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An Overview of the Sheep and Buffalo Gene Expression Atlas Projects

Emily Clark

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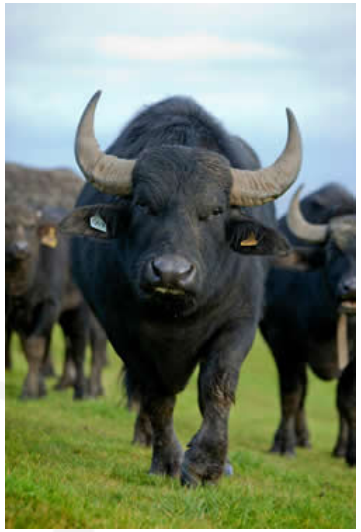
The Sheep and Water Buffalo Gene Expression Atlas Projects

The Sheep and Buffalo Gene Expression Atlas Projects had 3 key objectives:

1. Analyse gene expression data across tissues and cell types in sheep and water buffalo to provide insight into gene, cell and tissue function.

2. Improve annotation of the current versions of the sheep and water buffalo genomes and increase the resources available for ruminant genetics and genomics.

3. Increase our understanding of the transcriptomic control of complex traits in ruminants.

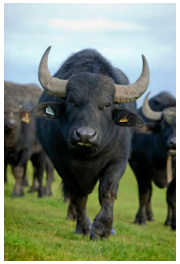


Tissue Collection and Atlas Design

Buffalo Gene Expression Atlas

Eighty tissues and cell types were collected per animal from eight adult buffalo (4 male, 4 female)

- Mediterranean, Pandharpuri, Bhadawari breeds
- Animals were between 6 months (Mediterranean) and 4-5 years (Indian)



Mediterranean

Pandharpuri

Bhadawari

Sheep Gene Expression Atlas

120 tissues were collected from each of 3 adult male and 3 adult female Texel x Scottish Blackface sheep (~2 years of age)
80 tissues were collected from each of 3 TxBF lambs at birth, 3 at one and 3 at 8 weeks of age
Fetal and maternal tissues were collected from days 23, 35 and 100 of gestation

Sequencing and Data Analysis

Illumina TruSeq libraries (125bp paired-end) were prepared by Edinburgh Genomics and run on the HiSeq v2500. In total: 429 libraries for sheep and 220 for water buffalo.

All FASTQ files were deposited in the Short Read Archive with associated FAANG metadata.

To analyse the data we used two approaches:

HiSat2-StringTie pipeline with either Oar v3.1 or UMD_CASPUR_WB_2.0 as the reference (conventional alignment based, novel transcript detection and validation of existing gene models).

Kallisto two-pass approach (high speed, alignment-free, using Oar v3.1 cDNAs as the reference transcriptome).

Gene expression was estimated as TPM (transcripts per million) by Kallisto and visualised in the network cluster analysis software Miru, Kajeka Ltd.

