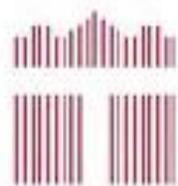


# Functional Involvement of Quiescin Sulfhydryl Oxidases on Male Reproduction

Tse-En Wang, Ph.D.  
National Taiwan University, Taiwan

2021/09/24

Keiichiro Maeda Memorial Ise Award 2020 and 2021



National  
Taiwan  
University  
國立臺灣大學



# Tse En Joan Wang



## 🎓 Education:

- **Bachelor, Biotechnology, China Medicine University**  
September 2012 — June 2016
- **Master and PhD, Veterinary Medicine, National Taiwan University**  
September 2016 — June 2021
- **Postdoctoral associate, Cellular and Molecular Physiology, Yale University**  
September 2021 — Present

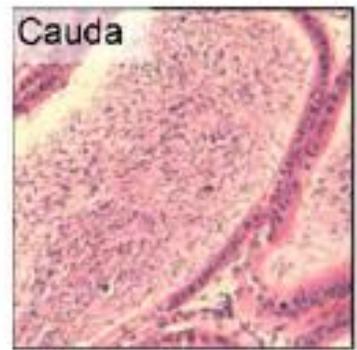
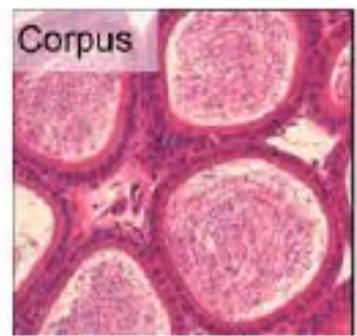
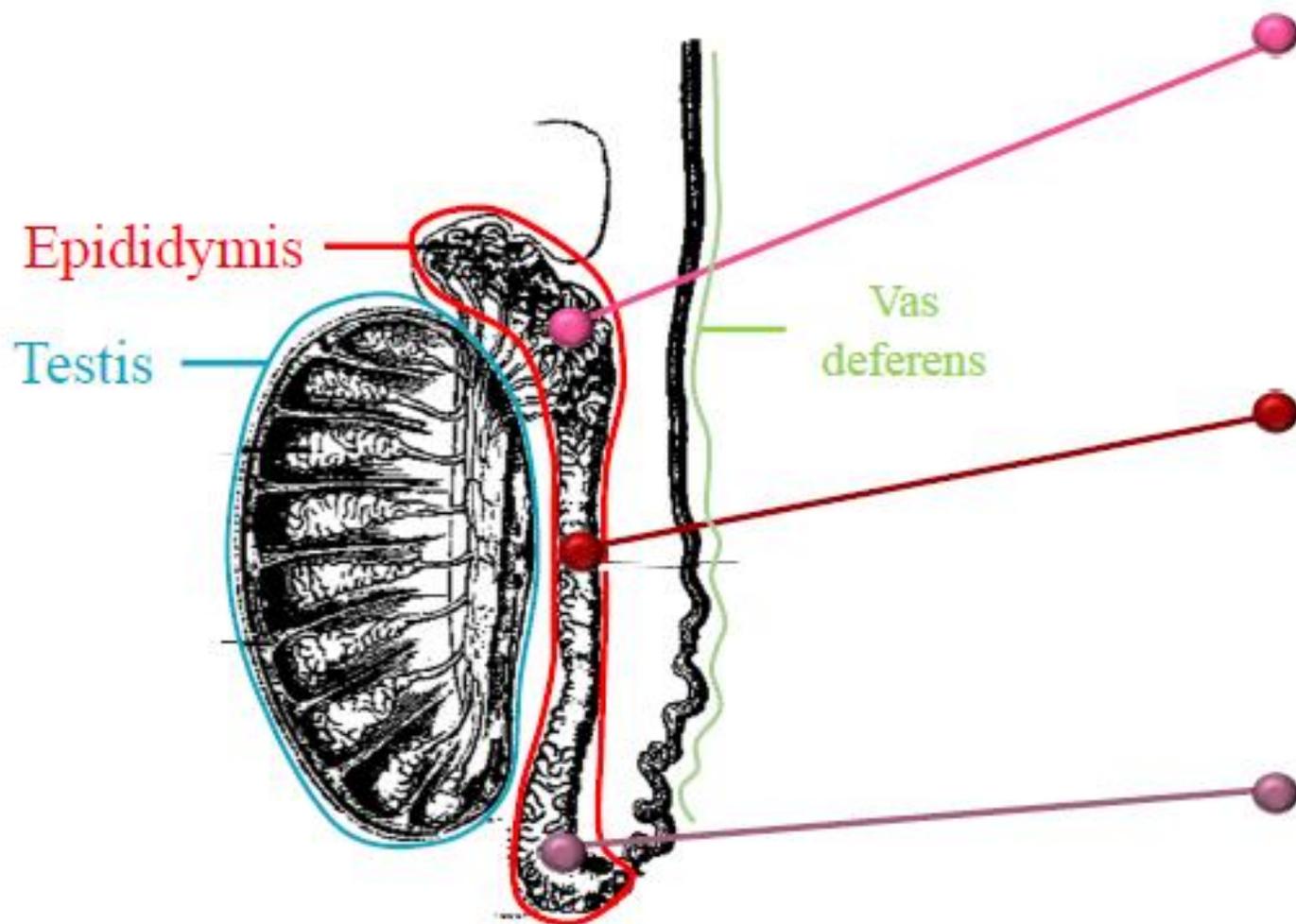
## 👔 Professionals:

- Molecular & cellular biology
- Reproductive biology
- Sperm physiology
- Proteomic

## 🏆 Achievements

- Awarded President Scholarship in NTU (2017-2020)
- Won cover page competition of Biology of Reproduction (2018 Nov.)
- Awarded Kei-ichiro Maeda Memorial Ise Award from Asian Association Veterinary School (2020)

