Understanding the biology behind fertility

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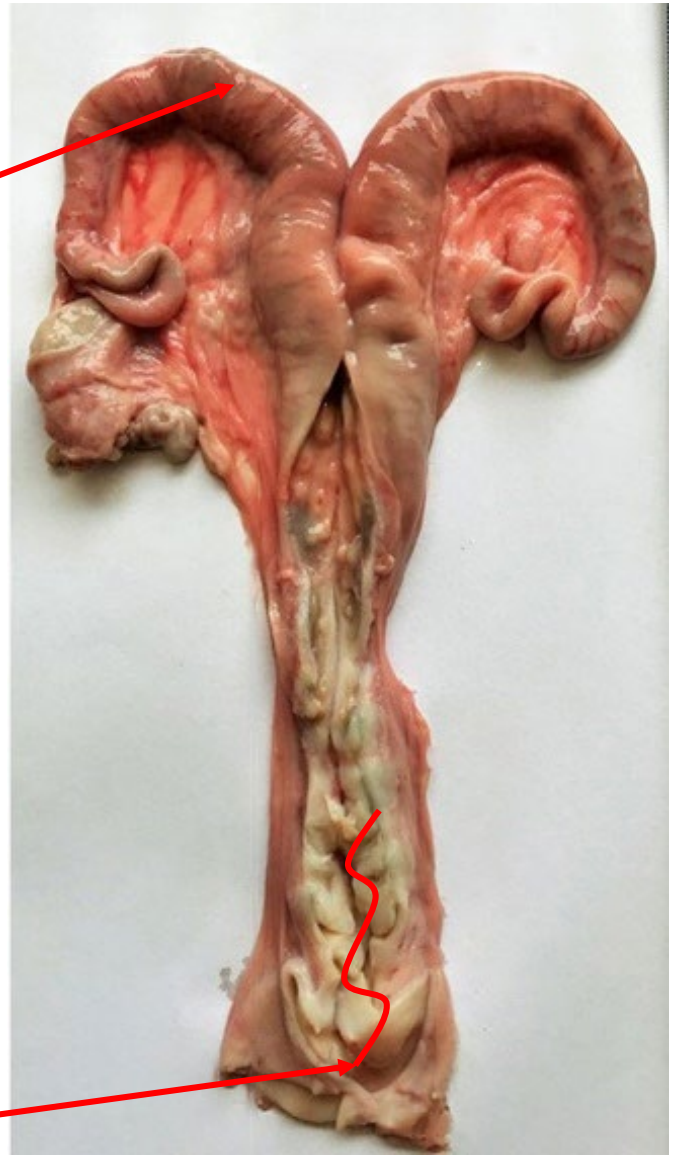


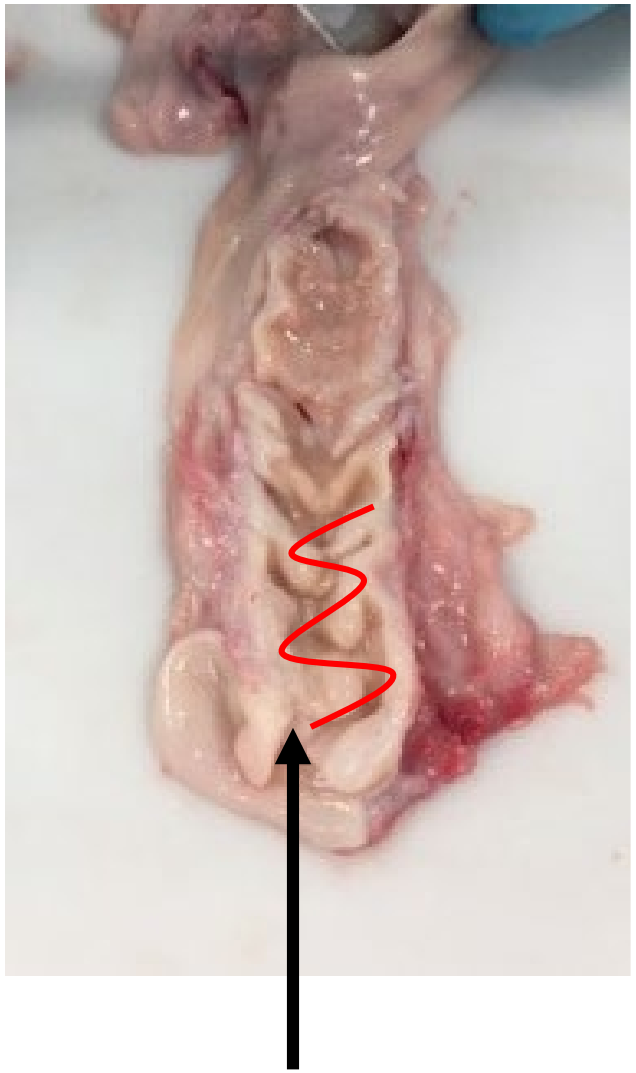
Exception Internationally

Norwegian White Sheep ~70 %

Norway is the exception→ ~70% Pregnancy Rates with frozen-thawed semen by the farmers themselves

