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EARLYNUTRITION

Long-term effects of early nutrition on later health



Effect of a dietary and exercise intervention during pregnancy and lactation on white adipose tissue gene profiles and adiposity with maternal obesity

Munich, Power of Programming

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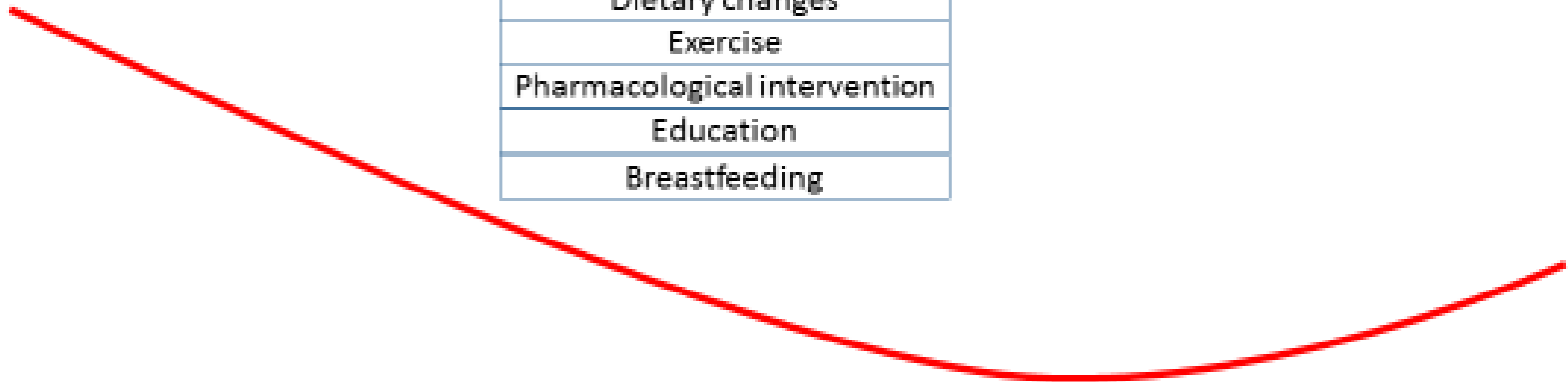
Maternal Obesity



