Inference of master regulators

Raw Count Matrix

48 samples
3 tissues x 4 time points x 4 reps.

genes	PT1-T4 4x4	OT1-T4 4x4	LT1-T4 4x4
gene1			
gene2			
gene3			
.			
.			
gene37,253			

pituitary(P); ovary(O); liver(L)

Normalized expression
FPKM

DEGs
T4 vs T1 per tissue

3 RIF analyses

Transcription factors
T4 vs T1 per tissue

Co-Expression

113 pituitary TFs
68 ovary TFs
124 liver TFs

key regulators
298 TFs

Gene selection for gene regulatory network (GRN) construction

Multi-omics results

DEG	8,625
DMG	2,315
DAC	859
DMP	427
TS	3,991
SNP	135
TF	298
Total	14,619

filter

≥ twice overlap among subcateg.

gene attributes

category	DE	DMG	DAC	DMP	TS	SNP	TF
#subcategory	3	3	2	3	3	1	3
gene1	1	0	1	1	0	1	0
gene2	0	1	1	0	0	0	0
gene3							
.							
gene1,936	1	0	1	0	0	0	0

get
FPKM expression mean > 0.2

PCIT input matrix
FPKM expression

genes	PT1-T4 4x4	OT1-T4 4x4	LT1-T4 4x4
gene1			
gene2			
gene3			
.			
.			
gene1,858			

presented as:
UpSet, heatmap, dotplot

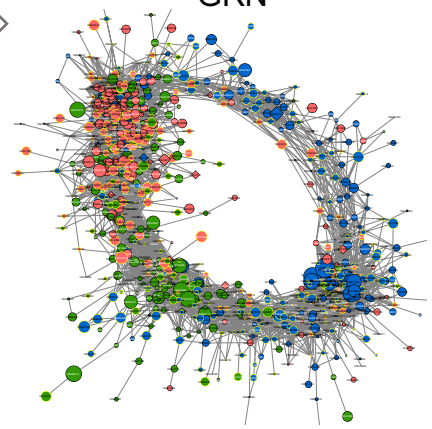
PCIT

PCIT output

gene1-gene2	0.97294	POS
gene1-gene3	0.96860	POS
gene1-gene4	-0.98359	NEG
.		
.		
.		
gene1-gene1,858		
gene2-gene1		
gene2-gene3		
.		
gene2-gene1,858		

network visualization
Cytoscape

Multi-omics multi-tissue GRN



Pre- and Post-maturation networks

PCIT input matrices

Pre-

12 samples at T1

genes	PT1 (4x)	OT1 (4x)	LT1 (4x)
gene1			
gene2			
gene3			
.			
gene1,858			

Post-

36 samples at T2, T3, T4

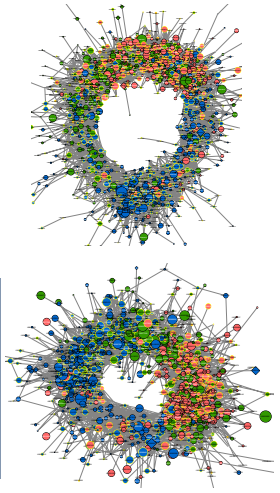
genes	PT2-4 (4x3)	OT2-4 (4x3)	LT2-4 (4x3)
gene1			
gene2			
gene3			
.			
gene1,858			

Pre-maturation network

gene1-gene2	0.97294	POS
gene1-gene3	0.96860	POS
gene1-gene4	-0.98359	NEG
.		
.		
.		
gene1-gene1,858		

Post-maturation network

gene1-gene2	0.96711	POS
gene1-gene3	0.95878	POS
gene1-gene4	-0.98478	NEG
.		
.		
.		
gene1- gene1,858		



Compute number of connections per gene

Differential connectivity
Post vs Pre

geneID	#Conn Pre-	#Conn Post	Post-Pre
gene1	10	599	589
gene2	114	657	543
gene3			
.			
.			
.			
gene1,858			

Subnetworks extractions

Subnetworks

selected based on

1-top trio diff. connected genes

2-top diff. connected TFs