SHOT-IN-THE-DARK AI

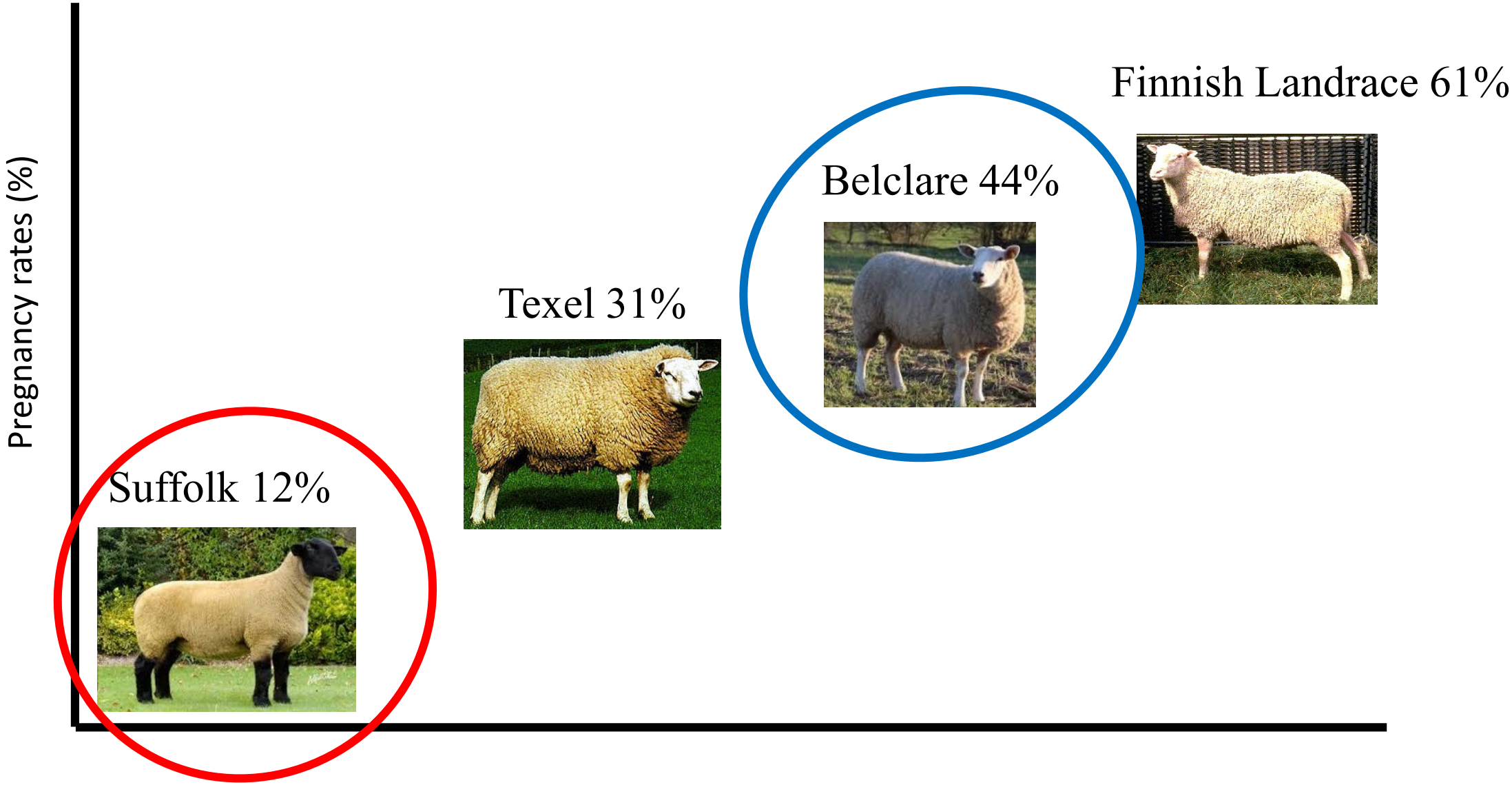
Why the Success in Norway?



Depth of penetration

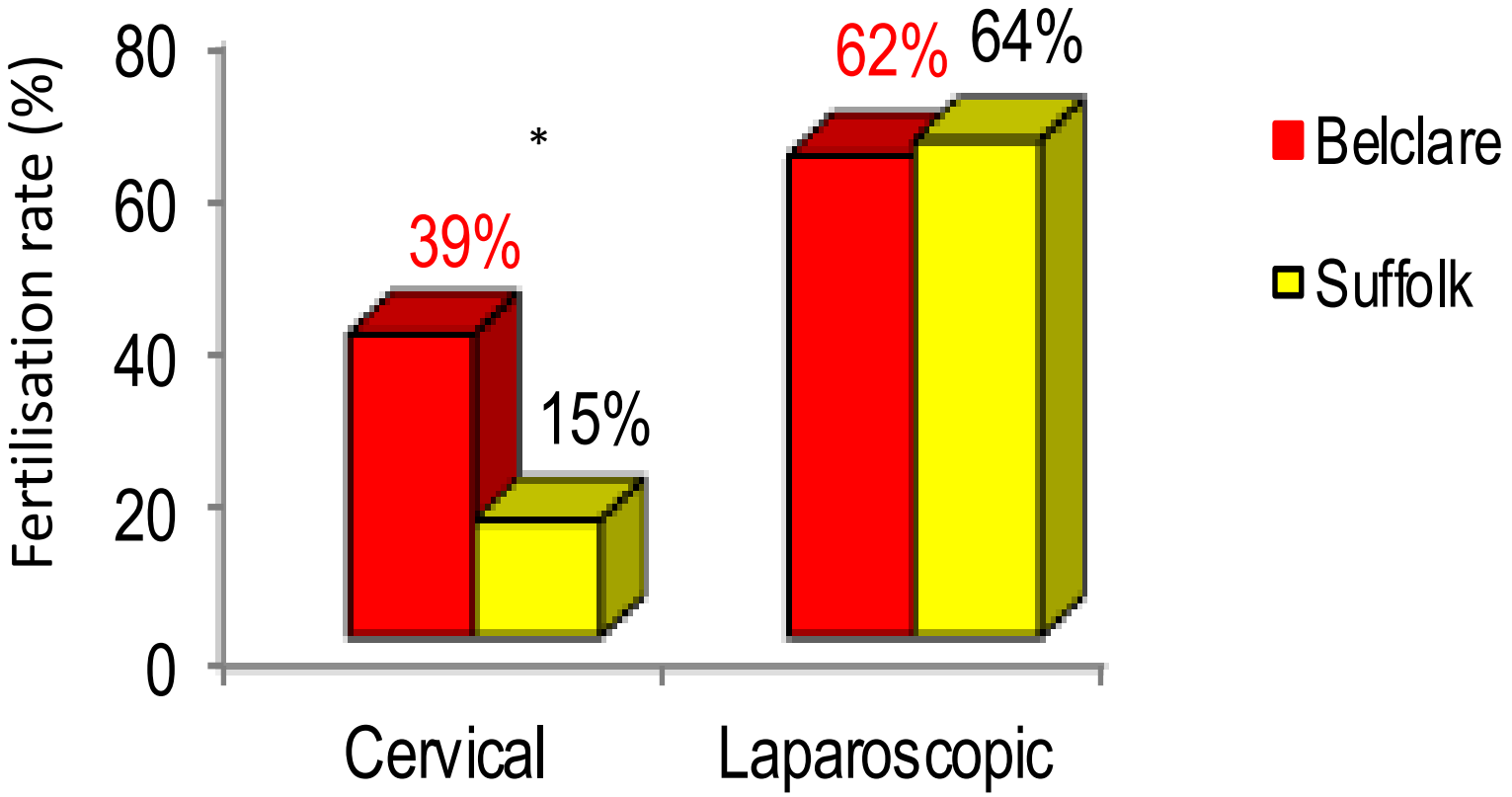
Donovan et al., 2004; *Anim Reprod Sci* 84:359-68.

