

GenitoUrinary Development Molecular Anatomy Project

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About GUDMAP

The **GenitoUrinary Development Molecular Anatomy Project (GUDMAP)** is an open access online resource developed by a consortium of researchers which provides gene expression data, transgenic mice and tools to facilitate research and teaching. Initially GUDMAP focused on the murine urogenital system but more recently it has been extended to include:

- **Nociceptive GUDMAP (nGUDMAP)** focuses on nociceptors and cell types associated with pain processing for the murine lower urinary tract and pelvic region.
- **Human GUDMAP (hGUDMAP)** extends the gene expression database to include data sets that annotate human bladder, urethra and kidney.

GUDMAP data includes: **Large-scale in-situ hybridisation screens, 3D OPT data, microarray gene expression data and sequencing data.** Expression data are annotated using a **high-resolution ontology** specific to the developing GU system.

Beginning in 2017 the GUDMAP database will expand the set of online tools available to researchers and begin incorporating more human kidney and urinary tract data.

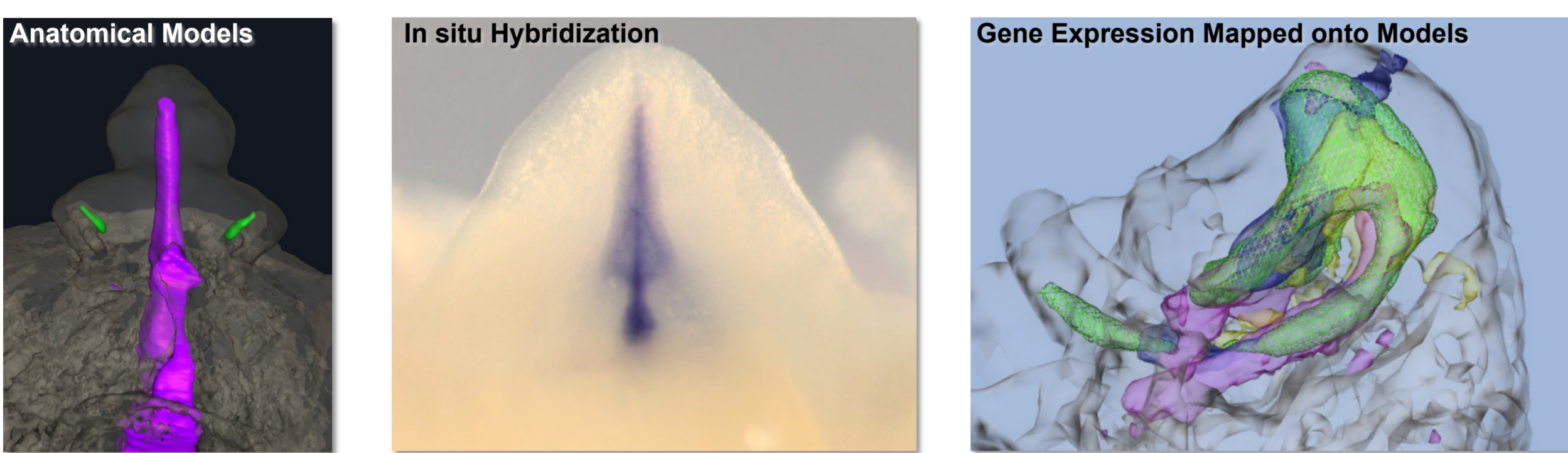
Summary 'gene-strip' (below) provides an overview of expression data available for each gene. Clickable links connect to in-situ data & images, disease/phenotype associations and microarray data.