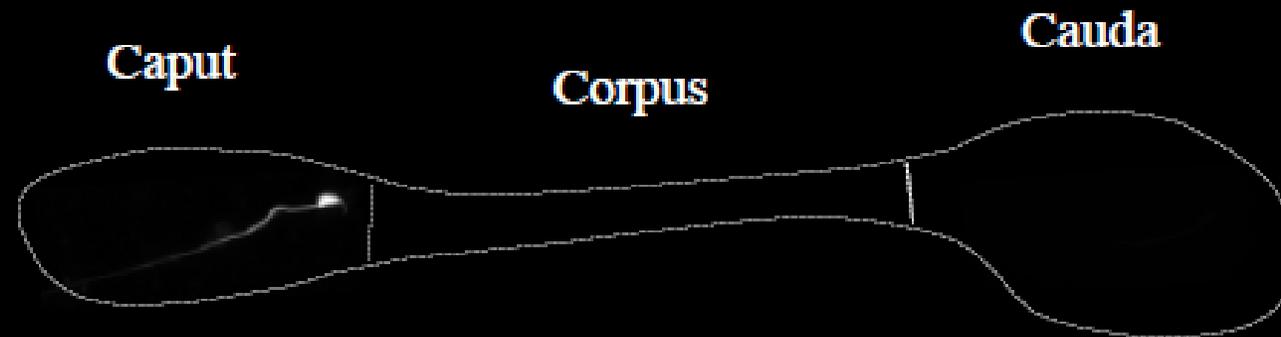
# Destiny of sperm cells



# Thiol oxidation is essential for sperm maturation

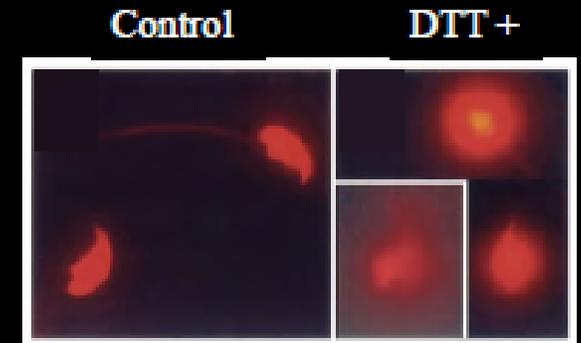
Cauda sperm tails appeared less fluorescent than the caput sperm tails with the fluorescent labeling monobromobimane(mbbr).

Shalgi, et al, 1989



# Effects of sulfhydryl oxidation on sperm maturation

The inter- and intra-protamine disulfide bonds are used to manipulate DNA packing in the sperm.



Monika A. Szczygiel., et al, 2002

Sperm flagellar straightness is maintained by the formation of disulfide bonds.



T w Ljiri., et al, 2014

# Quiescin Sulphydryl Oxidase (QSOX) profile:

1. Type:

→ FAD-dependent sulphydryl oxidase

2. Equation:



3. Functional domain:

→ N-terminal: thioredoxin domain (**Trx**)

