component) and mammalian renal/urinary & reproductive phenotypes.

Table showing result of a query to find diseases associated with the gene *Wt1*.

OMIM ID	Disease Name	Gene Symbol	Gene MGI ID	ISH data	Flag	NCBI
194070	WILMS TUMOR 1	<i>Wt1</i>	MGI:98968	1	N	1
194080	DENYS-DRASH SYNDROME	<i>Wt1</i>	MGI:98968	1	N	1
256370	NEPHROTIC SYNDROME, EARLY-ONSET, WITH DIFFUSE MESANGIAL SCLEROSIS	<i>Wt1</i>	MGI:98968	1	N	1
194072	WILMS TUMOR, ANIRIDIA, GENITOURINARY ANOMALIES, AND MENTAL RETARDATION SYNDROME	<i>Wt1</i>	MGI:98968	1	N	1
136680	FRASIER SYNDROME	<i>Wt1</i>	MGI:98968	1	N	1
109800	BLADDER CANCER	<i>Wt1</i>	MGI:98968	1	N	0
601363	WILMS TUMOR 4	<i>Wt1</i>	MGI:98968	1	R	0

Link out to OMIM disease page

Link in to GUDMAP gene expression data

Associations are obtained from NCBI and through text-matching gene symbols in OMIM entries.