Ewe breed effects on fertility following cervical AI using frozen-thawed semen



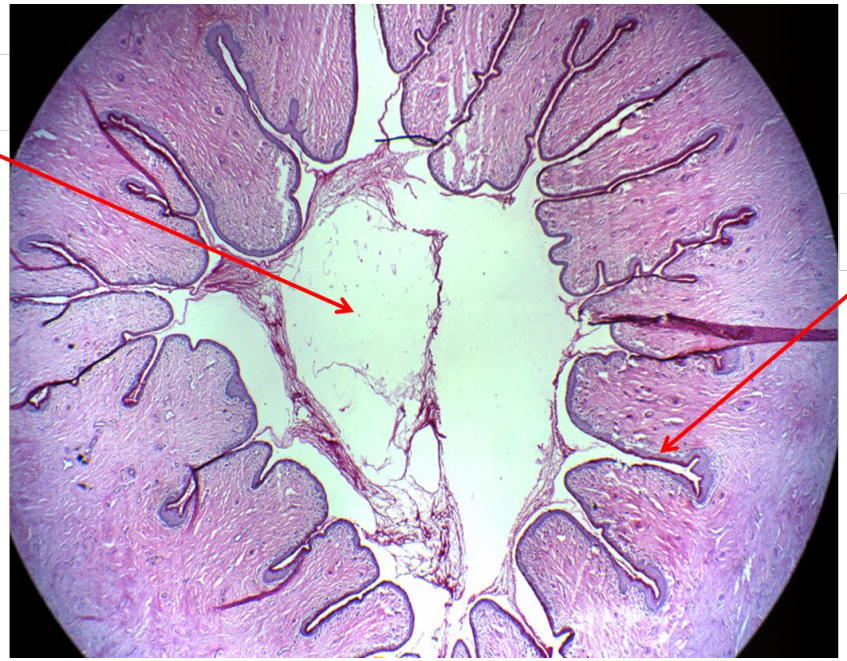
Donovan et al., 2004; *Anim Reprod Sci* 84:359-68.

