

# Glial cell line-derived neurotrophic factor enhances porcine oocyte competence *in vitro*

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# Glial cell line-derived neurotrophic factor (GDNF)

- First identified in the central nervous system
- Promotes the survival, growth and differentiation of several classes of neurons
- Mediated by a receptor complex involving GDNF family receptor  $\alpha$ -1 (GFR $\alpha$ -1) and rearranged during transfection (RET) receptor

# GDNF during development

- Regulates ureteric branching during embryonic kidney development
- Mediates tube formation in mammary glands via MAPK pathway
- GDNF dose-dependently affects spermatogonial stem cells in the testes

Karihaloo et al. (2005) *Nephron Exp Nephrol*, 100:e40-e45

Dettin et al. (2003) *Biol Reprod*, 69:1565-1671.

Naughton et al. (2006) *Biol Reprod*, 74:314-321

# Expression of GDNF by *in situ* hybridization in the adult mouse

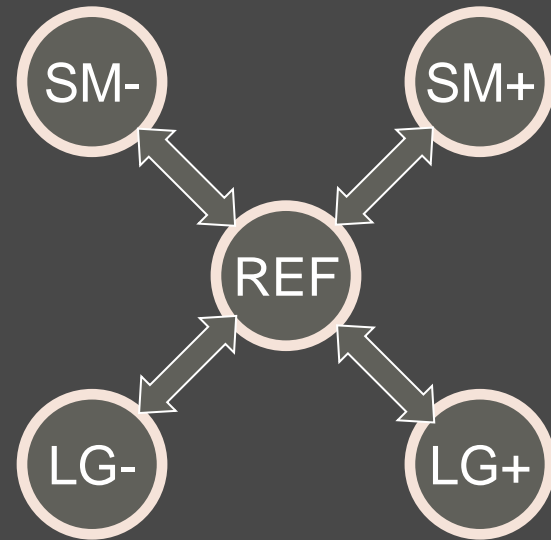
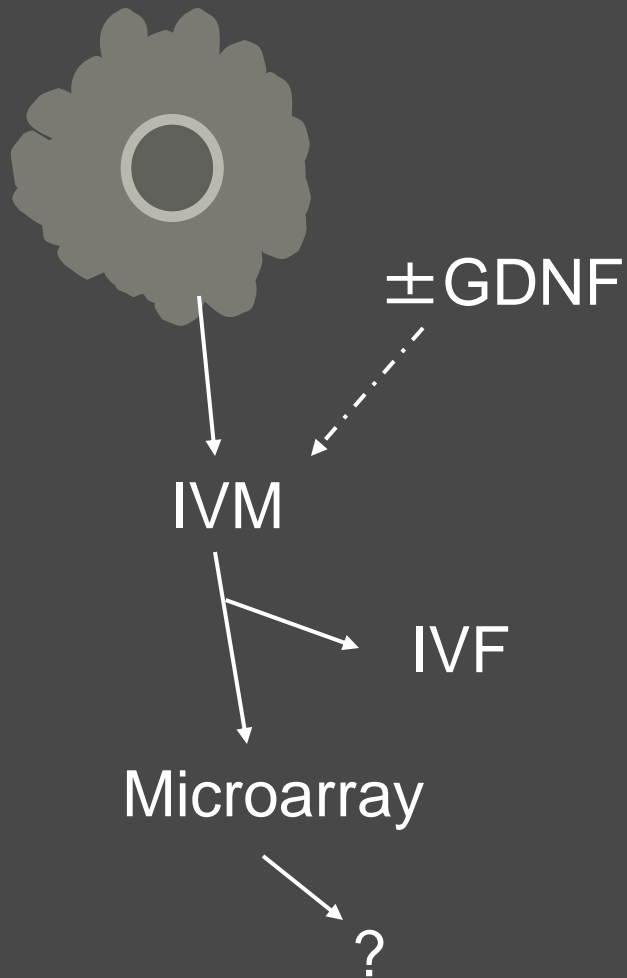
V Gagnion	+	Intestine	-
SCG	-	Liver	-
DRG	-	Heart	-
<b>Ovary</b>	<b>+++</b>	Lung	-
Oviduct	-	Thymus	-
Testicle	-	Kidney	-
Epididymis	-	Adrenal gland	±
Prostate	+	Bladder	-
Coagulating gland	-	Urethra	-
Esophagus	-	Skin	±
Stomach	-		