Potential interventions in maternal obesity

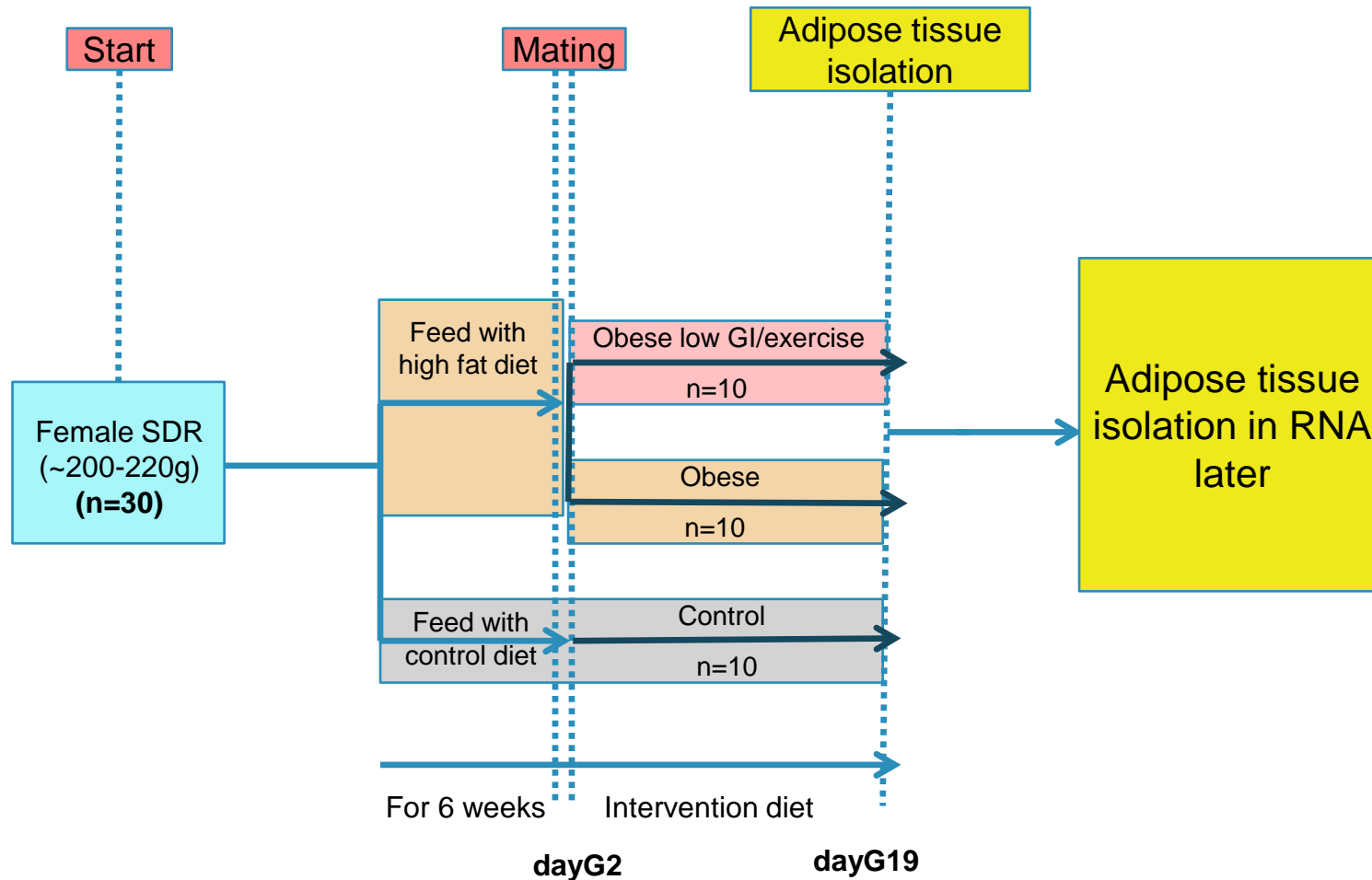
Brown adipose tissue
Dietary changes
Exercise
Pharmacological intervention
Education
Breastfeeding