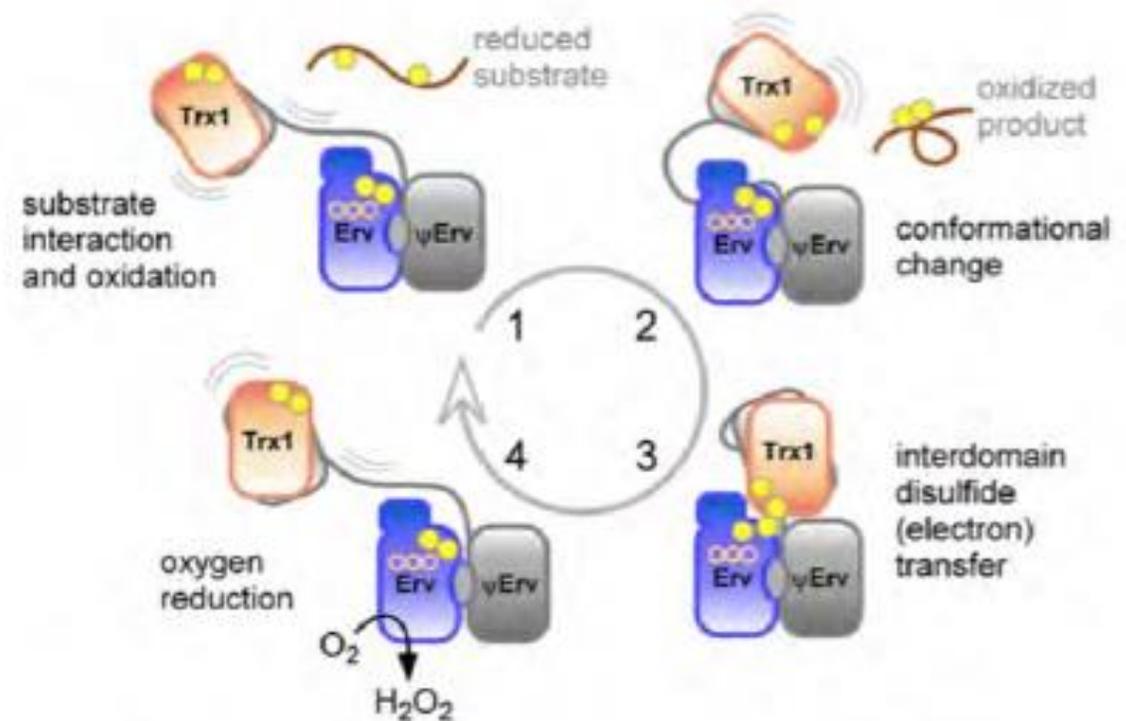
Protein disulfide bond formation

→ C-terminal: **Erv** enzyme domain

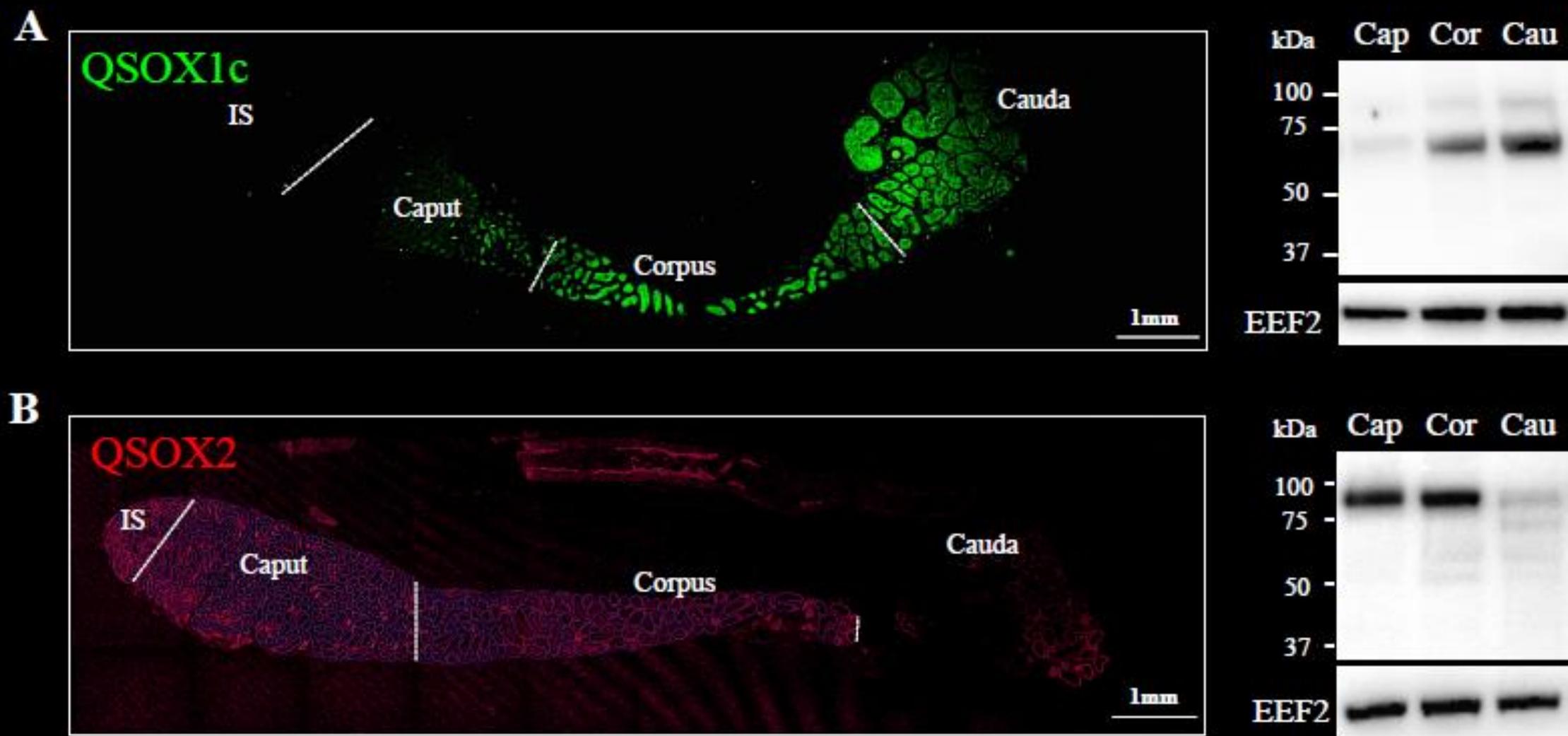
Redox reaction site

4. Multigene family:

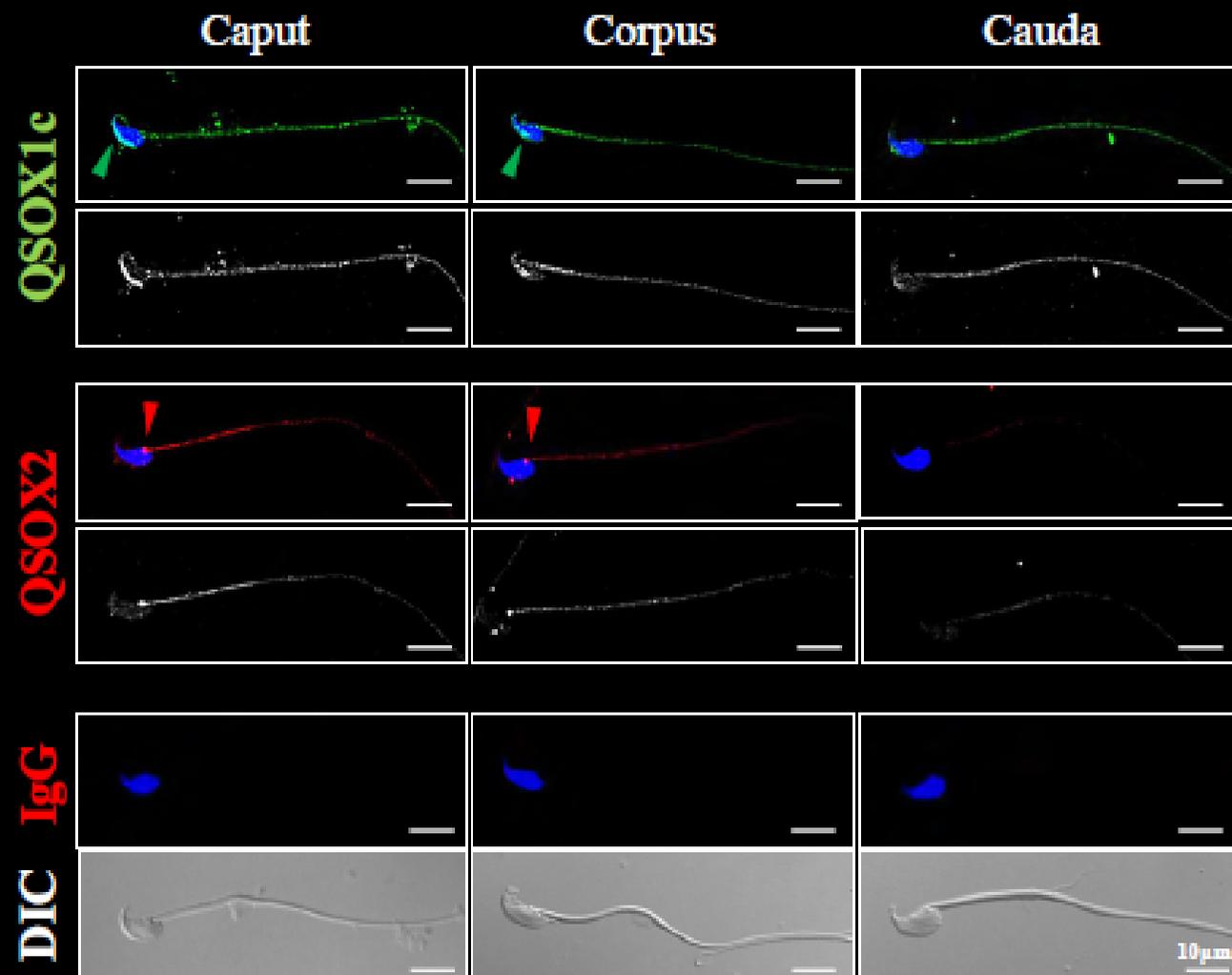
**QSOX1 & QSOX2**



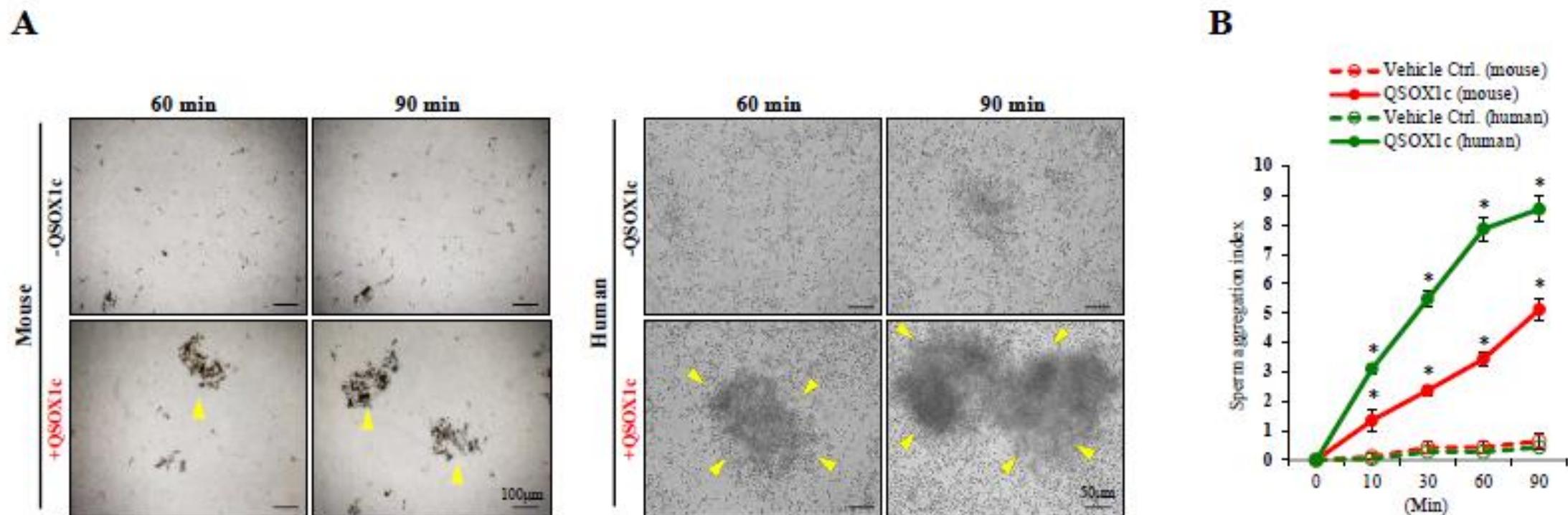
# Complementary tissue distribution of QSOX1c and QSOX2 in the epididymis