http://genomics.ed.ac.uk

Visualizing the gene expression atlas datasets

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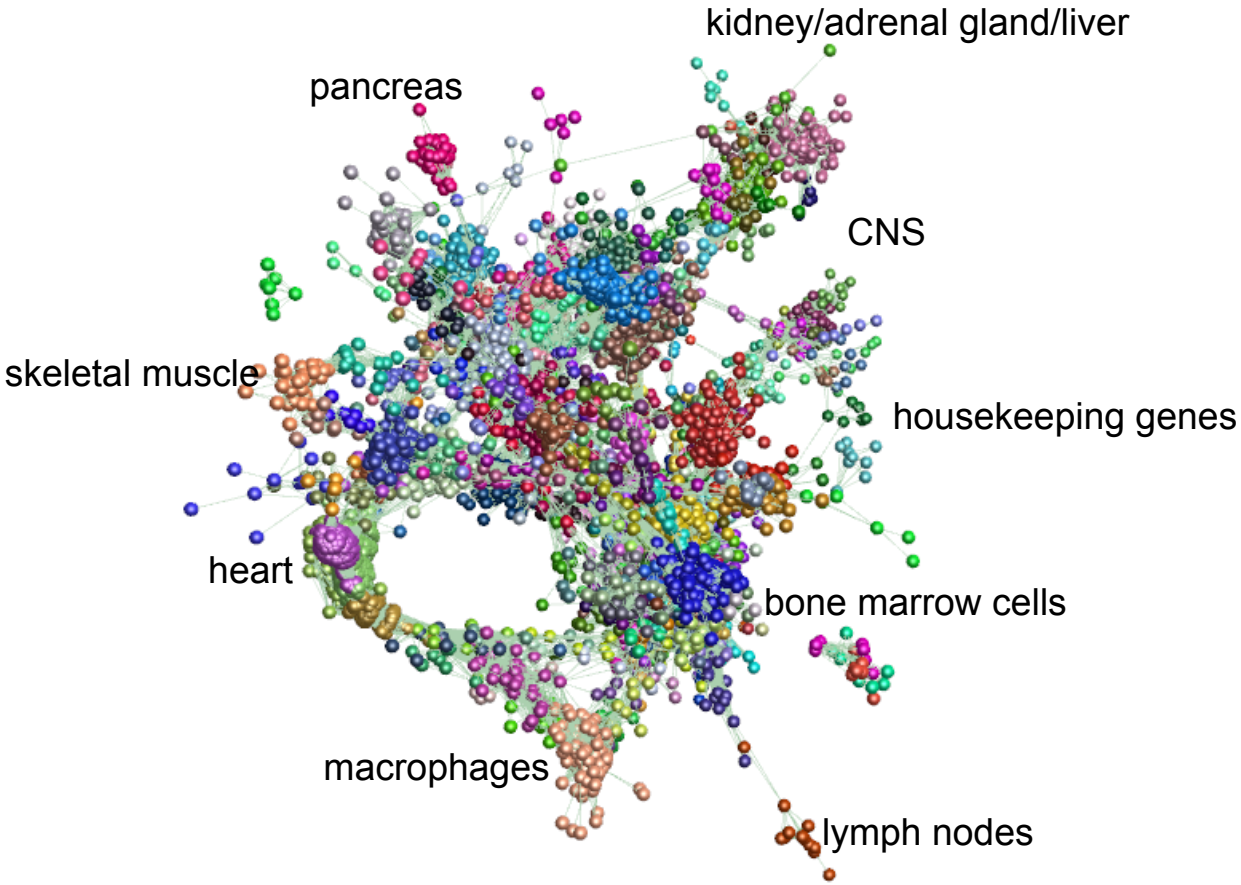
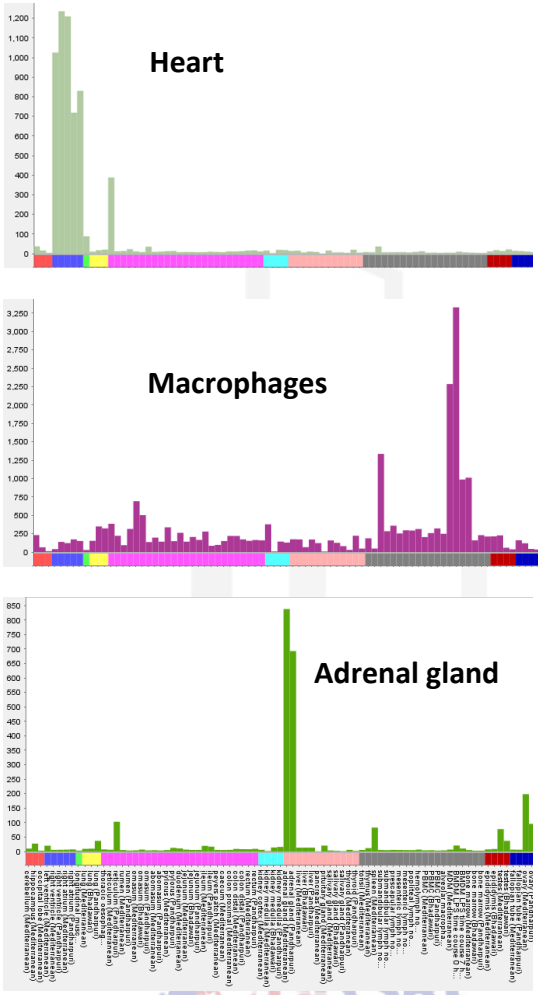
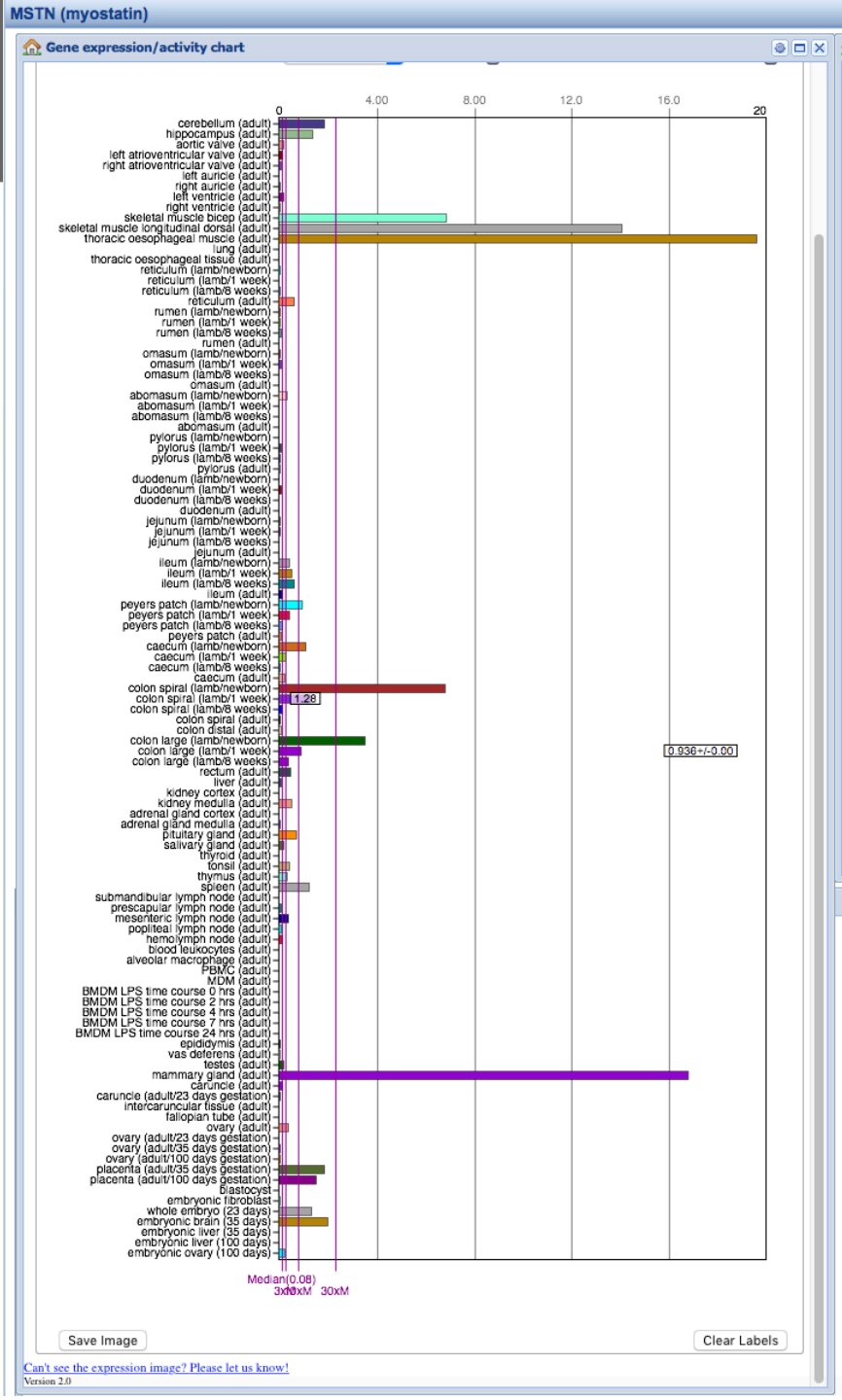
Miru 見る





Gene-to-gene network graph of the water buffalo atlas dataset using a pairwise Pearson correlation r>0.8



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Gene Expression Profiles Across Tissues in Sheep

BioGPS.ORG

http://biogps.org/sheepatlas/

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RESEARCH ARTICLE

A high resolution atlas of gene expression in the domestic sheep (*Ovis aries*)

Emily L. Clark, Stephen J. Bush, Mary E. B. McCulloch, Iseabail L. Farquhar, Rachel Young, Lucas Lefevre, Clare Pridans, Hiu G. Tsang, Chunlei Wu, Cyrus Afrasiabi, Mick Watson, C. Bruce Whitelaw, Tom C. Freeman, [...], David A. Hume [view all]

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