# Objective

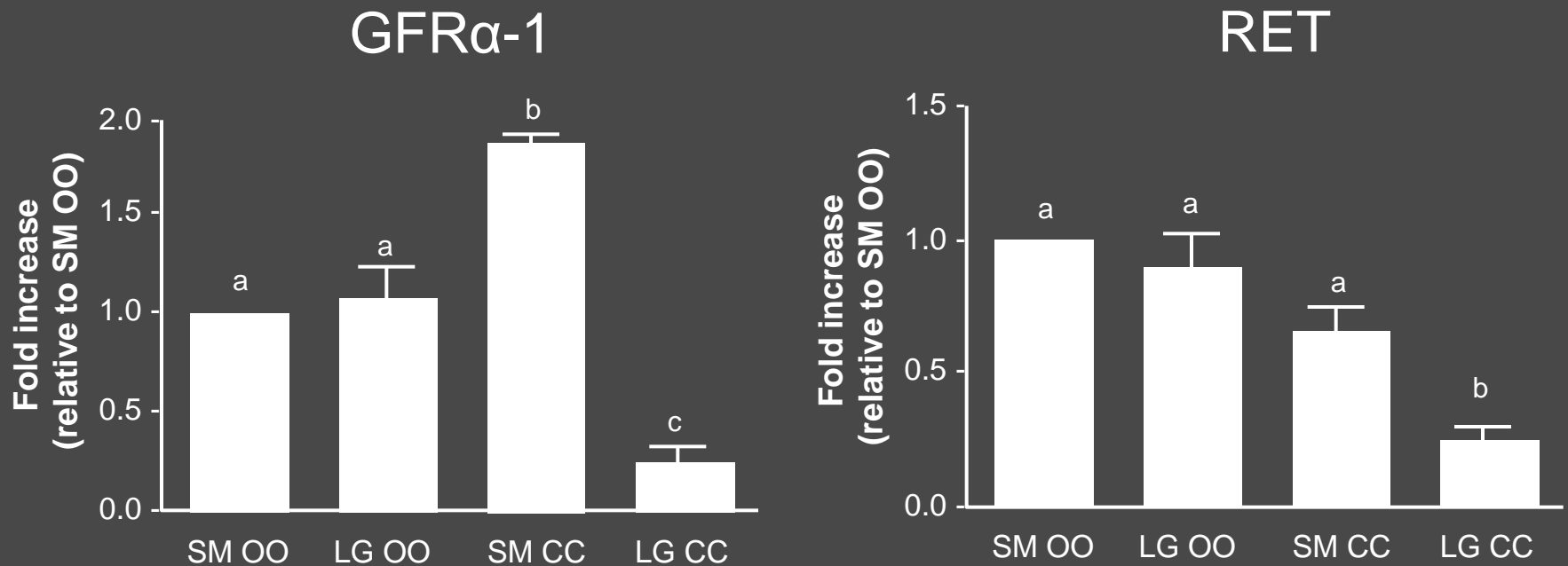
Elucidate a mechanism by which GDNF enhances oocyte competency

1. Genes involved in GDNF pathways
2. Stage-dependent role of GDNF
3. Does GDNF contribute to a more *in vivo*-like transcriptome?