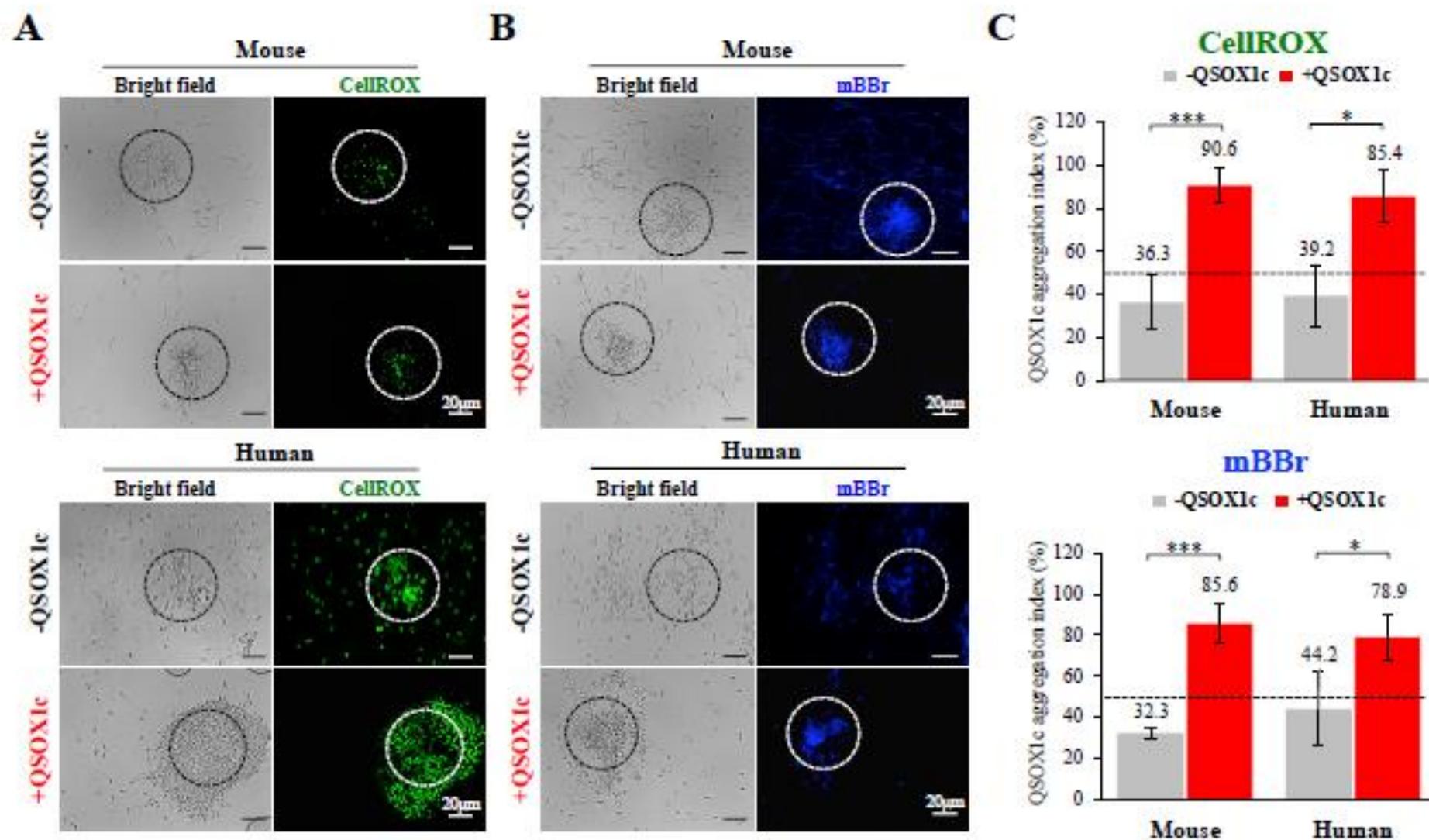
# Distinct sperm membrane surface association of QSOX1c and QSOX2



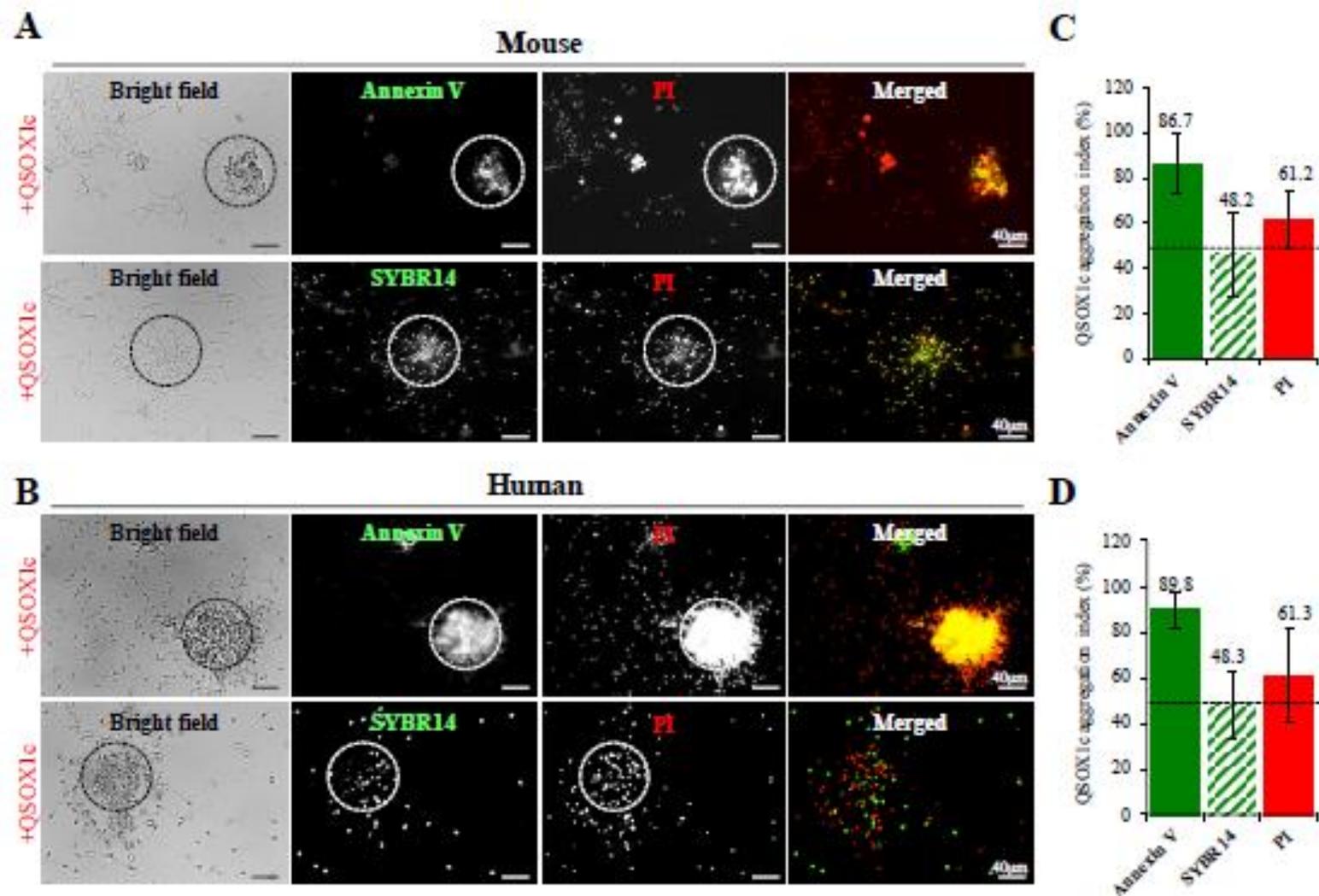
# QSOX1c induced *in vitro* sperm aggregation in humans and mice