Scope for intervention

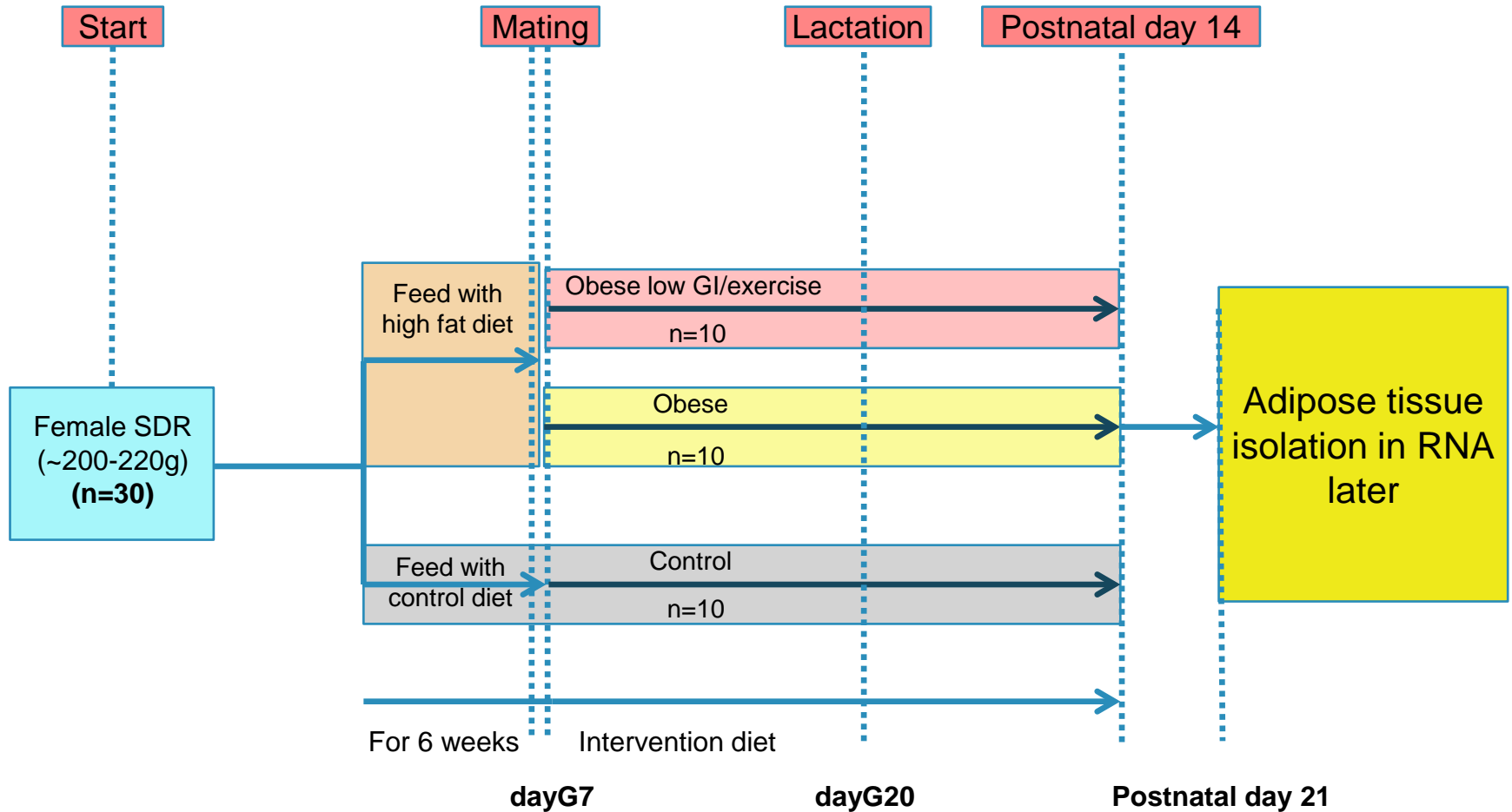


	Periconception	Early Pregnancy	Late Pregnancy	Birth	Postnatal
Primary factors during maternal obesity influencing pregnancy outcomes			General Health		
			Lifestyle		
			Current diet		
			Maternal age		
			Ethnicity		
			Socioeconomic status		
			GDM		
			Placental function		
			Weight gain		

WP2 – Maternal Phase I – Pregnancy (P)



WP2 Maternal Phase II – Lactation (L)