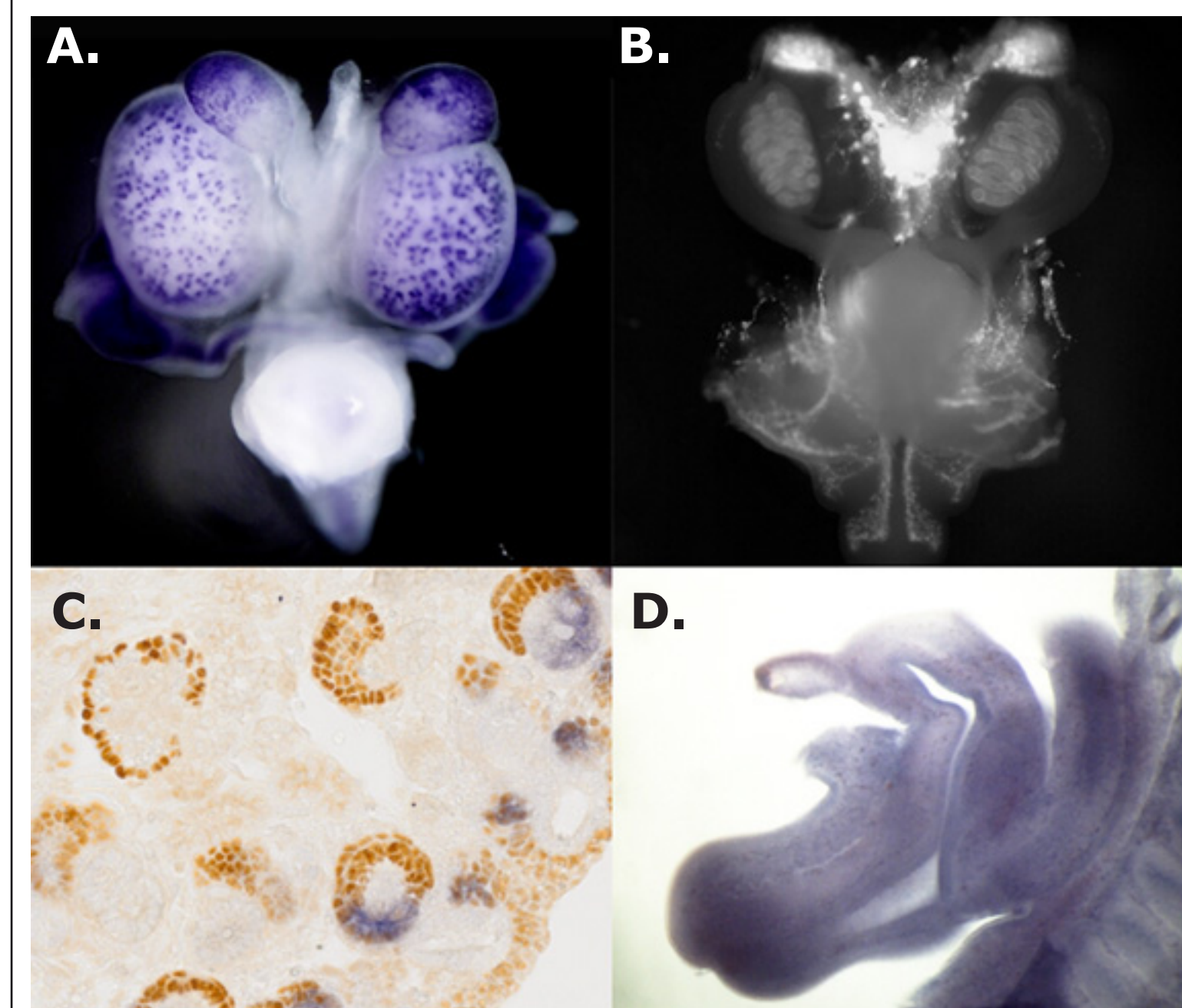
### Markers

In situ hybridization screens have revealed novel markers for specific anatomical components.

The **renal vesicle**, a structure once believed to be homogeneous, has both **proximal** and **distal** domains.

#### In situ data

- In situ hybridization screens (wholemout and section)
- In situ analysis of transgenic reporter screens (wholemout)
- Immunohistochemistry (section)



**A:** (GUDMAP:11296) *Wnt4* RNA expression in the early nephron.  
**B:** (GUDMAP:10716) A Sox10-YFP transgene labels neural crest cells as they stream into the urogenital tract.  
**C:** (GUDMAP:8200; GUDMAP:8209) Metanephros double-stained for Wt1 protein (orange) and *Wnt4* RNA (blue).  
**D:** (GUDMAP:11389) *Ets1* RNA expression in components of the urogenital sinus and urorectal septum.

#### cDNA Microarray data

- Array analysis of laser-captured components of the developing GU system
- Array analysis of FACS-isolated cells from transgenic reporter mice