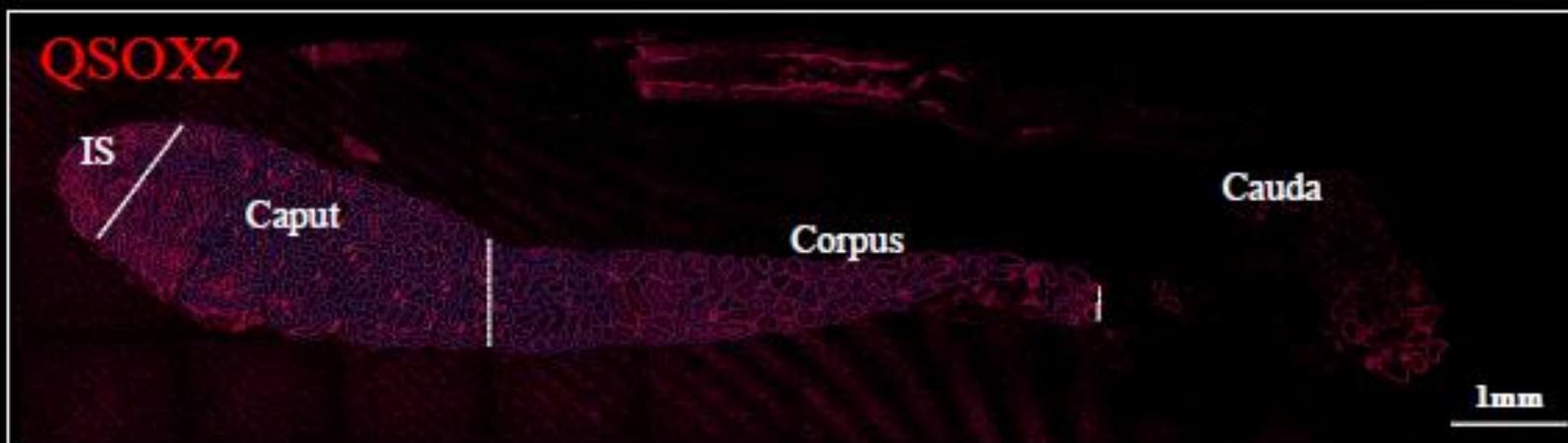
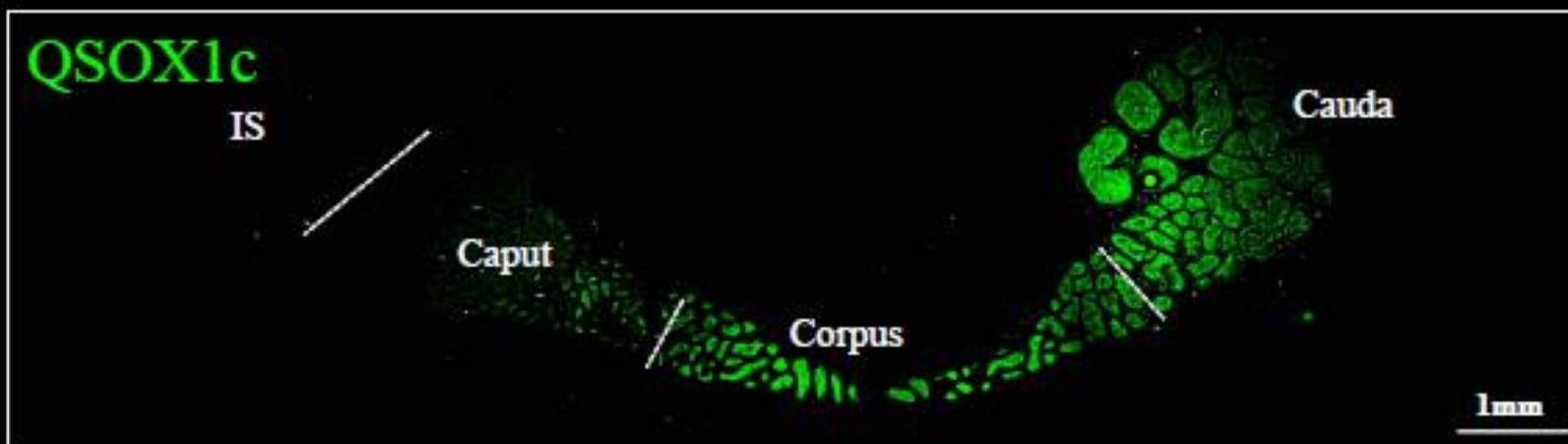
# QSOX1c aggregated sperms were oxidatively stressed and had abundant surface free thiols