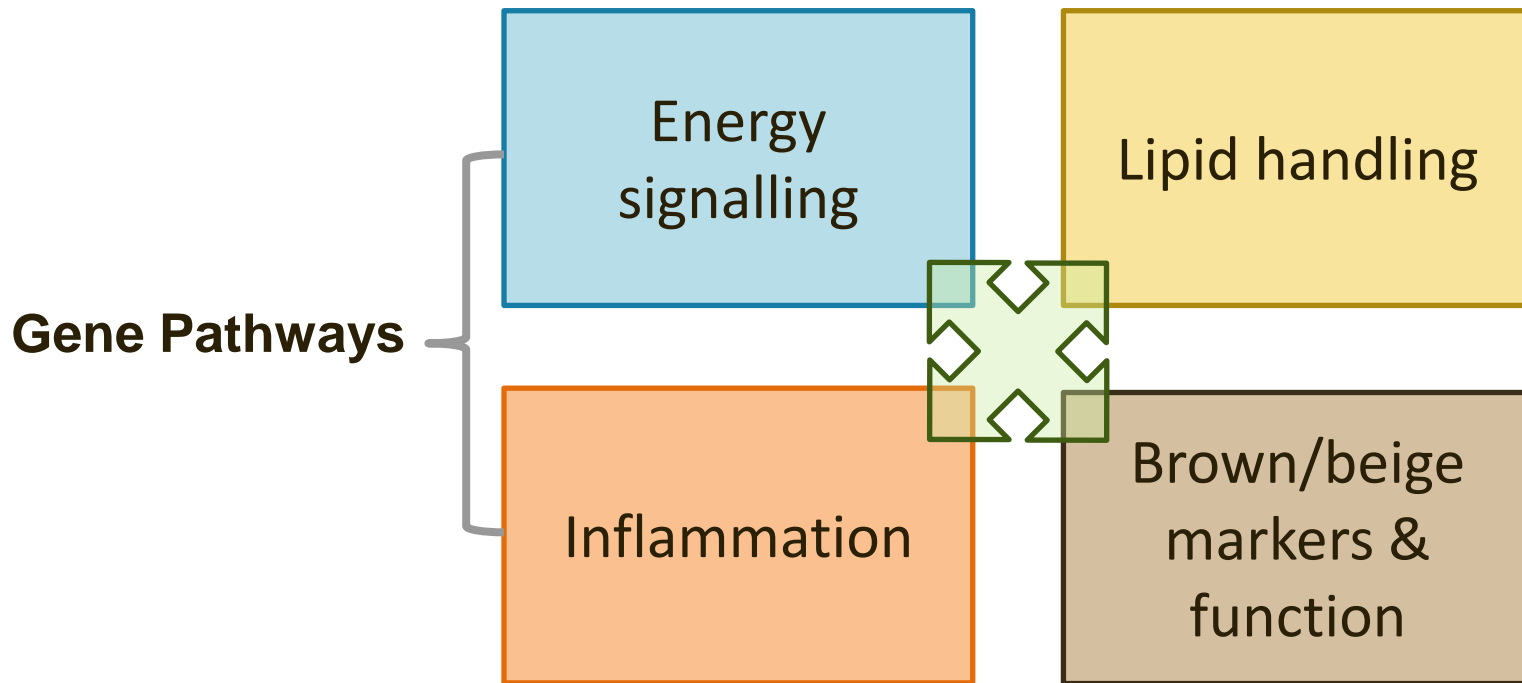


Maternal Adipose Tissue Weights



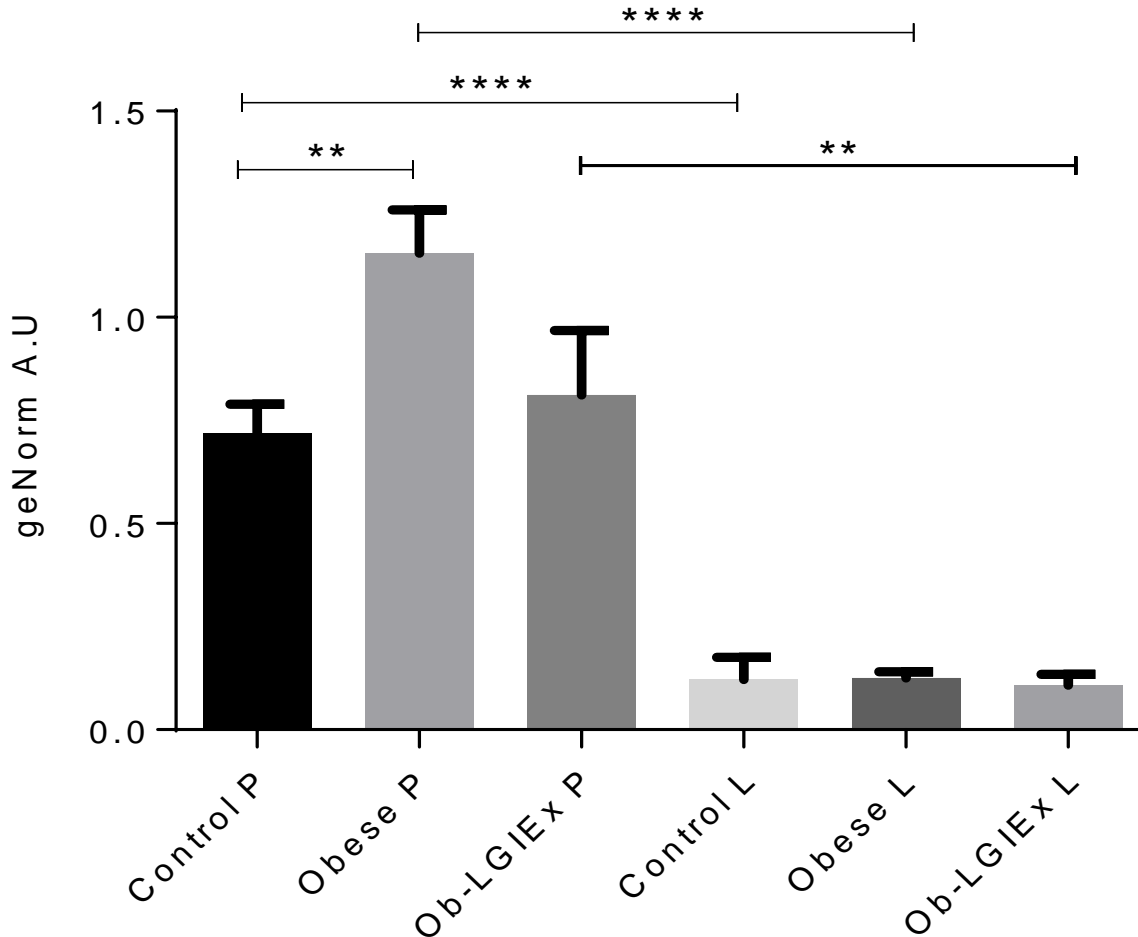
Pregnancy (GD18)	Groups		
	Control	Obese	Ob-LG-Ex
Body weight (g)	401.0±6.0	448±5.0**	407.0±10.8##
Inguinal WAT (g)	5.37±0.79	8.29±0.68*	4.42±0.31###
Mesenteric WAT (g)	3.12±0.53	6.74±0.88**	2.00±0.42###
Gonadal WAT (g)	6.20±1.08	13.62±0.64**	7.34±0.03###
Retroperitoneal WAT (g)	4.18±0.84	10.90±0.95***	4.88±0.70###
Brown AT (g)	0.36±0.03	0.45±0.04	0.25±0.02##
Lactation (PND 21)			
Body weight (g)	321.4±8.2	366.6±8.3***	353.3±3.8
Inguinal WAT (g)	4.14±0.78	4.18±0.59	6.60±1.66
Mesenteric WAT (g)	1.67±0.20	2.47±0.65	1.45±0.25
Gonadal WAT (g)	2.66±0.39	4.32±0.92	2.86±0.44
Retroperitoneal WAT (g)	2.25±0.26	2.74±0.54	2.29±0.38
Brown AT (g)	0.21±0.02	0.23±0.02	0.21±0.03