Database Statistics		04-Nov-2016
Assay Type	Entries	Genes
All In Situ Hybridisation (ISH):	10760	3692
Wholemount ISH (WISH):	7346	2896
Section ISH (SISH):	3414	1437
OPT ISH:	59	31
Immunohistochemistry (IHC):	170	32
Transgenic Reporters:	135	38
Microarray:	467	-
Sequencing:	337	-

Gene	Disease	Stage	Expression Profile	Expression Images	Microarray expression profile	RNA-SEQ
Krt5	OMIM(7)	TS17-TS28				View on UCSC View on IGV

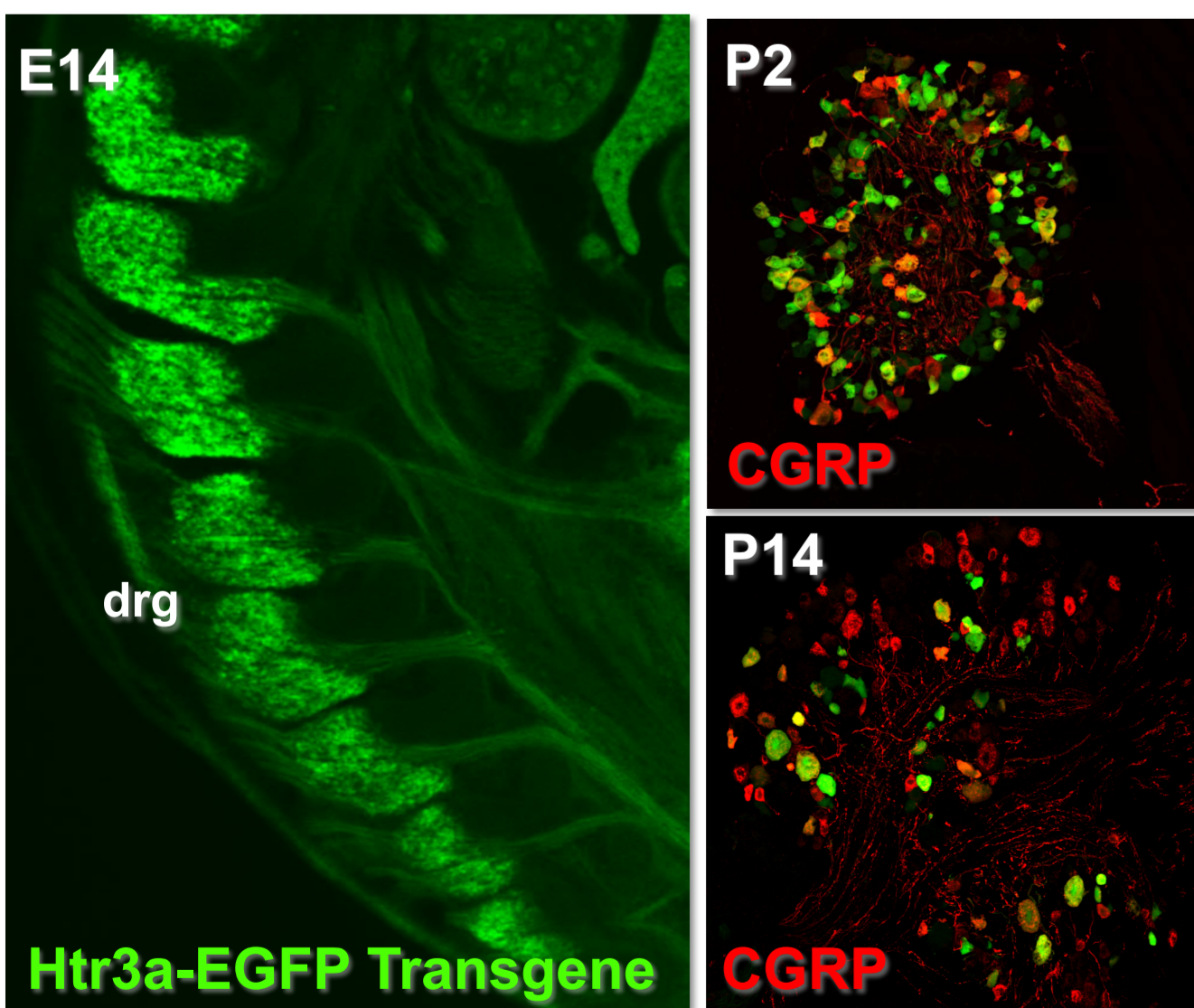
Example of GUDMAP *in situ* Entry (GUDMAP:20862), displaying images (above) and expression mapped on anatomy ontology (right).