# QSOX1c aggregated apoptotic mouse and human sperm *in vitro*

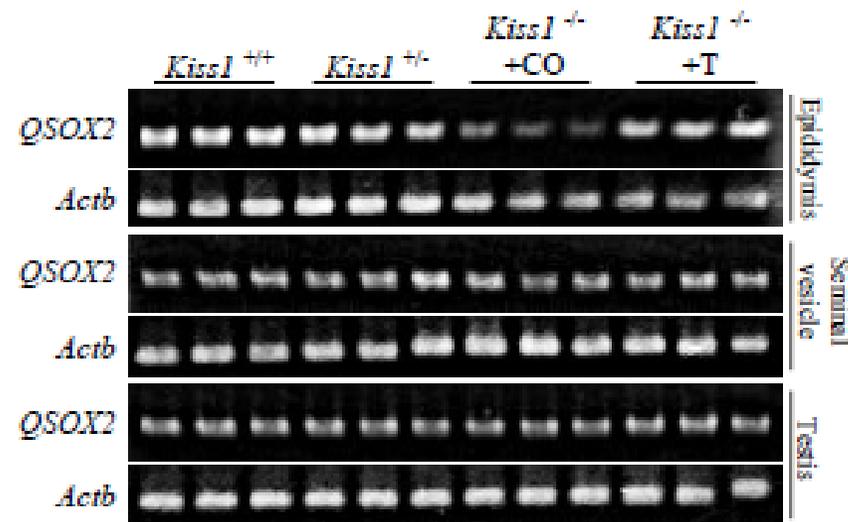




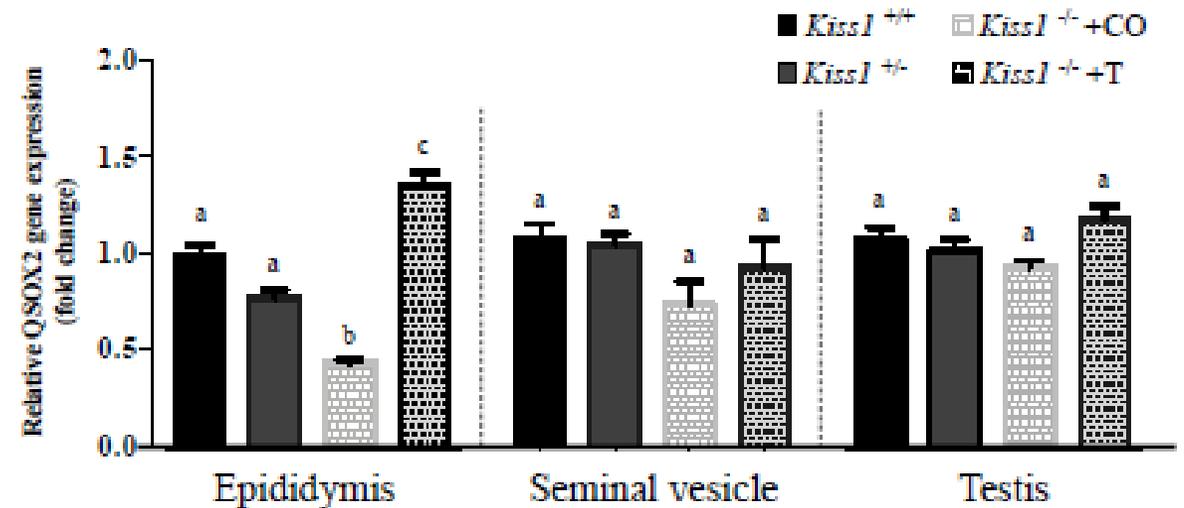


# Testosterone positively regulated epididymal QSOX2 synthesis

A

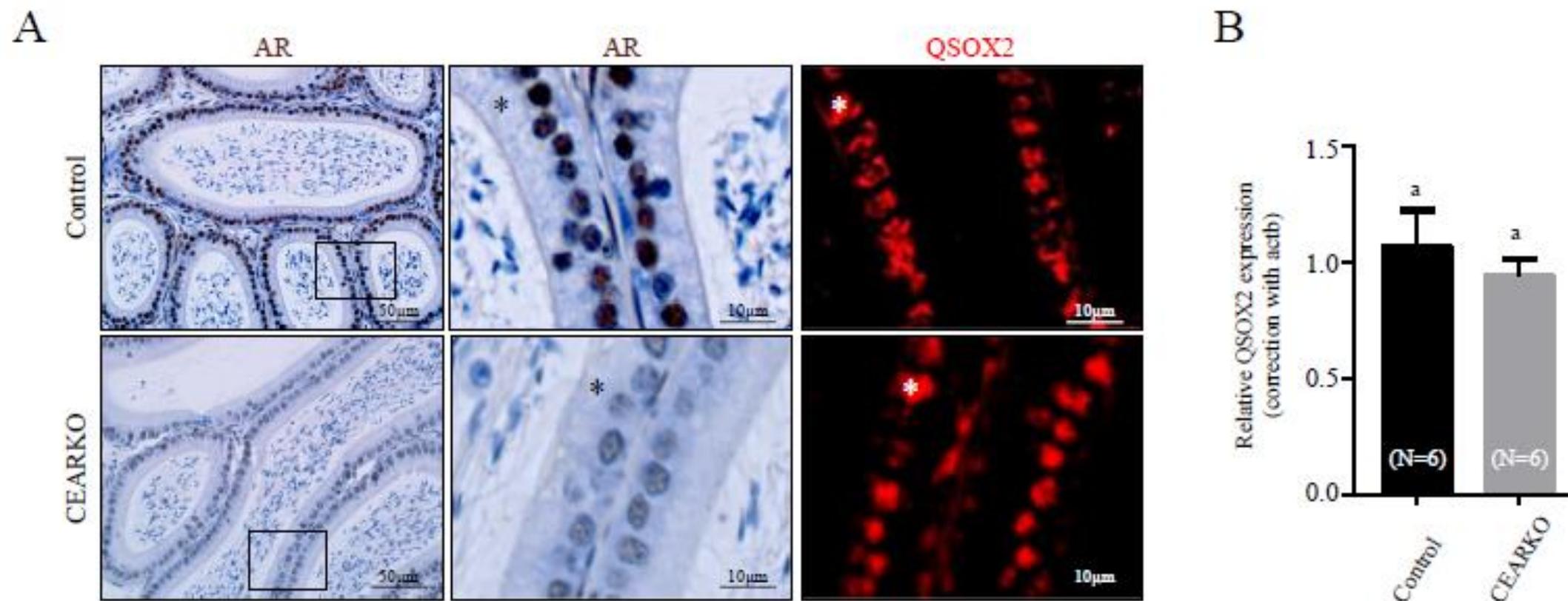


B



In collaboration with Fuko Mastuda sensei at Utokyo

# Testosterone regulated QSOX2 synthesis through AR-independent pathway

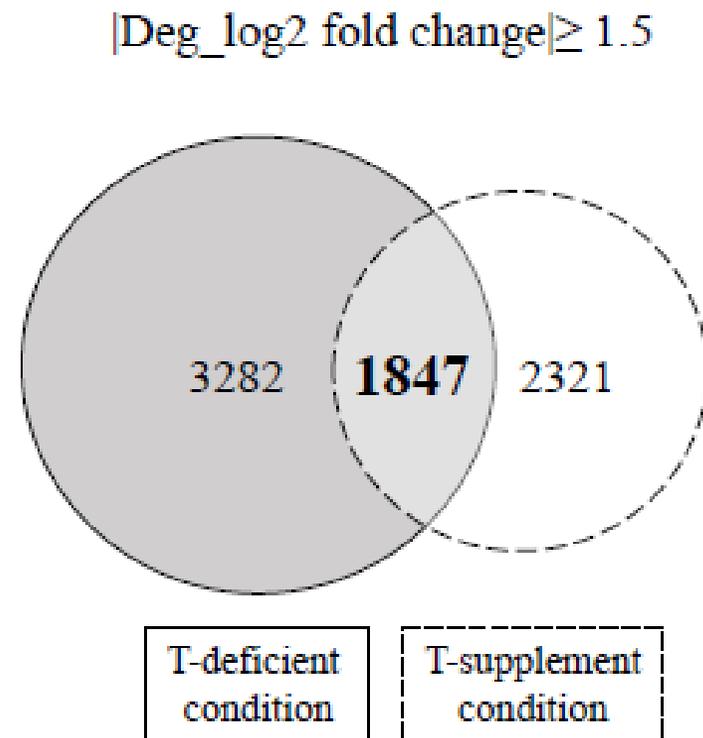