Methods



Relative gene expression using GeNorm algorithm against panel of multiple, stable reference genes (TBP, SDHA & YWHAZ).

Gene expression inguinal adipose tissue: Pregnancy v lactation



Expression shown in:

Energy signalling genes
 Protein kinase b
 Insulin receptor substrate 1
 Insulin receptor substrate 2
 Mammalian target of rapamycin

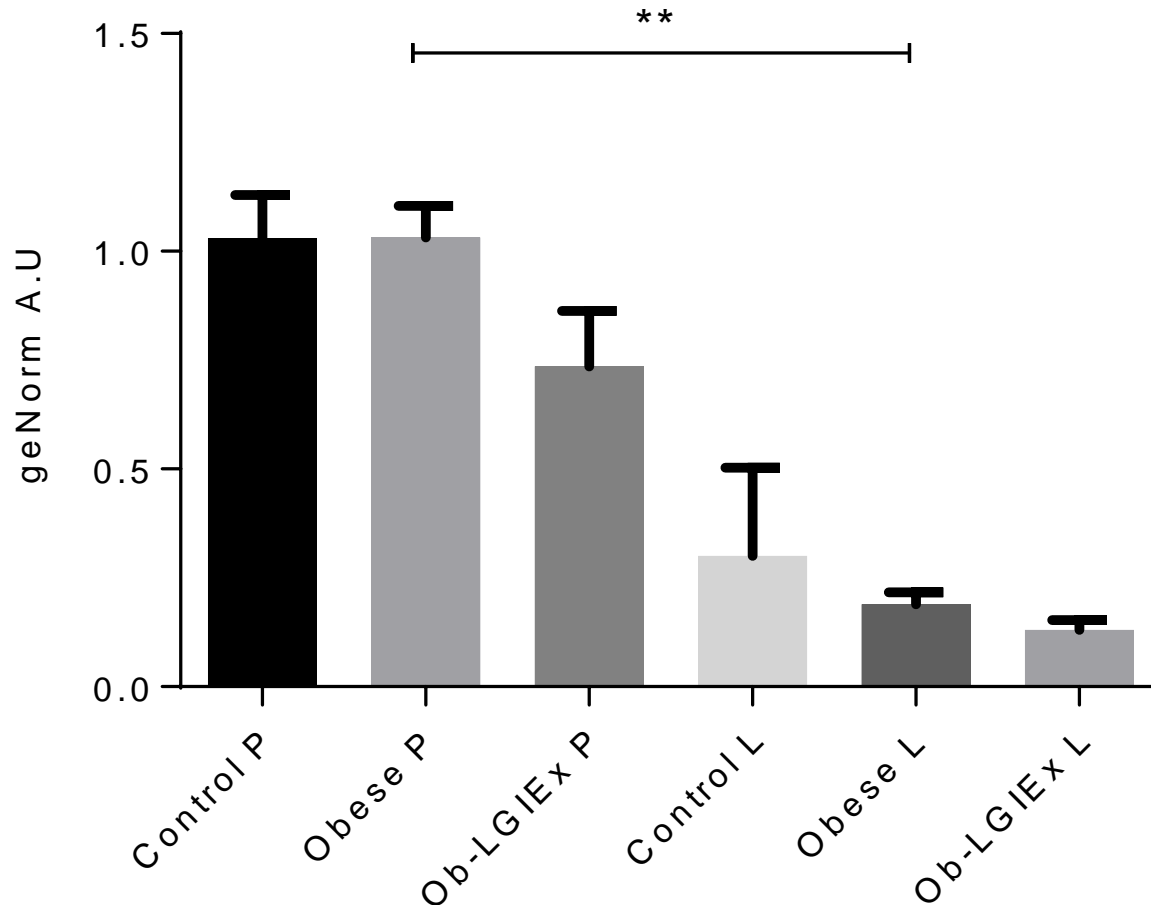
Lipid handling genes
 Lipoprotein lipase
 Fatty acid translocase
 Fatty acid transport protein 4

Inflammatory genes
 Toll-like receptor 4
 Tumour necrosis factor α

Significant findings

- \uparrow with obesity in pregnancy
- removed with intervention
- \downarrow with lactation, all groups

Gene expression inguinal adipose tissue: Pregnancy v lactation cont.



Expression shown in:

Energy signalling genes
Transcription factor 7 like 2

Lipid handling genes
Sterol regulatory binding protein

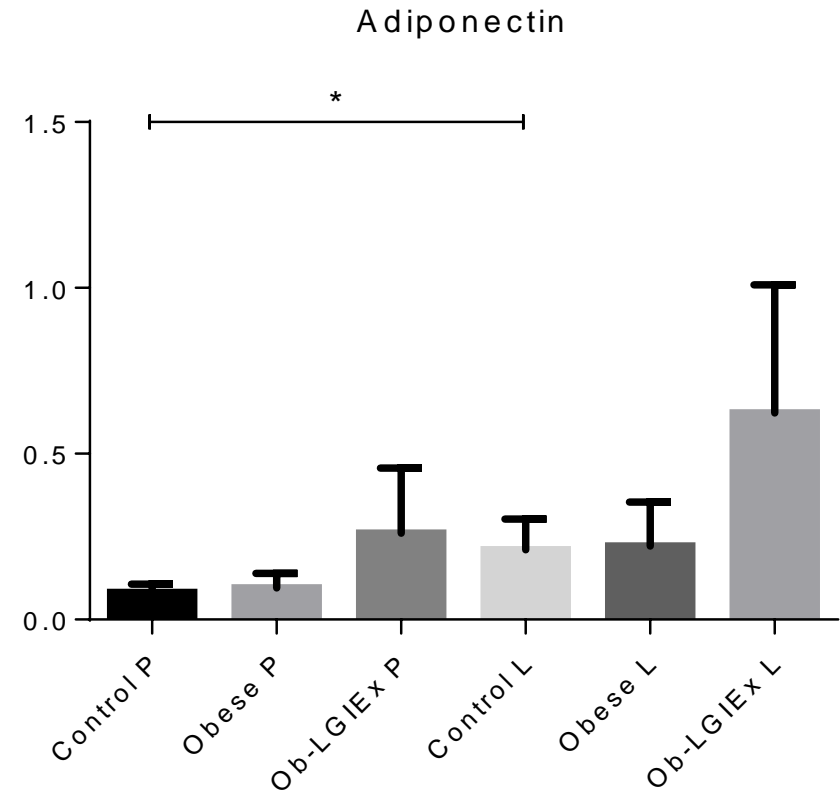
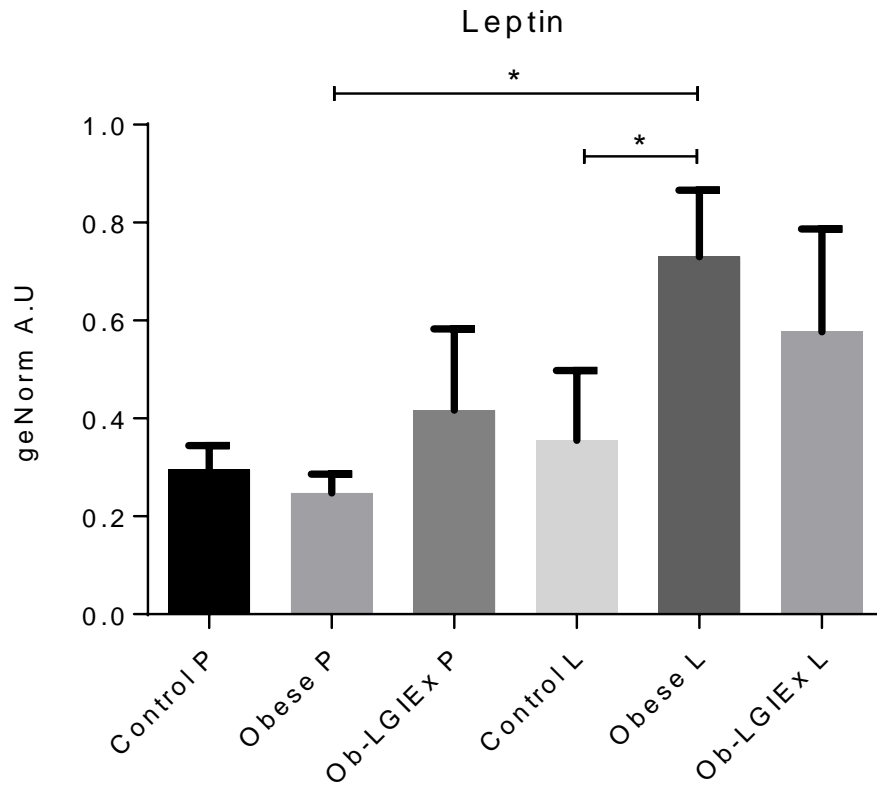
Mitochondrial genes
NADH dehydrogenase 4

Significant findings

- ↑ with obesity in pregnancy compared to lactation

No significant findings were found in fatty acid binding protein 4 or uncoupling protein 1

Appetite signalling genes



Brown Adipose Tissue analysis (Preg GD19)



Gene	Group		
	Control	Obese	Ob-Ex-LG
Akt	0.66±0.08	0.85±0.04	0.71±0.07
IRS-1	0.99±0.10	1.03±0.17	1.10±0.09
IRS-2	1.51±0.26*	0.67±0.17*	0.68±0.07
Leptin	1.19±0.30	1.39±0.49	1.69±0.66
mTOR	1.28±0.13	1.48±0.17	1.45±0.14
TCF7L2	1.24±0.14	1.32±0.33	1.20±0.12
CD36	0.66±0.13	0.81±0.12	0.77±0.07
FATP4	0.96±0.10	1.17±0.12	1.01±0.05
LPL	1.47±0.17	1.29±0.10	1.39±0.20
IL6	0.40±0.08	0.55±0.19	1.57±1.21
TNF-α	0.90±0.13	0.94±0.12	1.13±0.16
UCP-1	0.47±0.12	0.42±0.11	0.16±0.07

Summary



Expression of genes involved in analysed pathways are up-regulated during P in comparison to L.

These differences were further increased in the presence of obesity, which were attenuated with the intervention during P but not L.

Appetite signaling genes upregulated in L to P.

Tissue from offspring currently under investigation.



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