OPT 3D Atlas of Gene Expression in Developing Genital Tubercle and Urethra (M. Cohn Lab)



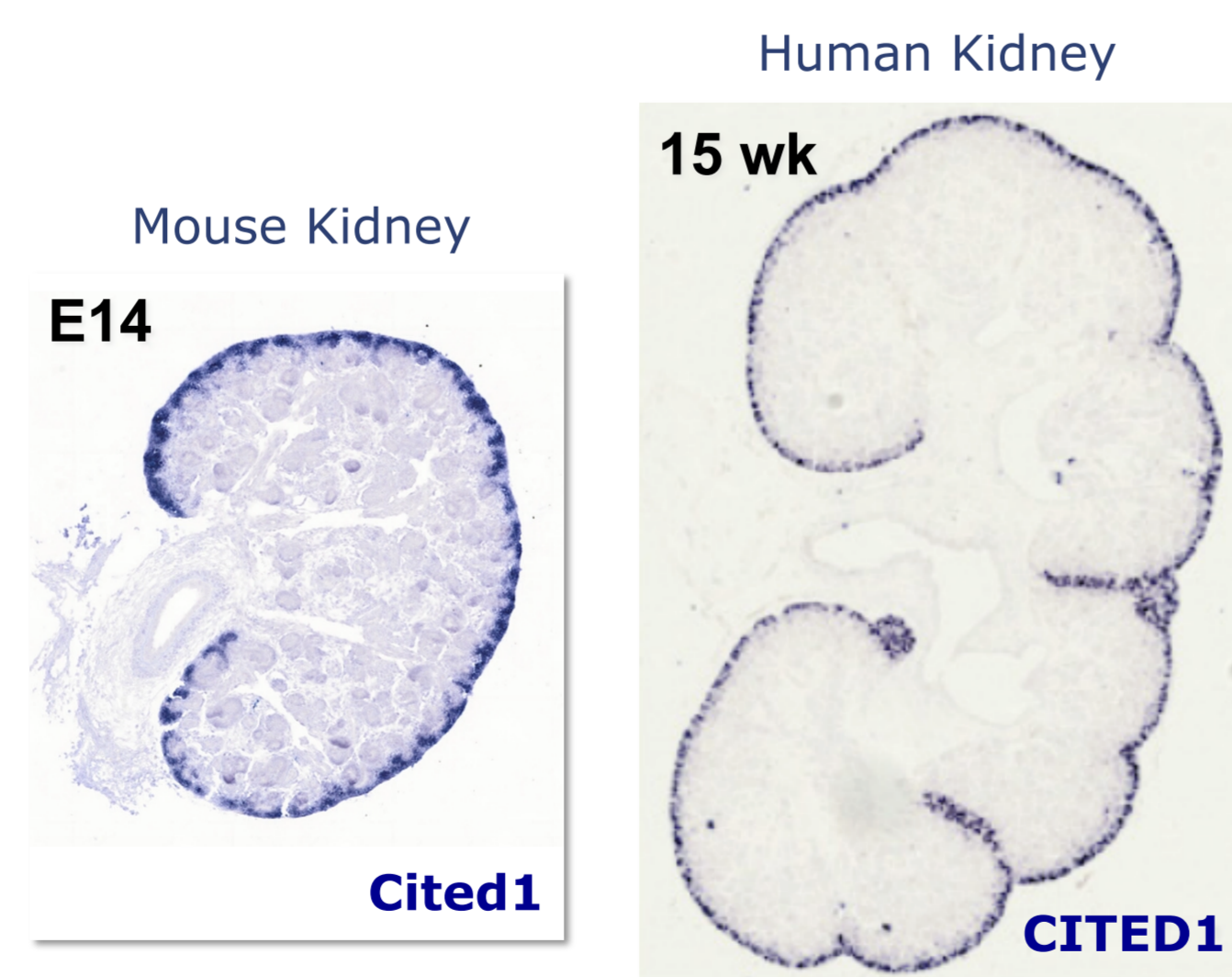
Nociceptive GUDMAP "nGUDMAP"