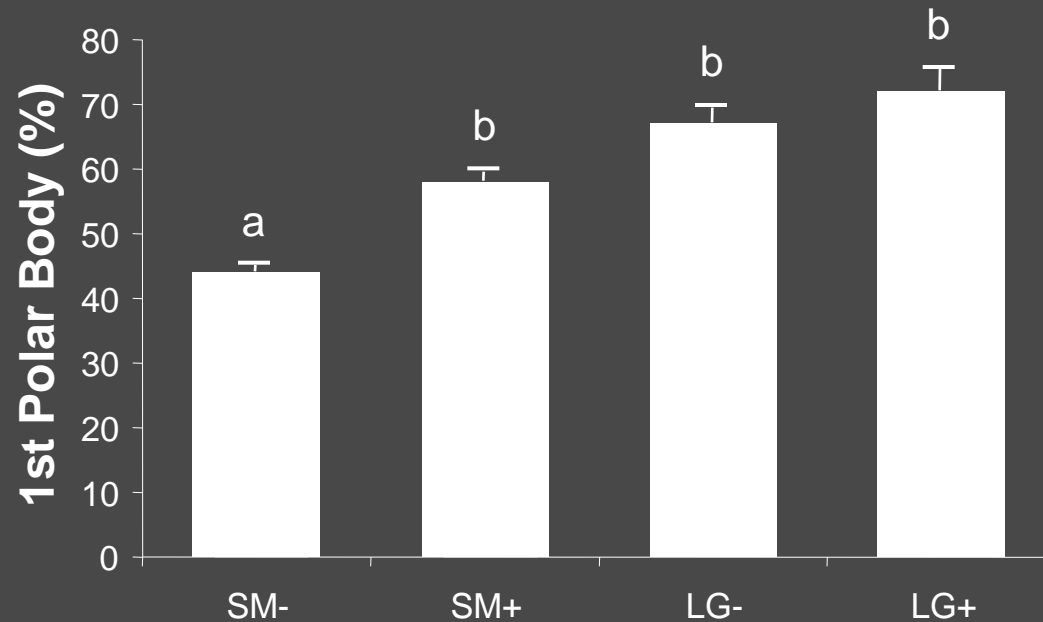
# Experimental Design



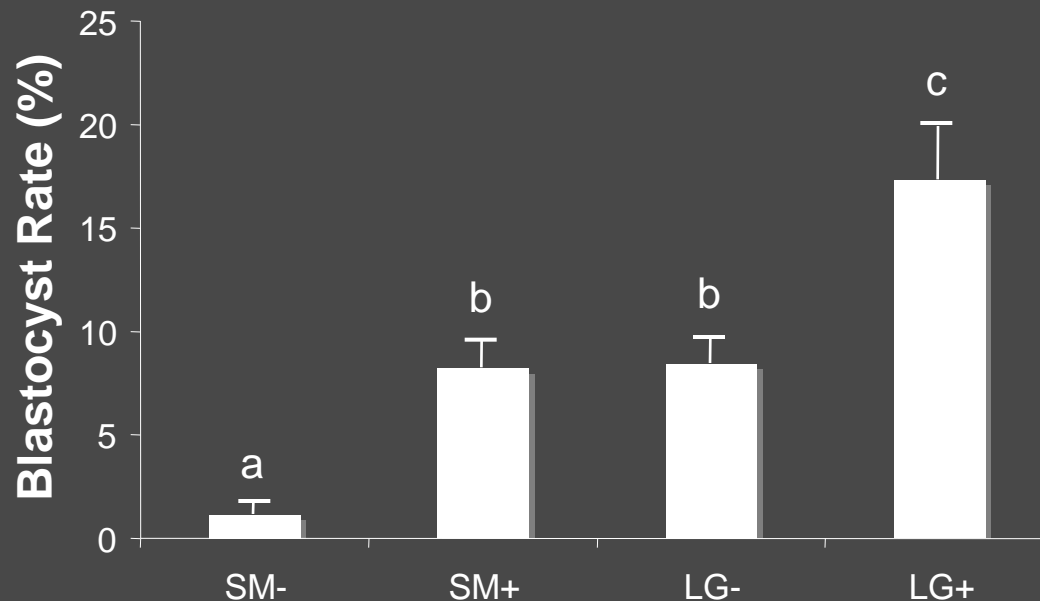
# GFR $\alpha$ -1 and RET Expression