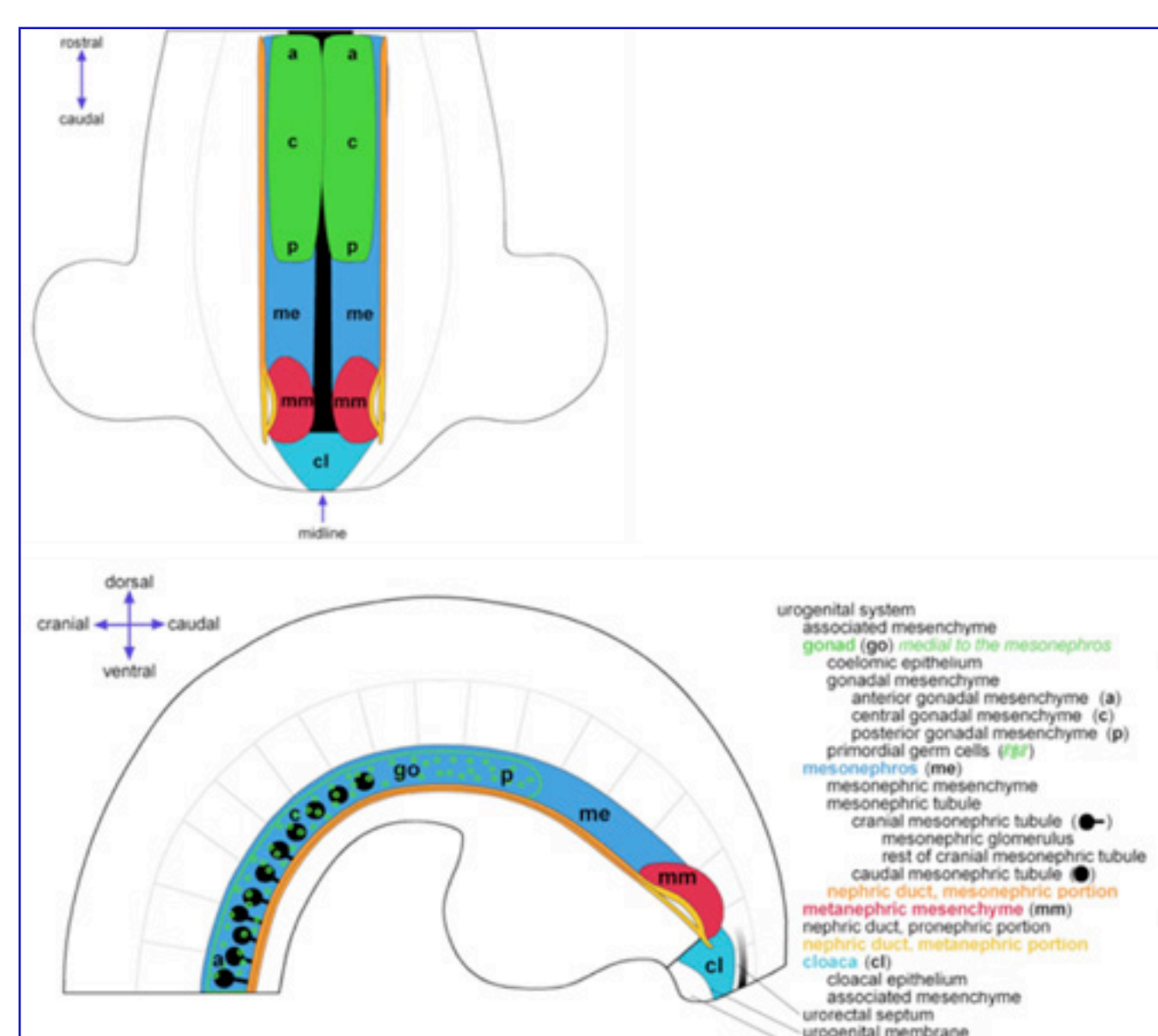
Microarray Expression Profile for *Hif1a*. The heatmap displays the level of expression for four different *Hif1a* probes across a range of components of the renal/urinary system.

### GUDMAP Tutorial

- The website has **tutorials** describing GU organogenesis.

#### The development of the murine kidneys

The **metanephros** develops from the most caudal part of the nephrogenic cord that is itself derived from the intermediate plate mesoderm. The initial renal anlage that develops from the most rostral part of the nephrogenic cord is termed the pronephros. The latter is not believed to function in the mouse, or in any other mammal. However, within the pronephros, a relatively small number of pronephric (or nephrotomal) vesicles form in a cranio-caudal direction, and these "drain" into the pronephric duct. As the pronephros is a relatively transient structure in mammals, the absence of differentiated **glomeruli** within it strongly suggests that it probably does not act as even a primitive excretory organ. Despite the complete degeneration of the pronephros, the pronephric duct is retained. This structure is then taken over by the **mesonephros** (also termed the "Wolffian" body), and is only then termed the **mesonephric portion of the nephric duct**.



Diagrammatic representation of the early urogenital system accompanied by GUDMAP ontological terms

- A **high-resolution anatomy ontology** has been developed by the GUDMAP consortium to describe the subcompartments of the developing murine genitourinary tract.

Screenshot of expression annotation, with renal vesicle notes, of GUDMAP:8200 (gene *Wt1*).

### Using The Database

#### < Boolean Query

The web interface enables users to perform advanced, Boolean queries in addition to more basic browse/query functions. Complex queries can be constructed to search for gene expression based on selected anatomical structures.

Search and select

Build, edit, view collection

Analyse collection

#### > Collections

Enable users to build collections of GUDMAP entries, genes and images. It is then possible to further analyse these sets using standard operators (e.g. union, intersect) to find similarities and differences.

### References

Little MH et al. (2007). A high-resolution anatomical ontology of the developing murine genitourinary tract.

Gene Expr Patterns. 7(6):680-99.

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