In collaboration with Dr. Lee Smith at University of Edinburgh

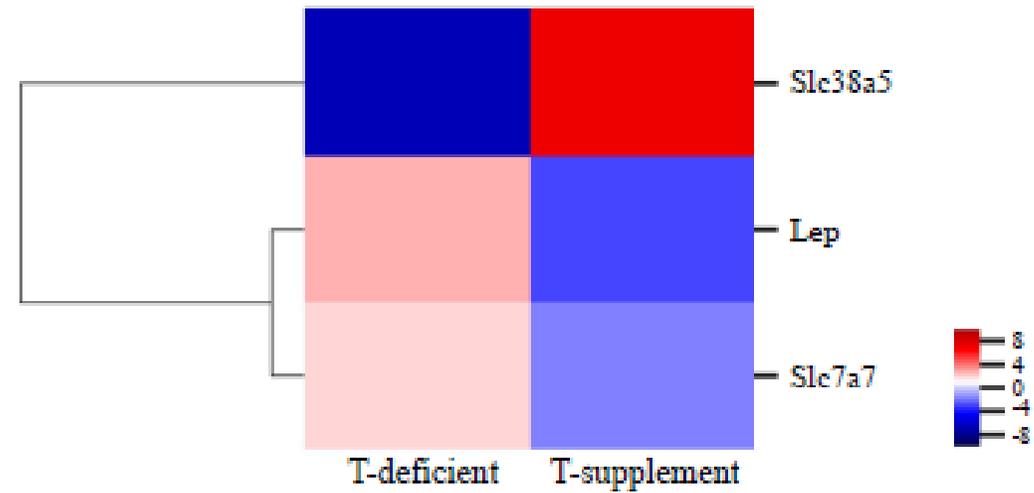
Wang, T. E., et al, 2021

# List of testosterone-responsive glutamine/glutamate transporters

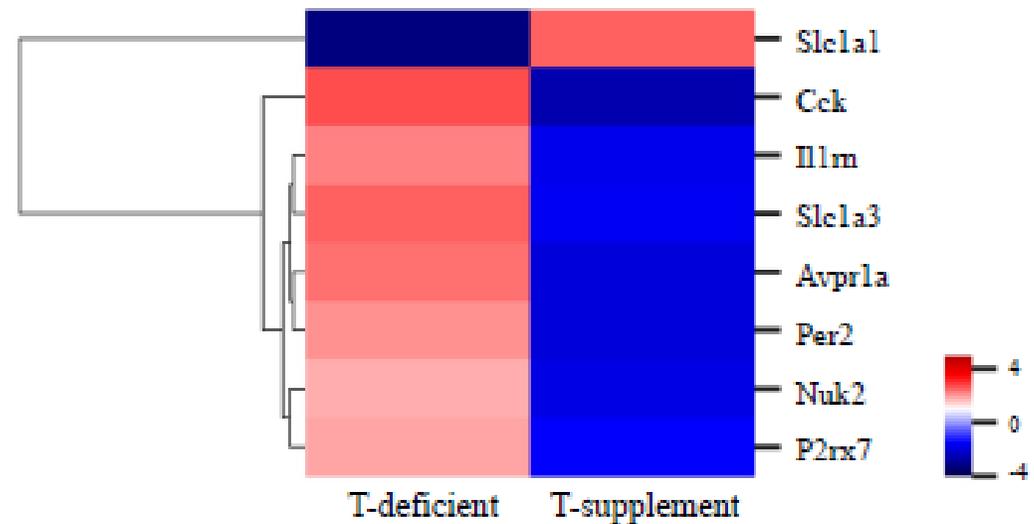
**A**



**B**

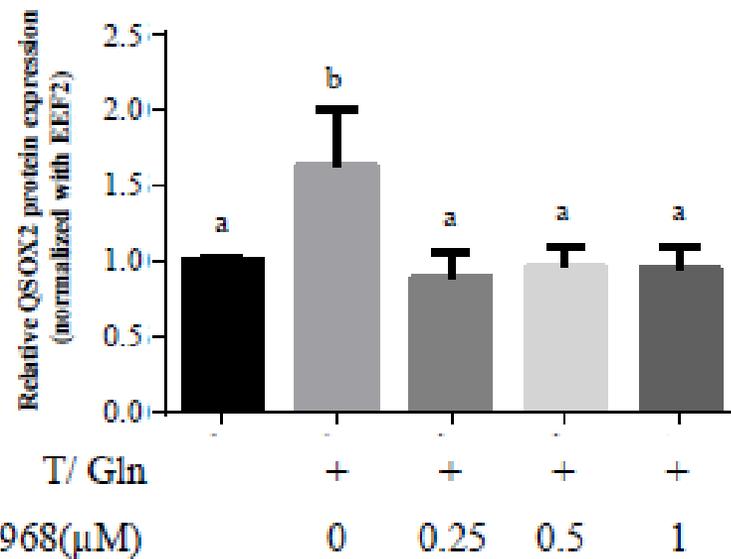


**C**

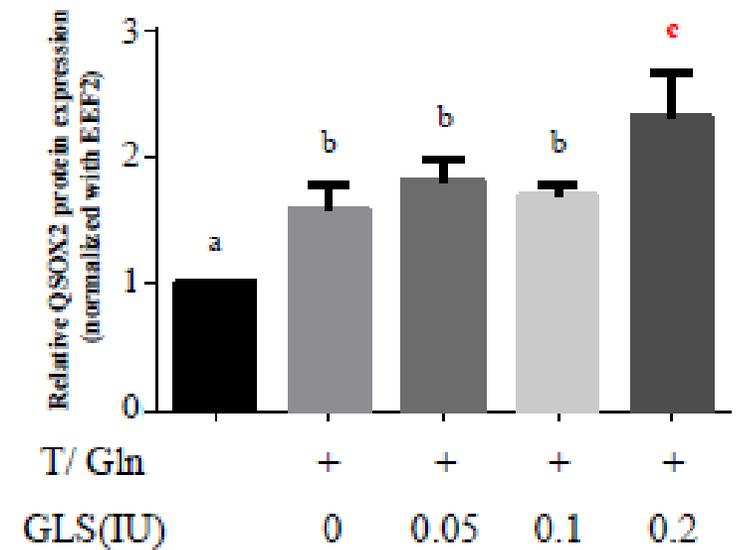
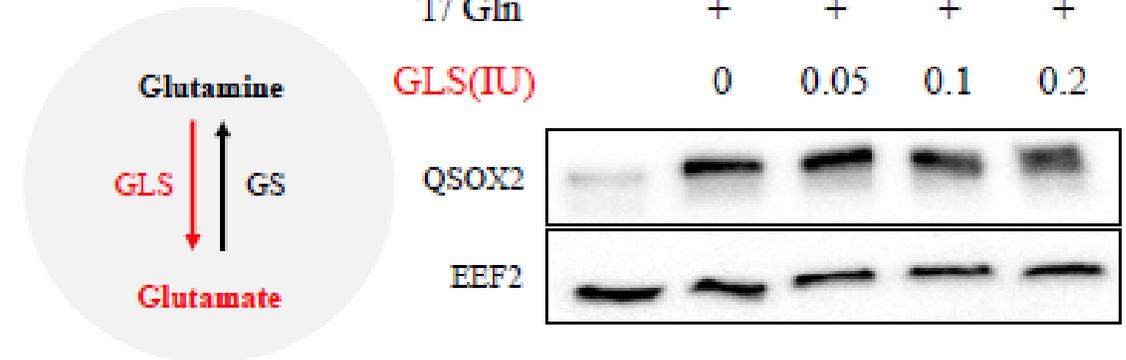