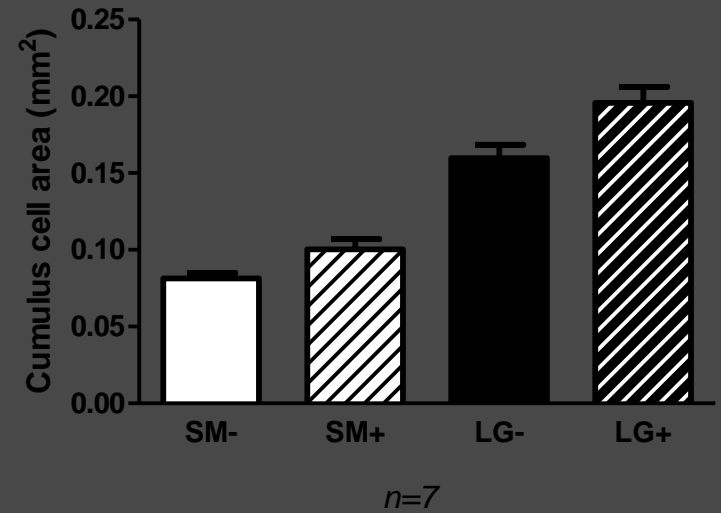
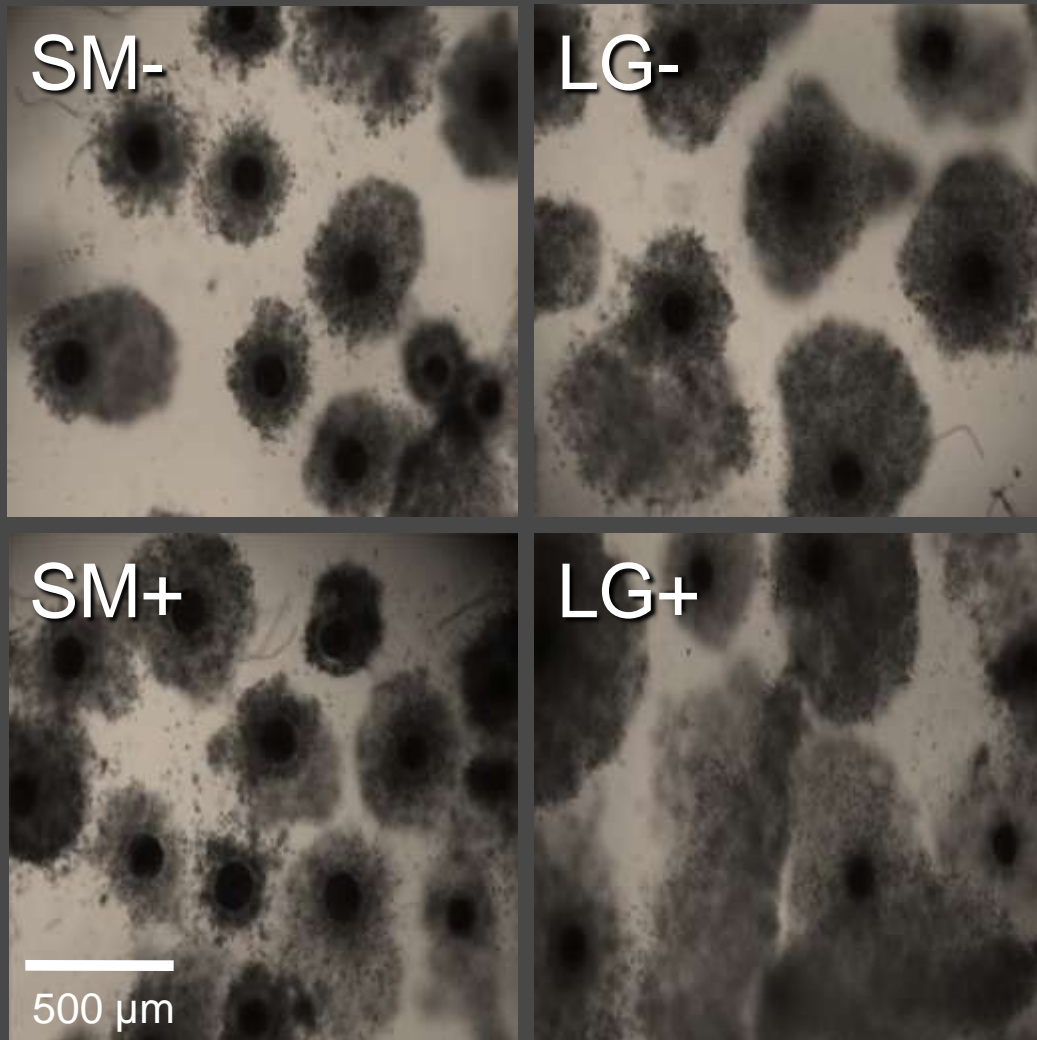
# GDNF enhances nuclear maturation in SM oocytes