Cervix is the Location of the Ewe Breed Differences



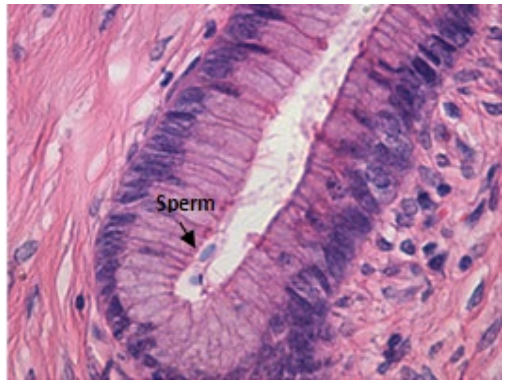
Fair et al., 2005

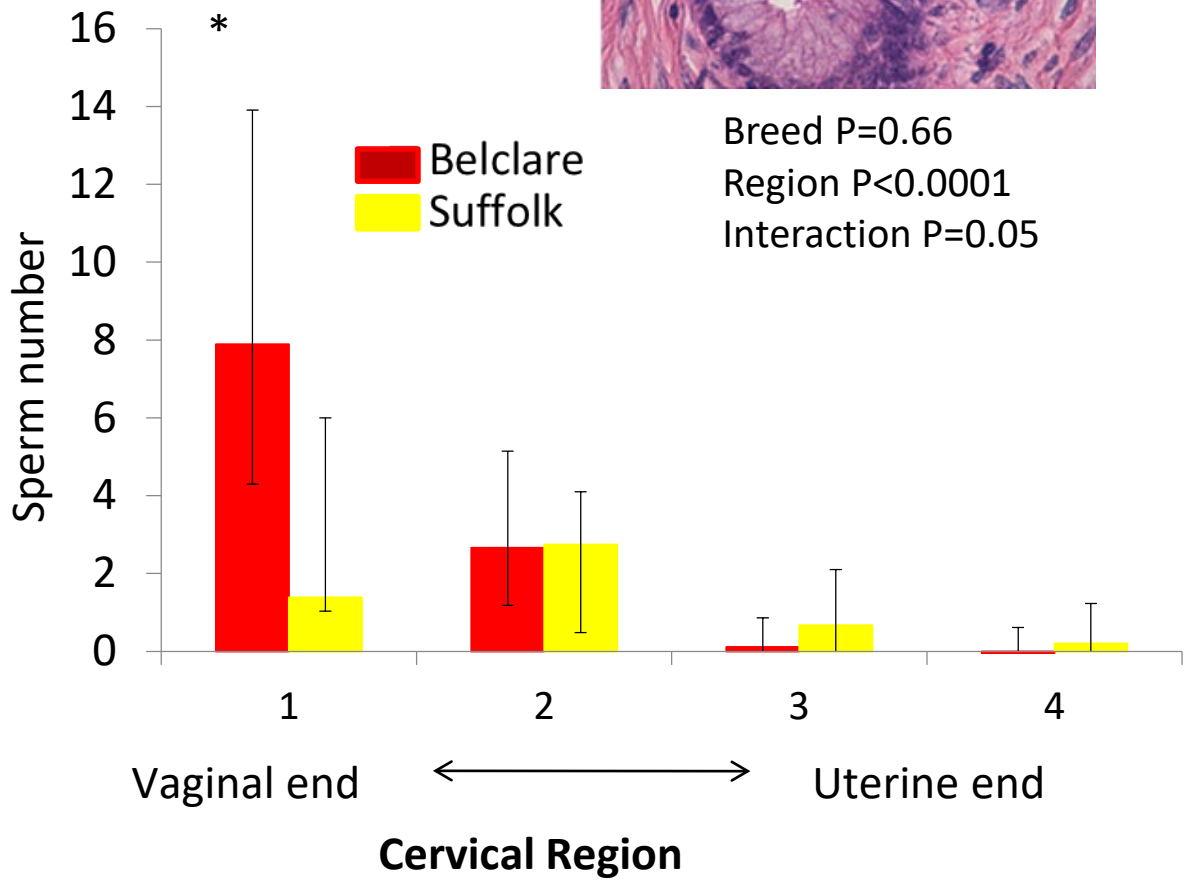
Privileged Pathways



Fair et al., 2019

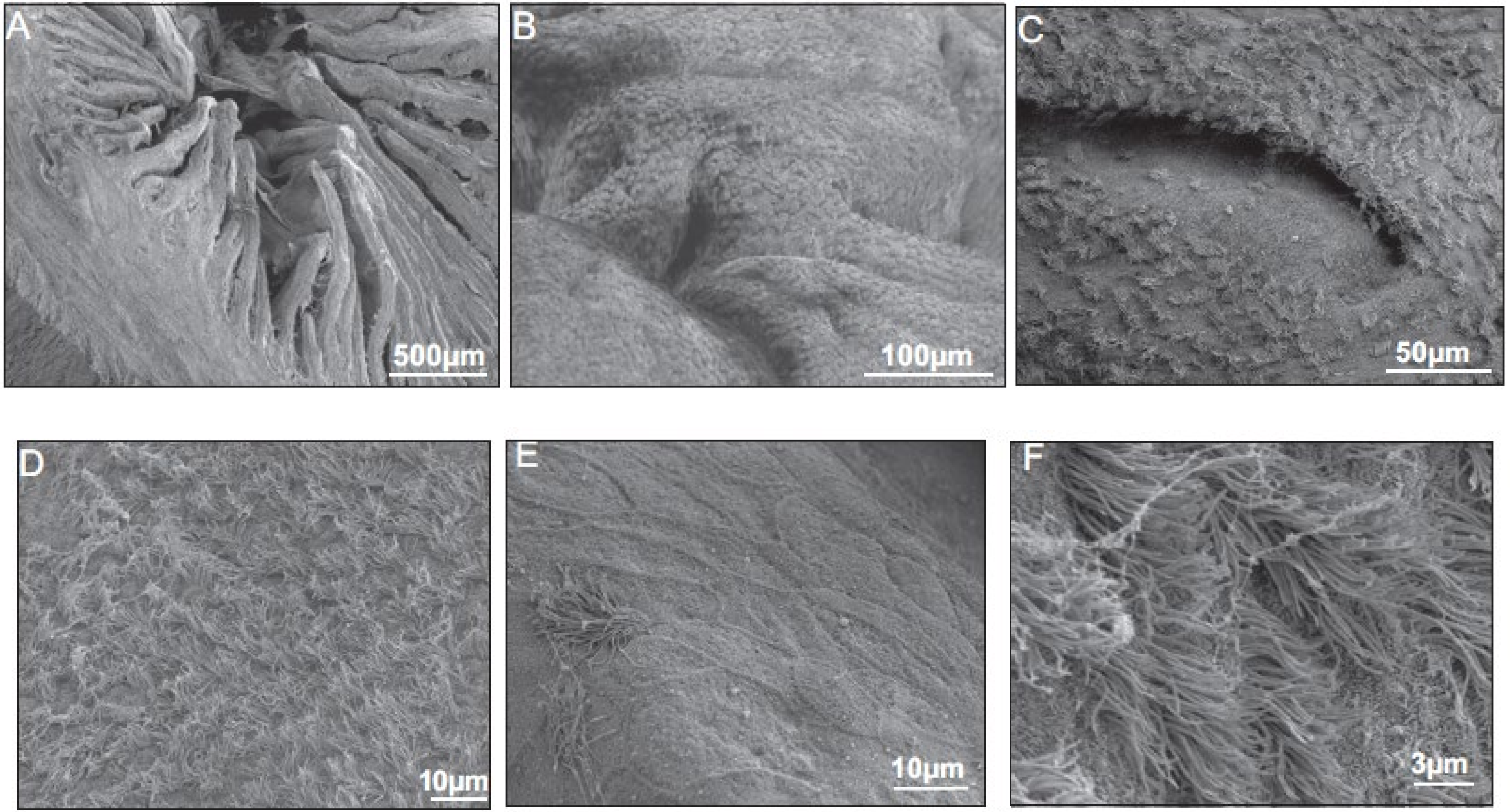
Channels