Developing DRG Immunohistochemistry (Southard-Smith Lab)



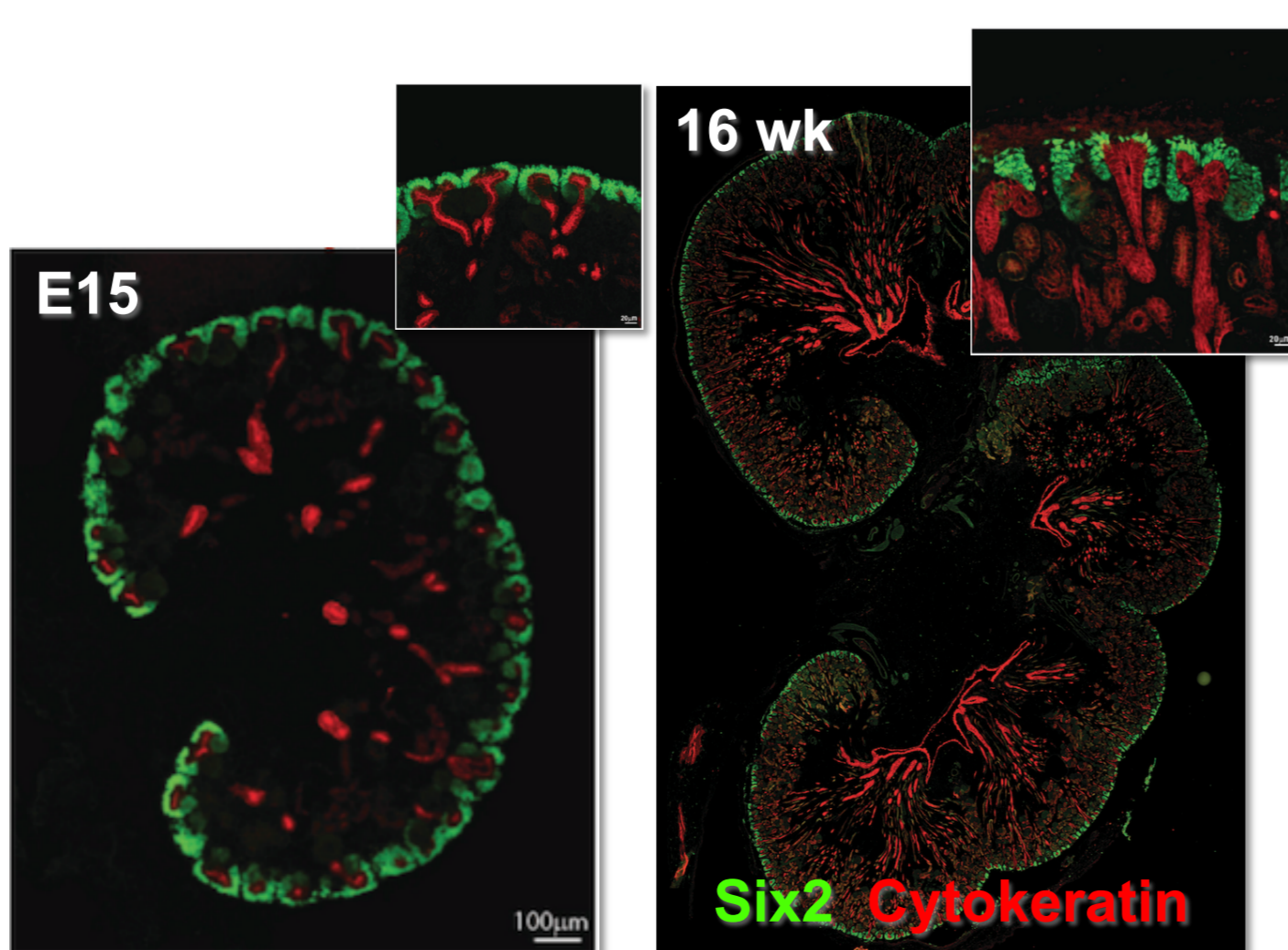
