

Demo 2: What genes specifically mark the structure I am interested in?

Example using Ureteric Tip

- Using the Boolean Anatomy Query to search for genes
- Viewing the expression of genes in more detail

Go to the [GUDMAP gene expression home page](#). Click on [Boolean Query](#).

GUDMAP

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Expression Database

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Expression Database

- Organ Summaries
- Analysis
- Annotate
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- Labs
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Query

- Gene *i* Options
- Anatomy *i*
- Boolean Anatomy** ← **Click here**
- Accession ID *i*
- Gene Function *i* Options
- Disease *i*

Browse

- Array
 - Series *i*
 - Sample *i*
 - Platform *i*
- Theiler Stage *i*
- Gene *i*
 - RNA *i*
 - Protein *i*
 - RNA and Protein *i*
- In situ
- Transgenic *i*

Assay	Genes	Entries
ISH	2977	7801
Microarray		259
IHC	9	12
Tg	1	6

Last Editorial Update: 23-Sep-2009
Last Software Update: 15-Sep-2009 (V 5.1.0)

Focus by Organ / System

- [Metanephros](#)
- [Lower urinary system](#)
- [Early reproductive system](#)
- [Male reproductive system](#)
- [Female reproductive system](#)

Use a Boolean Anatomy Query to find genes expressed in the ureteric tip and not in surrounding tissues. This query is composed in the text box at the foot of the page using a simple syntax. A [guide to using the Boolean Query Syntax](#) is available.

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Expression Database > Boolean Anatomy Search

Search gene expression patterns in selected anatomical components.

Current anatomy display is for stage range TS17 to TS28.

[Find Components in Tree](#) *i*

i Javascript Tree Menu

- mouse (TS01-TS28)
- organ system (TS11-TS28)
 - visceral organ (TS12-TS28)
 - genitourinary system (TS13-TS18)
 - urinary system (TS19-TS28)
 - reproductive system (TS19-TS28)
 - nephric duct group (TS19-TS19)

G Group or group descendent. Groups provide alternative groupings of terms.

Search for: *i*

Expression is: present not detected uncertain *i*

in to:

with at

Expression is: present not detected uncertain

in to:

with at

[Run Query](#) [Save Query](#) *i*

with at

[Run Query](#) [Save Query](#) *i*

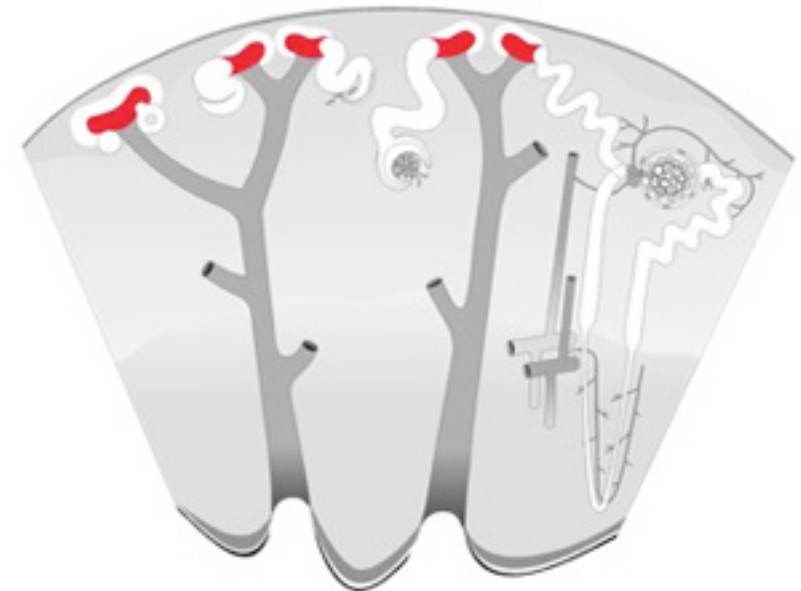
The left-hand panel shows such a query. This query searches for GENES with expression present (p) in the ureteric tip (red text) but not detected (nd) in a selection of other tissues. Each structure is named according to the standard anatomy ontology. The image on the right is adapted from the [GUDMAP tutorial on mouse urinary system development](#), the red areas are the ureteric bud/tip where we are looking for annotated expression.

Building a complex query using Boolean Anatomy Query syntax.

Full details of using the syntax are on the [Boolean Query Syntax help page](#).



GENE: nd{in cap mesenchyme TS23..TS23} AND |
nd{in early tubule TS23..TS23} AND |
nd{in late tubule TS23..TS23} AND |
nd{in renal vasculature TS23..TS23} AND |
nd{in ureter TS23..TS23} AND |
p{in ureteric tip TS23..TS23} AND |
nd{in ureteric trunk TS23..TS23} AND |
nd{in renal interstitium group TS23..TS23}



Schematic diagram highlighting ureteric tip regions that are the subject of the query.

The result of the query gives a list of genes (with gene expression summaries). You can then click on the in situ or microarray expression summaries for more information. The red arrow indicates the [microarray expression profile of *wnt11* in the developing kidney](#).

The screenshot shows the Gudmap Gene Expression Database interface. The main content area displays 'Gudmap Boolean Query results' on 'Page 4 of 4'. The results are presented in a table with the following columns: Gene, Synonyms, Disease, Theiler Stage, In situ expression profile, In situ expression images, and Microarray expression profile. The gene *Wnt11* is highlighted in blue, and a red arrow points to its microarray expression profile, which shows a distinct pattern of red and blue spots.

Gene	Synonyms	Disease	Theiler Stage	In situ expression profile	In situ expression images	Microarray expression profile
Trim30	Rpt-1, Rpt1	OMIM(0)	TS18-28			
Trim37	MUL, 1110032A10Rik, 2810004E...	OMIM(0)	TS18-28			
Uhrf1	Np95, ICBP90	OMIM(0)	TS18-28			
Wnt11		OMIM(1)	TS18-28			
Zbtb24	ZNF450	OMIM(0)	TS18-28			
Zfa		OMIM(0)	TS18-28			
Zfx3	WBP9, A230102L03Rik, Atbf1	OMIM(0)	TS21-28			

The [microarray expression profile of wnt11](#) for the developing kidney shows that it is most highly expressed in the ureteric tip and ureteric bud.

Expression Database

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Display format:

tabbed panels
 sequential

<input type="checkbox"/>	Microarray expression profiles to display
<input checked="" type="checkbox"/>	Developing_kidney (MOE_430)
<input type="checkbox"/>	Lower Urinary tract (MOE_430)
<input type="checkbox"/>	Developing_kidney (ST_1)

Microarray Expression Profile for: Wnt11

Developing_kidney (MOE_430)

[Select All](#) | [Deselect All](#) Display entries per page

Page 1 of 1 Heatmap Heatmap values

<input type="checkbox"/>	Probe Id	Common
<input type="checkbox"/>	1450772_at	Wnt11 wingless-rel

Items in my MOE430_Probes: 0

[Add to my MOE430_Probes](#) [Get intersection with my MOE430_Probes](#)

[Replace my MOE430_Probes](#) [Get difference with my MOE430_Probes](#)

[View my MOE430_Probes \(or other selections\)](#)

Summary

What genes specifically mark the structure I am interested in examining?

- Use the Boolean Anatomy Query to build complex queries
- The Boolean Query Syntax, using AND & OR, gives you flexibility to incorporate multiple components into a query
 - Search for genes with expression present in your structure of interest and not detected in other structures
 - The resulting list of genes indicates potential markers for your structure
 - Link out from gene expression summary ('Gene Strip') to the data (e.g. microarray expression profiles) to view expression patterns in more detail