Breed P=0.66
Region P<0.0001
Interaction P=0.05

Richardson et al., 2019

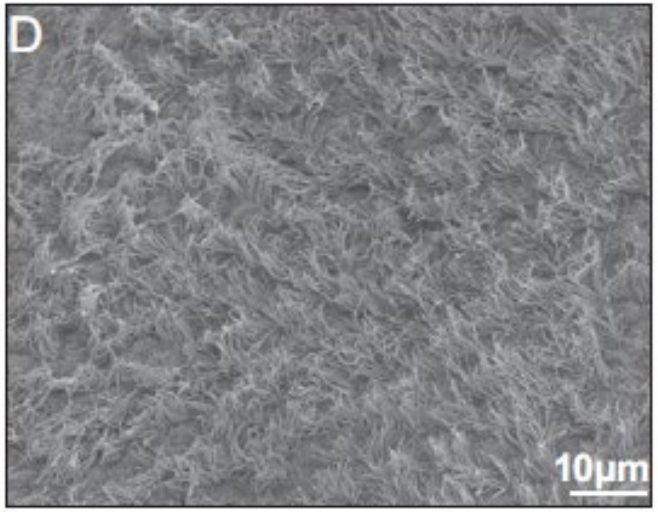


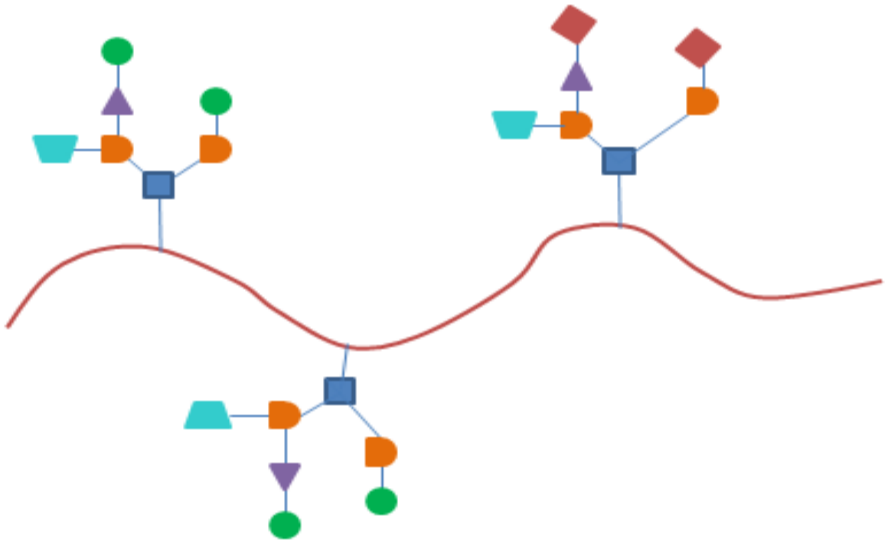
Fair et al., 2019

Cervical Mucus

Composition: water (~94%)

glycoproteins → **mucins** (~ 5%)