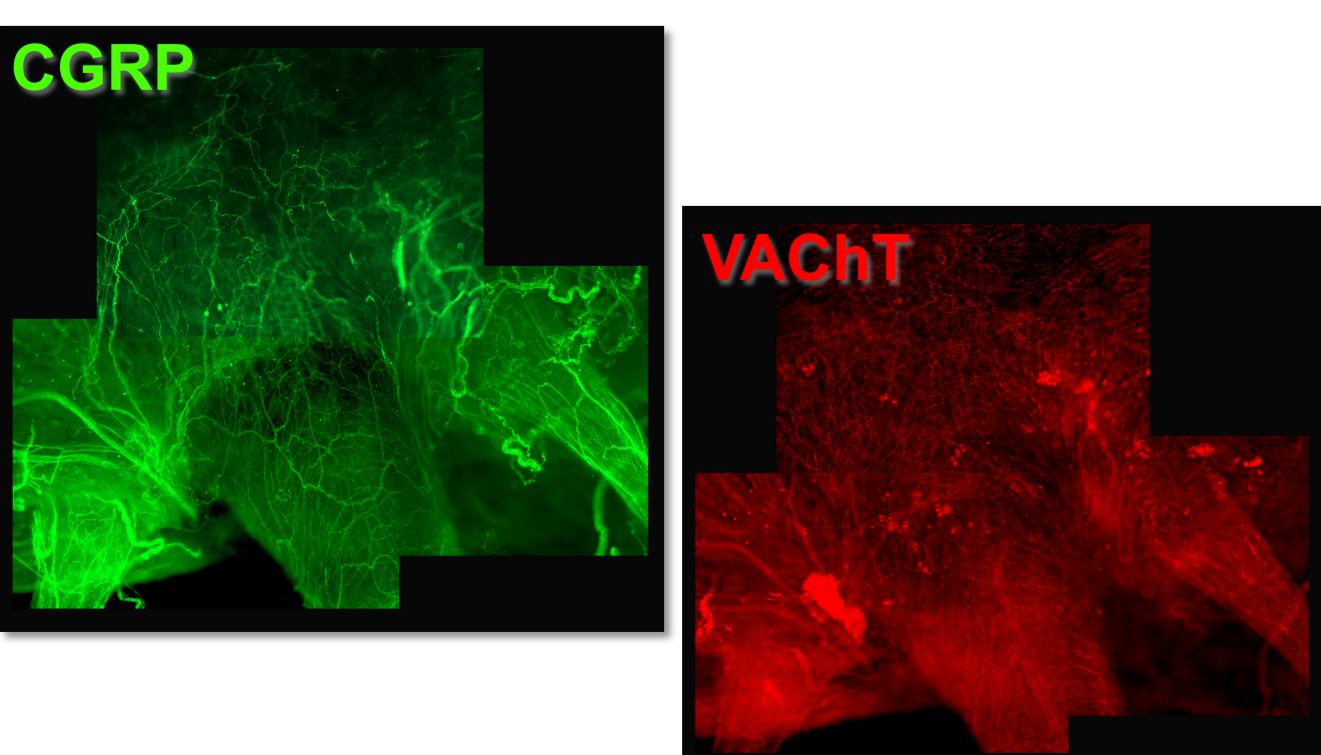
Human GUDMAP "hGUDMAP"