# GDNF increases parthenogenetic blastocysts



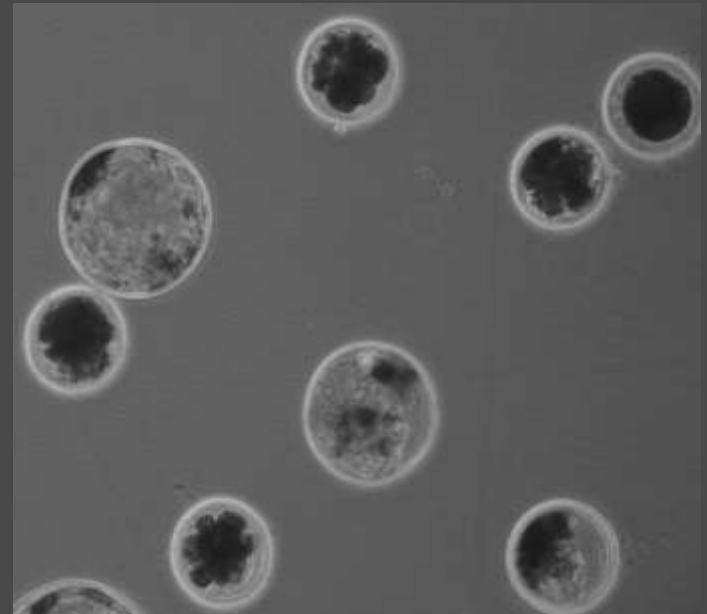
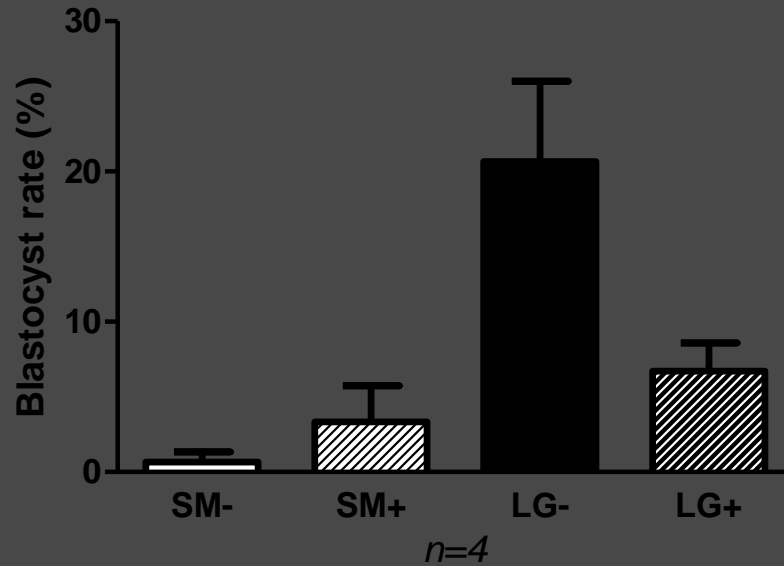
# GDNF cumulus cell expansion



# Porcine IVF

- Using this as a marker to determine oocyte quality
- Thanks to Minitube of America, we have been able to improve our IVF/IVC system for porcine embryos

# Blastocyst rate



# Discussion

- Cumulus cell expansion during IVM is improved with the addition of GDNF
- GDNF improves SM oocyte competence
- Effect of GDNF on LG oocyte competence is currently unclear

# Future work

- Further refine IVF procedure for blastocyst production
- Elucidate GDNF pathways in the oocyte
- Stage-specific differences in oocyte development
- Comparison to *in vivo*-produced oocytes

# Acknowledgements

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