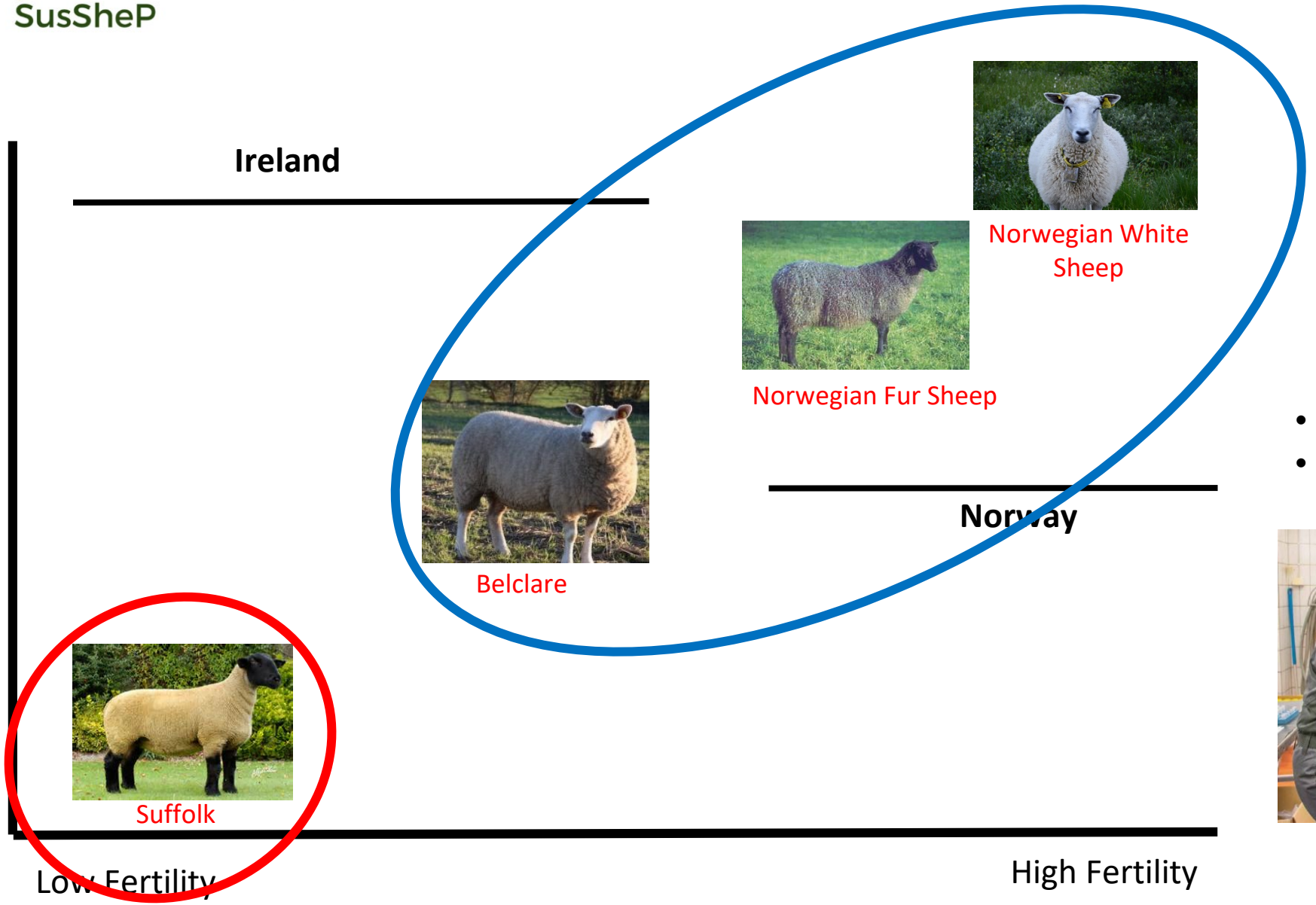




Fucose

Sialic Acid

Experimental Model



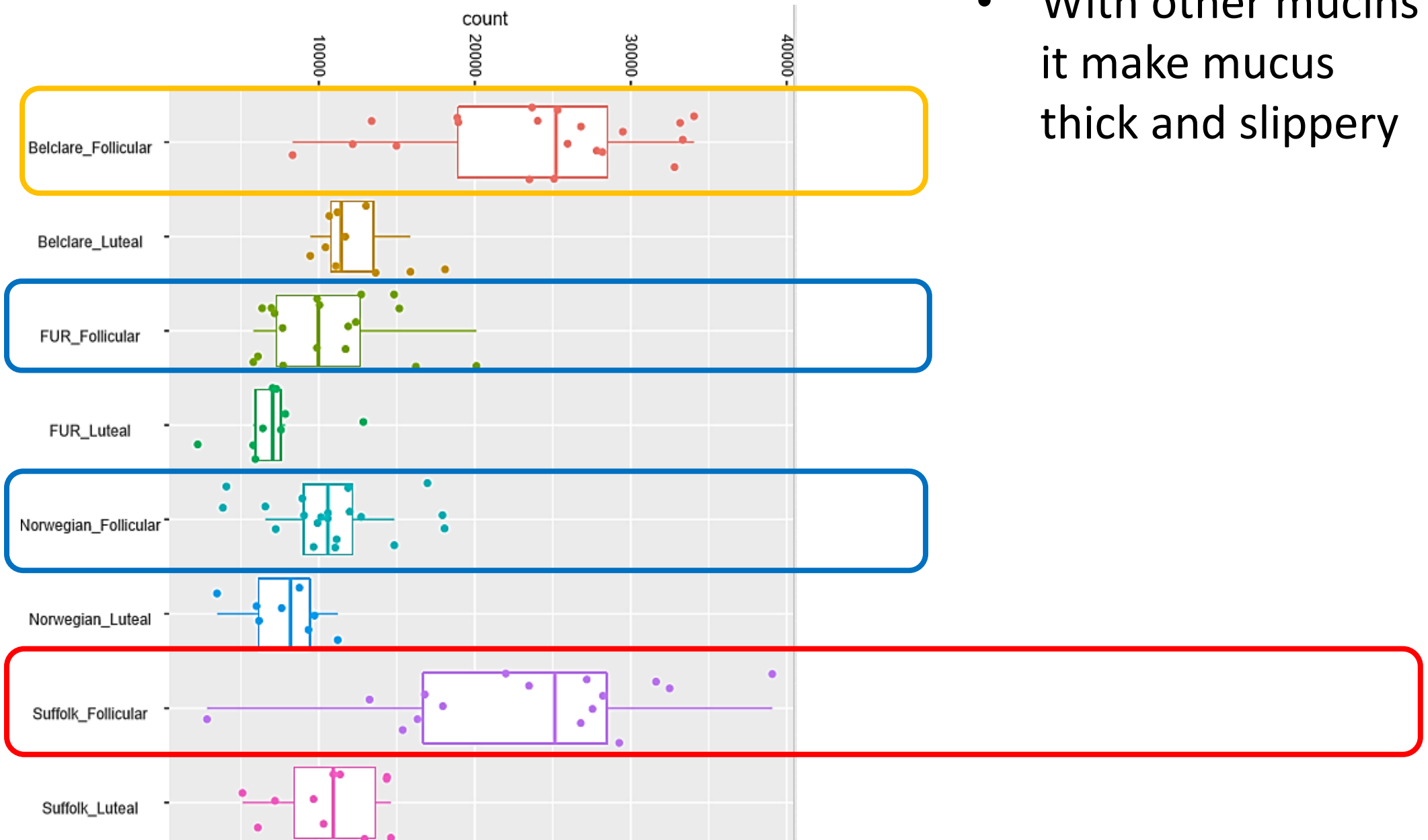
- n = 30 ewes per breed
- Induced and atural Oestrus
- Follicular & Luteal phases
- X3 replicates