In Situ Hybridization (A. McMahon Lab)



Immunohistochemistry

Adult LUT Immunohistochemistry (Keast Lab)



Schematics, Tutorials & Tissue Summaries

GUDMAP holds an extensive archive of high-quality schematics diagrams that illustrate different views of the developing mouse GU system

www.gudmap.org/Schematics/index.php

These help supplement **tutorials** describing GU organogenesis (Matt Kaufman) and enrich the GUDMAP Tissue Summary pages.

Primitive bladder (TS19-21) & Bladder (TS22-28) cell types:

- undifferentiated epithelial cells (TS19-21)
- P-D cells (TS19-21)
- superficial cells (SC, TS22-28)
- intermediate cells (IC, TS21-28)
- Krt5-basal cells (Krt5-BC, TS23-28)
- Ulpk expression

Top: Annotated sections of the bladder at TS20 (12 dpc), TS21 (13 dpc), TS23 (15 dpc) and TS28 (adult).

Middle: TS28 (adult) annotated section of the bladder with corresponding immunohistochemistry section.

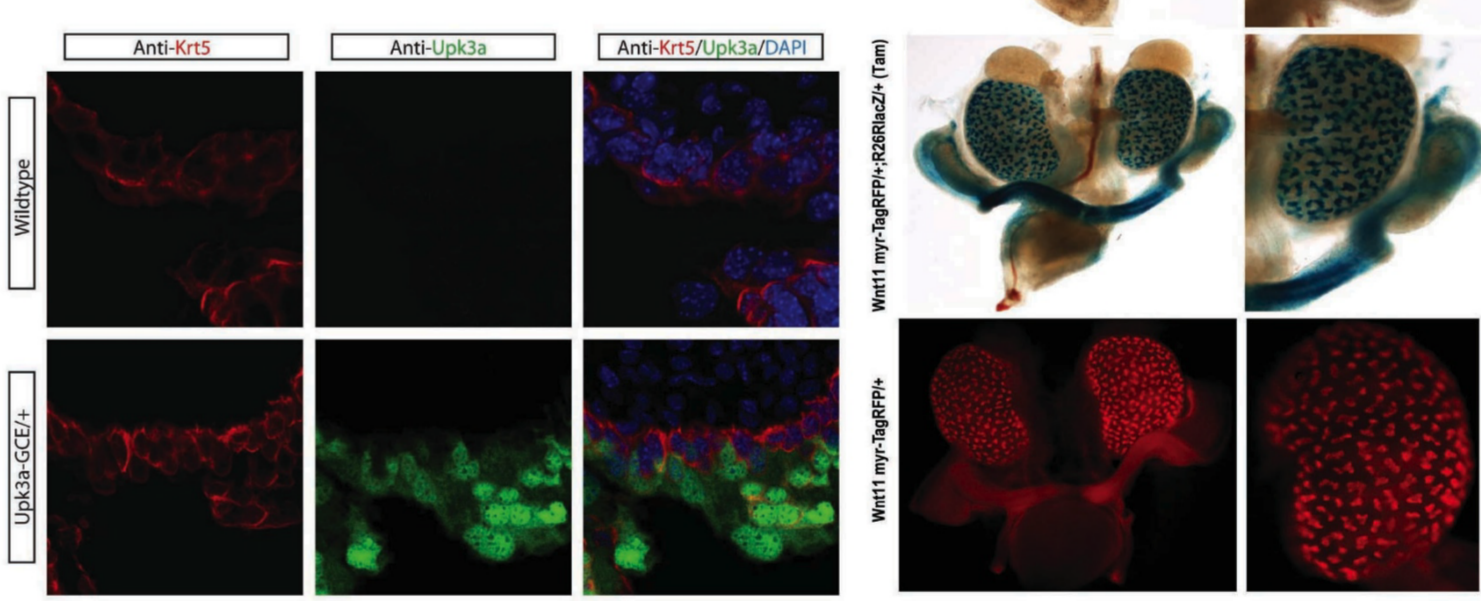
Right: TS28 (adult) annotated section of the male prostate with corresponding immunohistochemistry section.