# Glutamine-to-glutamate conversion is required for QSOX2 biogenesis

A

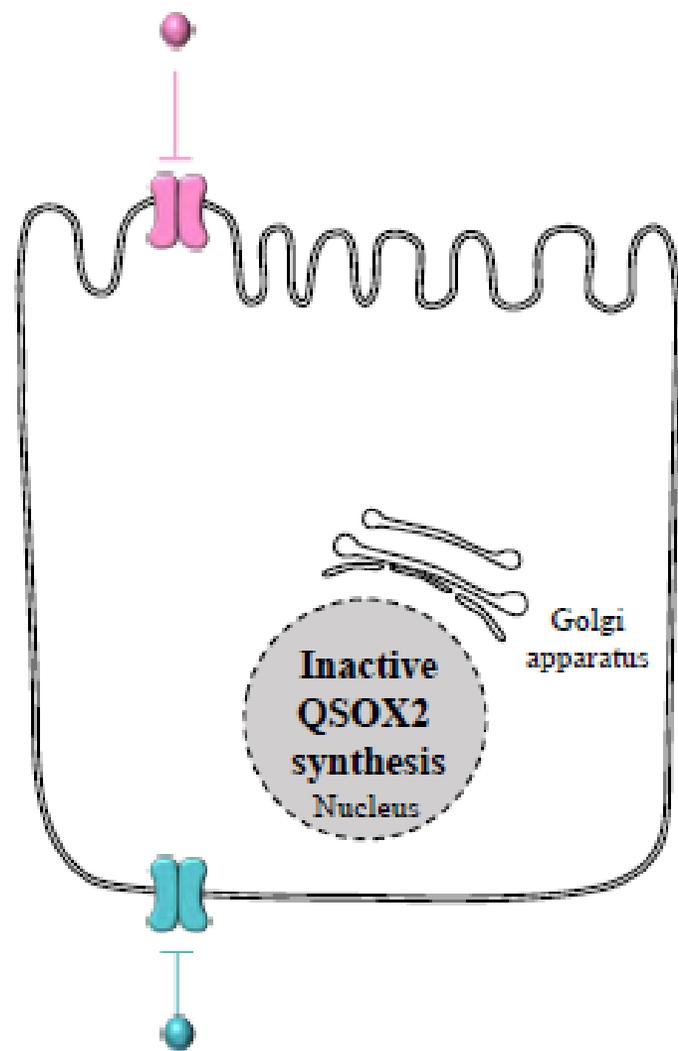


B

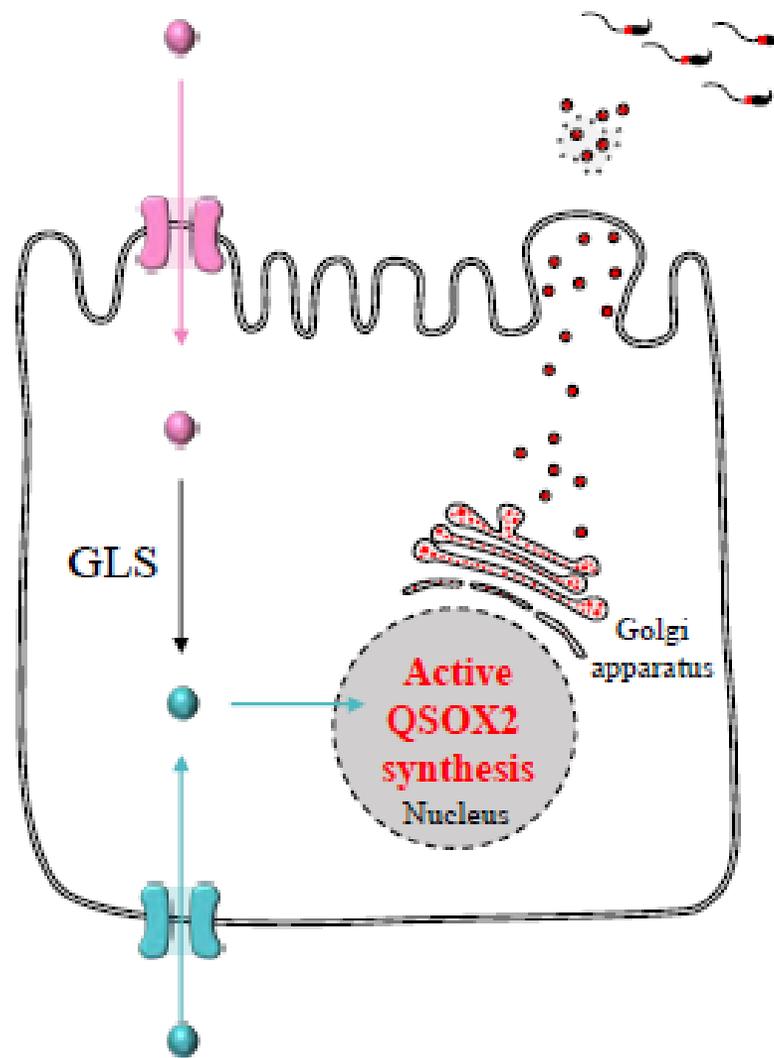


## Schematic conclusion

- Testosterone deficiency



- Testosterone supplement



- QSOX2
- Membrane vesicles containing QSOX2
- Glutamine
- Glutamine transporter
- Glutamate
- Glutamate transporter

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**Pei-shiue Jason Tsai**

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Dr. Hiroko Tsukamura

**Uni. of Edinburg, UK**

Dr. Lee Smith

**Uni. Newcastle, AUS**

Dr. Brett Nixon

Dr. Matt Dun

**Mackay Memorial Hospital, TW**

Dr. Sheng Hsiang Li

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科技  
Ministry of Science and Technology



4<sup>th</sup> UT-NTU Joint Conf. in Utokyo, Dec. 2019