- Volume/Colour/Viscosity
- Proteome/Glycome/Metabolome

Ewes Slaughtered at the end

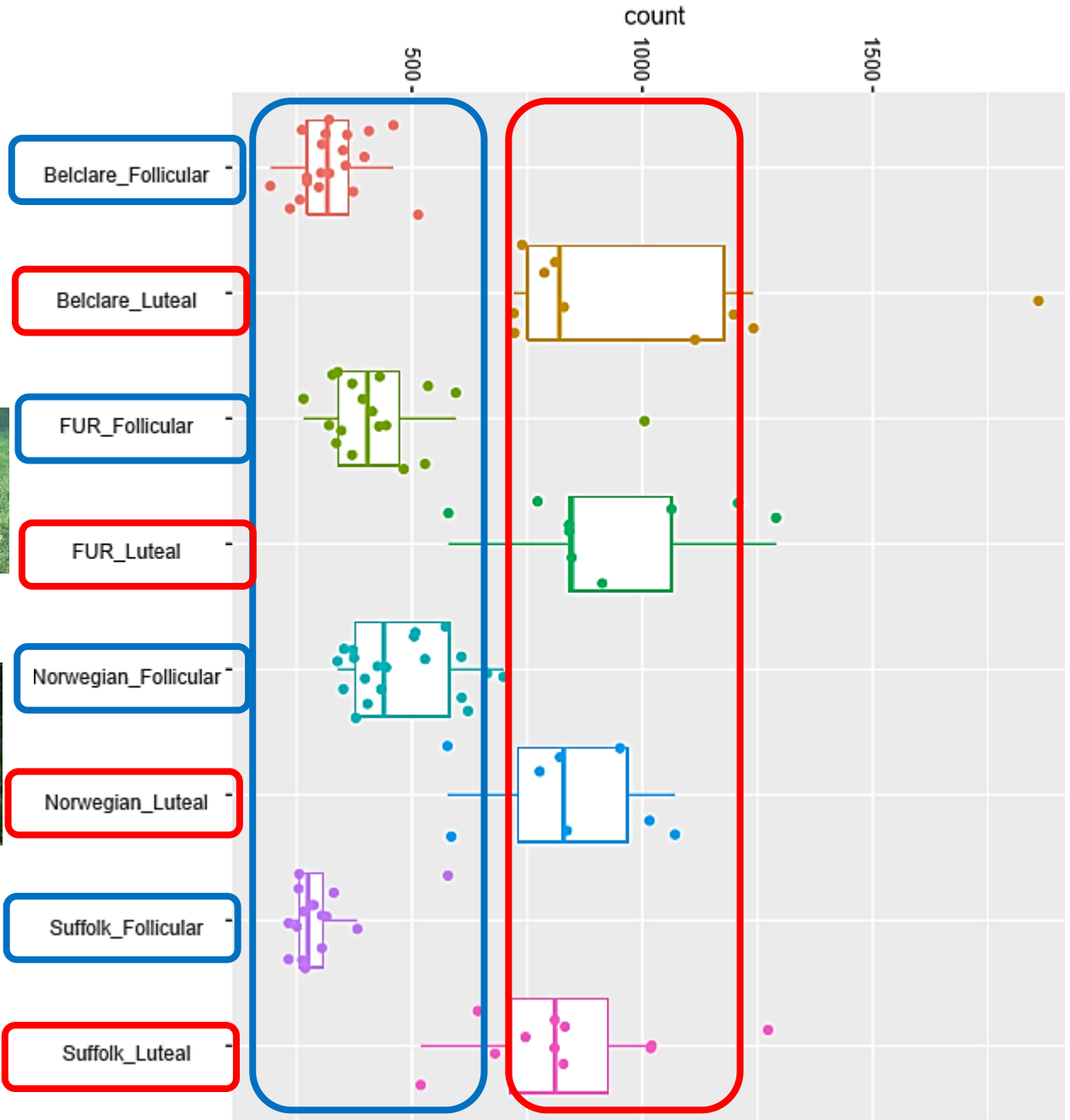
- Cervical transcriptome

Mucin 1

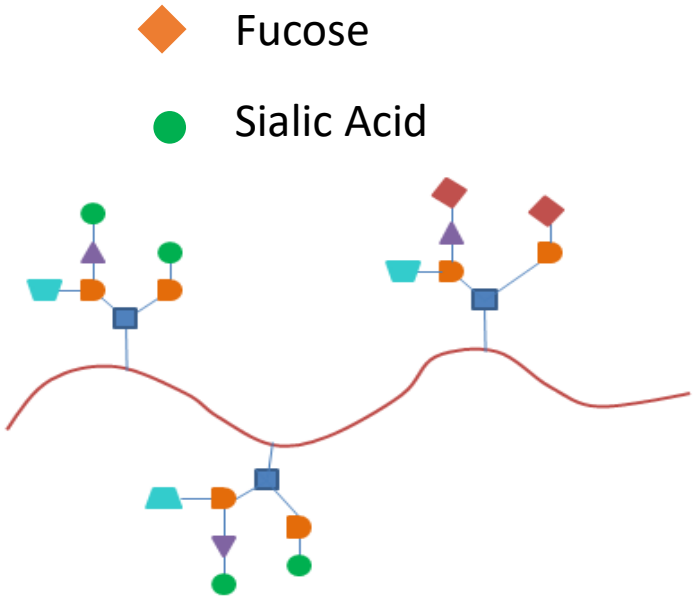


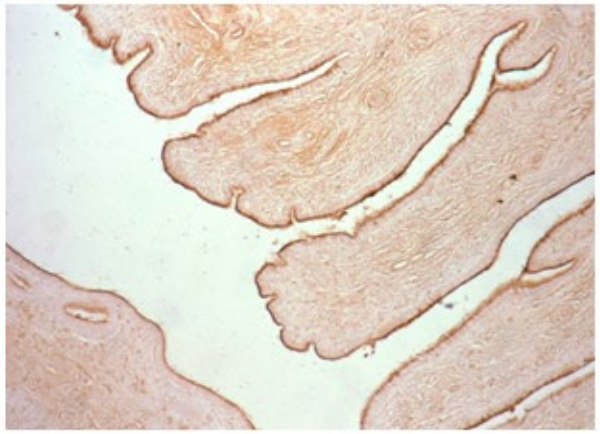
- With other mucins it make mucus thick and slippery

ST3GAL6 **Glycosyl-transferases**

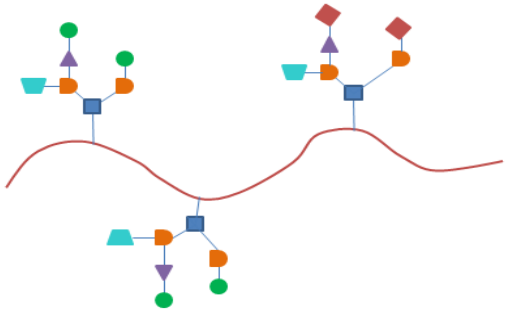


Enzyme transfers sialic acid to the N- or O-linked sugar chains of glycoproteins.