Novel Mouse Strains for Visualising, Isolating and Genetically Manipulating the GU System

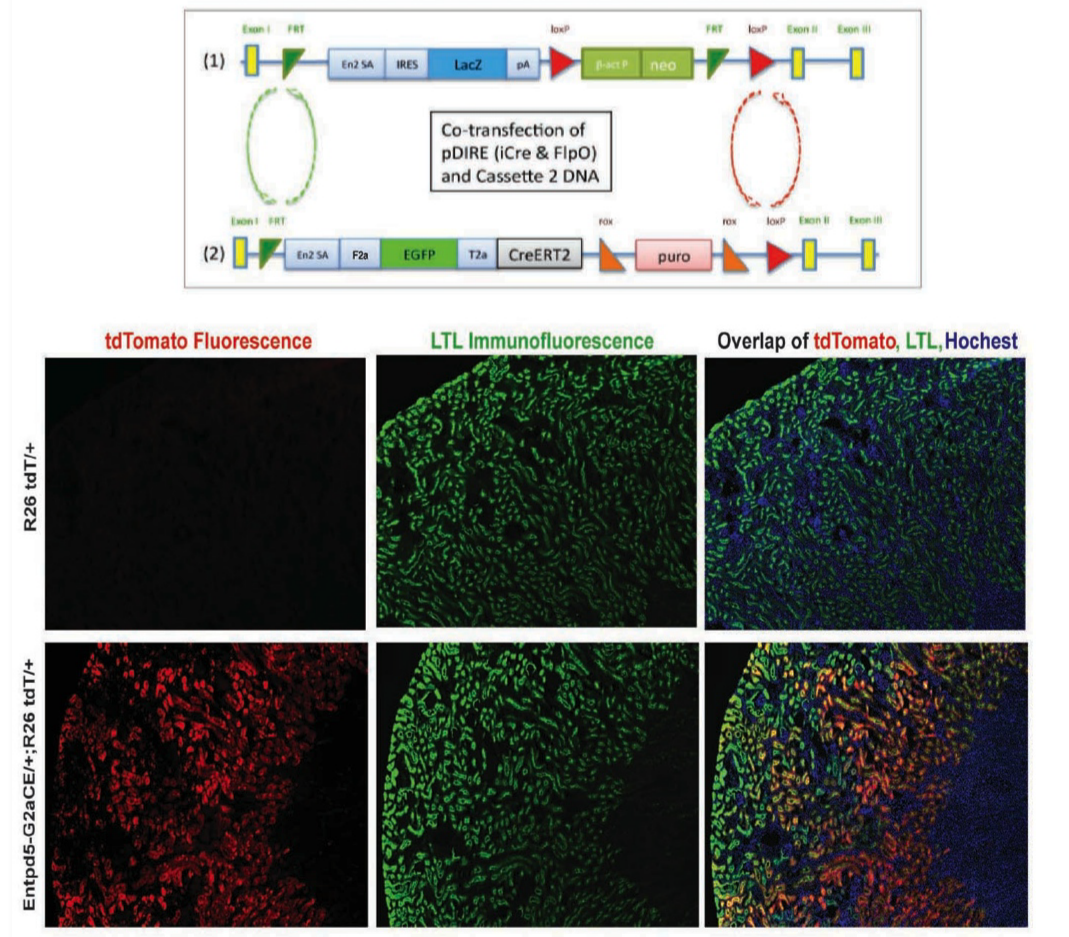
Goals:

- To mark key cell populations in order to isolate, trace and modulate gene activity through drug inducible CRE recombinase.
- Mice made available through the MMRC (Jackson Labs).

Part I: Use BAC mediated mouse transgenesis to drive eGFP and RFP:Cre::ERT2 fusion proteins in specific cell types in the GU system

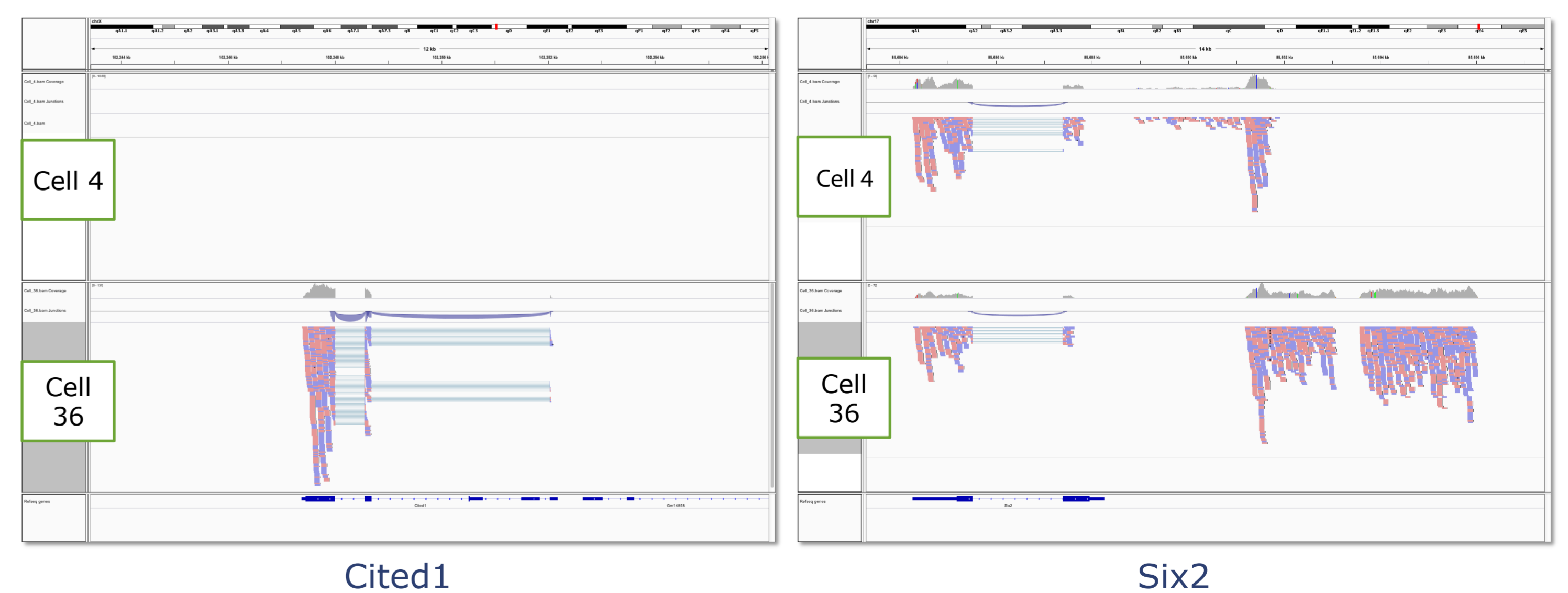


Part II: Obtain ES Cell clones through KOMP(NIH) and EUCOMM Consortia, create new alleles by dual Recombinase Mediated Cassette Exchange (dRCME) to drive eGFP and CRE::ERT2 proteins



Gene Expression Profile Analyses of GUDMAP Data

IGV Genome Browser View of Single Cell Data - E11.5 metanephric mesenchyme (S. Potter and B. Aronow)



References

- All past contributors to GUDMAP can be found at www.gudmap.org/About/Projects/
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