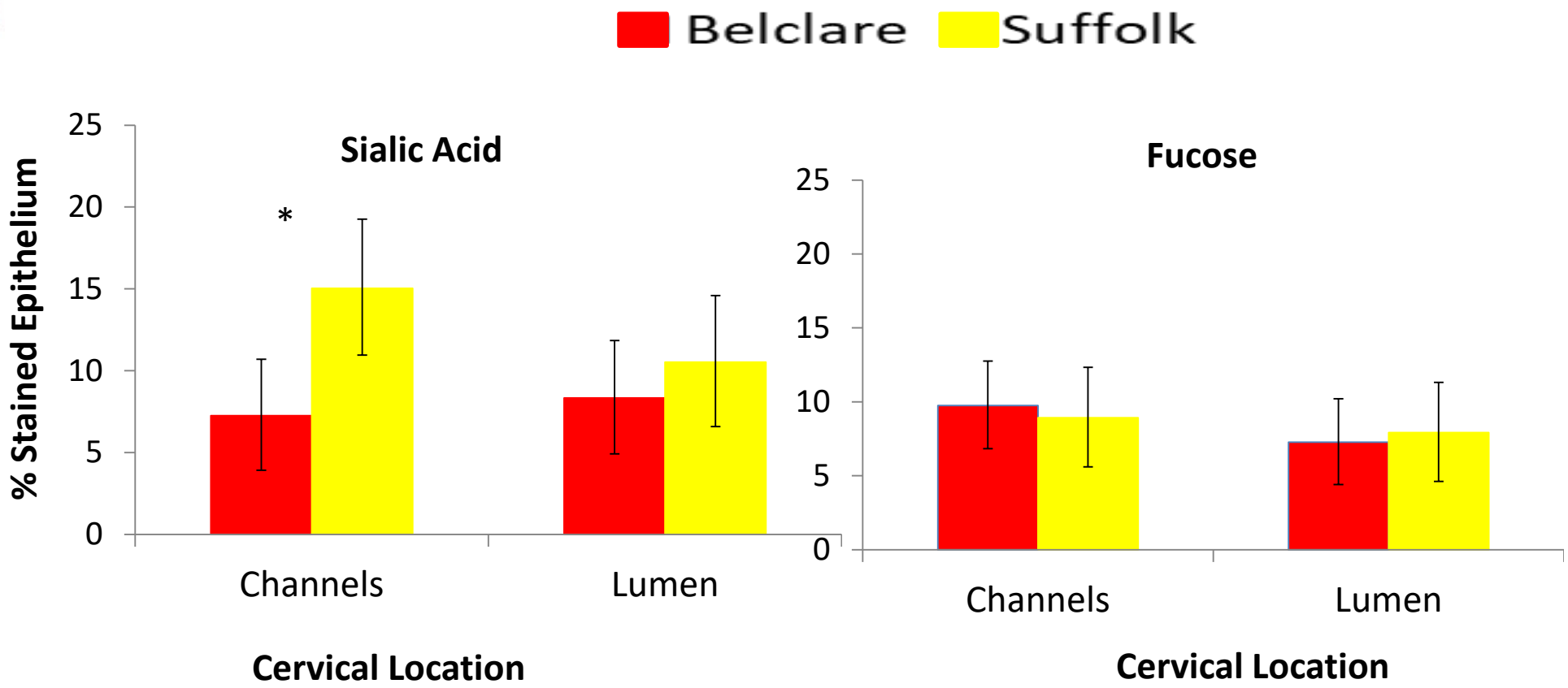


Mucin glycosylation in cervical channels and lumen



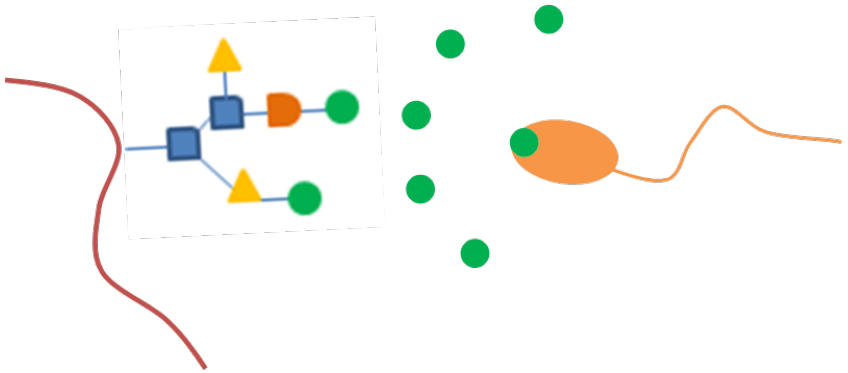
Fucose

Sialic Acid

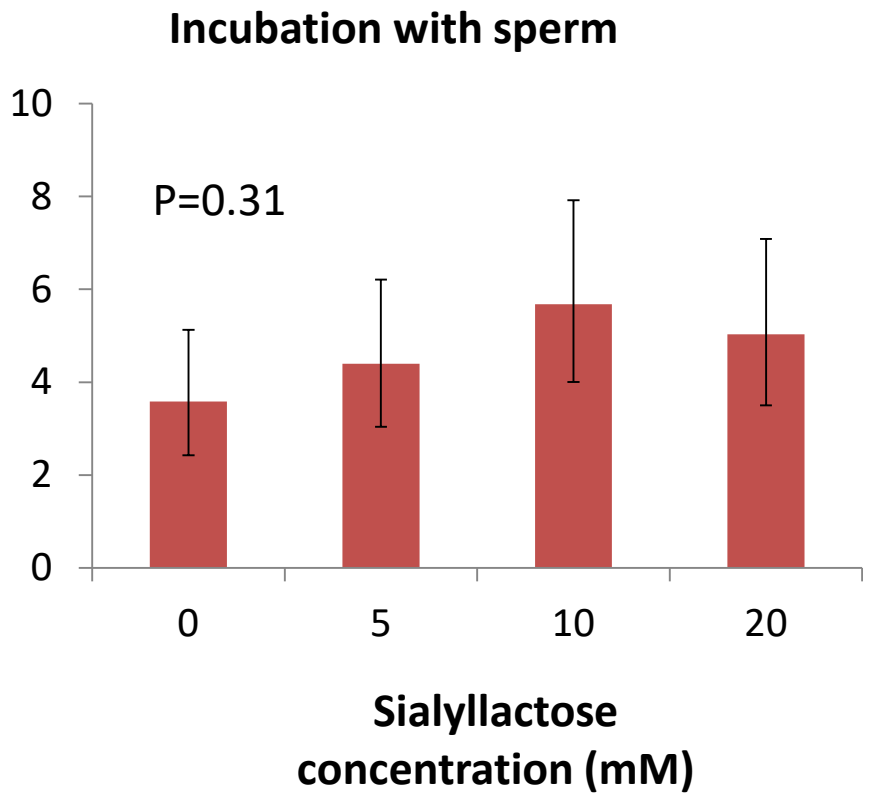


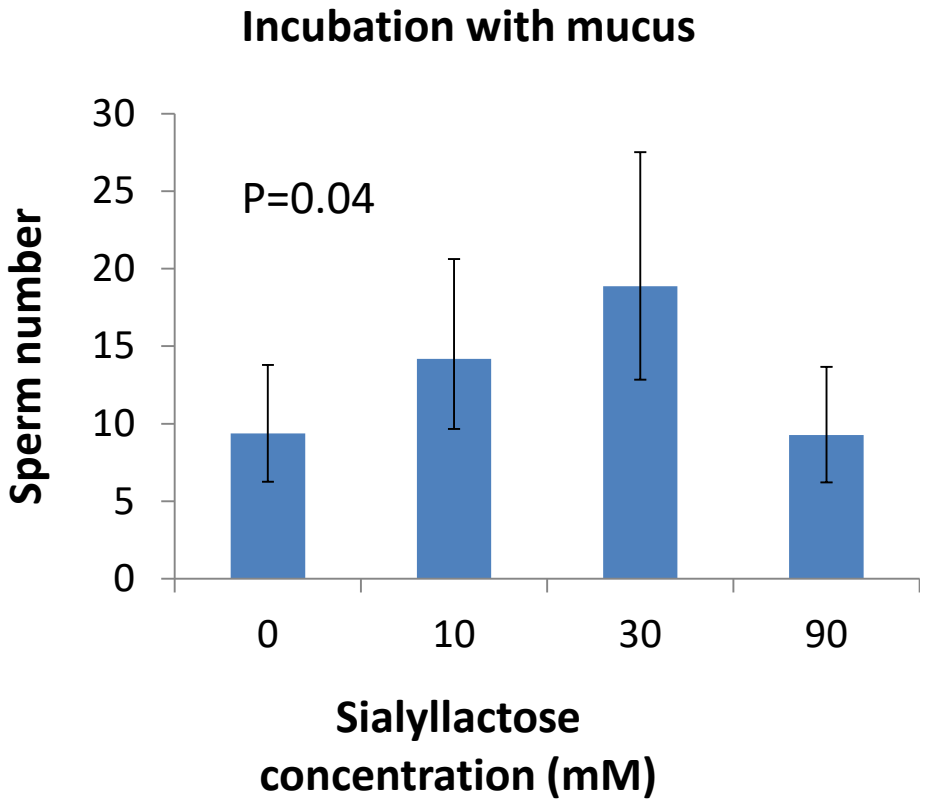
Error bars = 95% C.I.

Richardson et al., 2019



Effect of sialic acid on sperm penetration *in vitro*





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Richardson et al., 2019

Conclusion

Building a in-depth profile of the cervical biology of ewe breeds

Sperm interaction with sugars attached to mucins is important

Ultimate goal is to add a sugar/biochemical to semen extender prior to freezing

A lot done….more to do

SusSheP

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