



THE UNIVERSITY OF HONG KONG
LI KA SHING FACULTY OF MEDICINE
香港大學李嘉誠醫學院



Centre for Reproduction, Development and Growth
Li Ka Shing Faculty of Medicine
The University of Hong Kong

HKU with an international research team identifies the key molecule for sperm-egg binding

The vital process that marks the beginning of human life

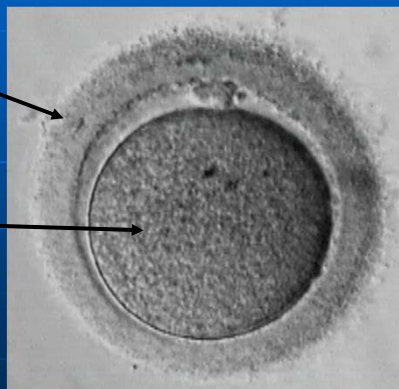
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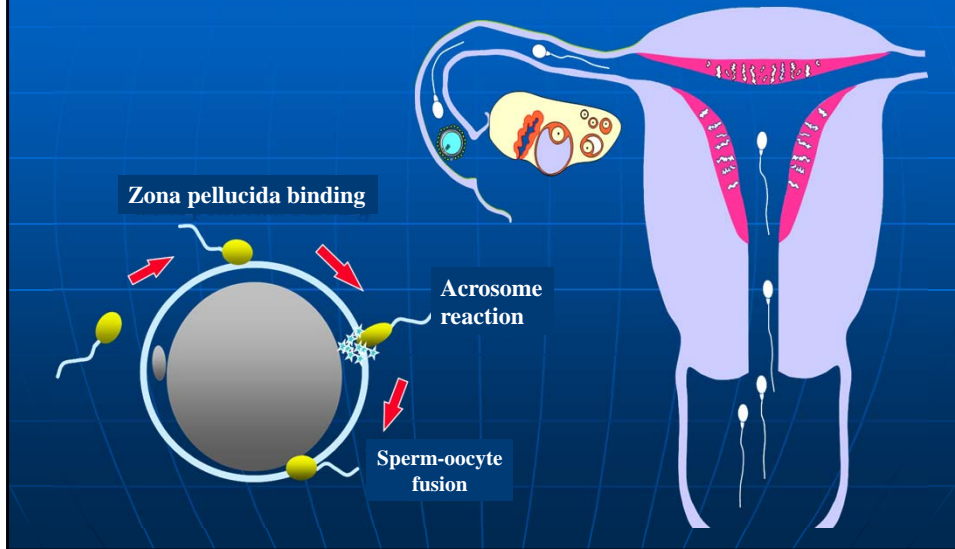
Human egg is surrounded by the zona pellucida

Zona pellucida

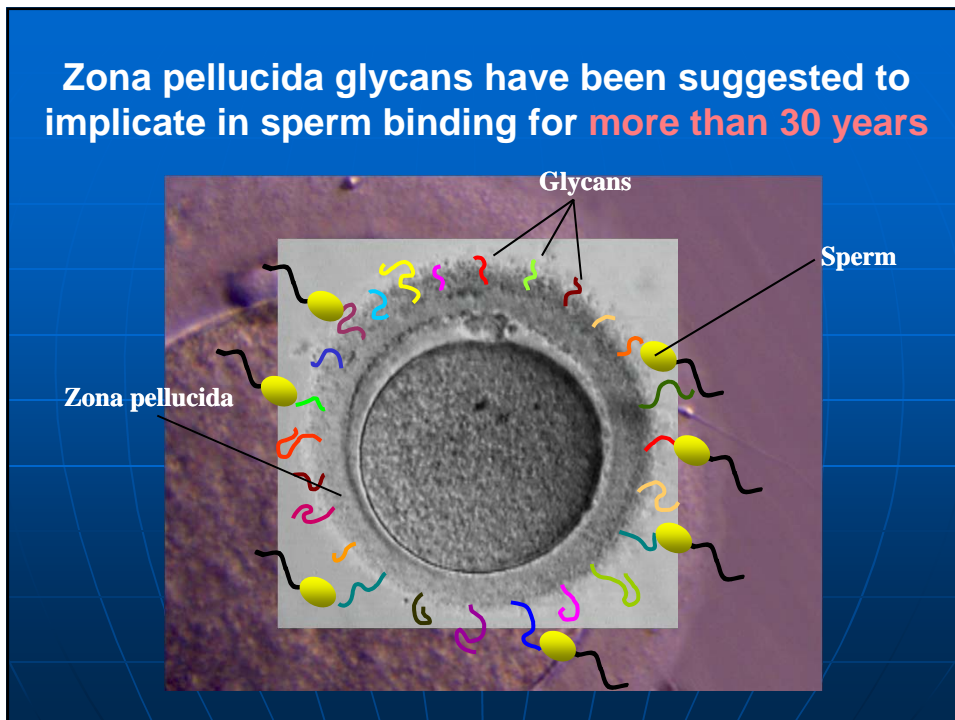
Egg



Sperm-zona pellucida binding enabling the initiation of fertilization, the vital process that marks the beginning of human life.



Zona pellucida glycans have been suggested to implicate in sperm binding for **more than 30 years**



Glycan: sugar chain of monosaccharides

Examples of Disaccharides:



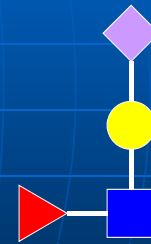
Sucrose



Examples of Monosaccharides:

- Glucose (Glc)
- Mannose (Man)
- Galactose (Gal)
- N-Acetylglucosamine (GlcNAc)
- N-Acetylgalactosamine (GalNAc)
- ◆ N-Acetylneuraminic acid (Neu5Ac)
- ▲ Fucose (Fuc)

Example of glycan:

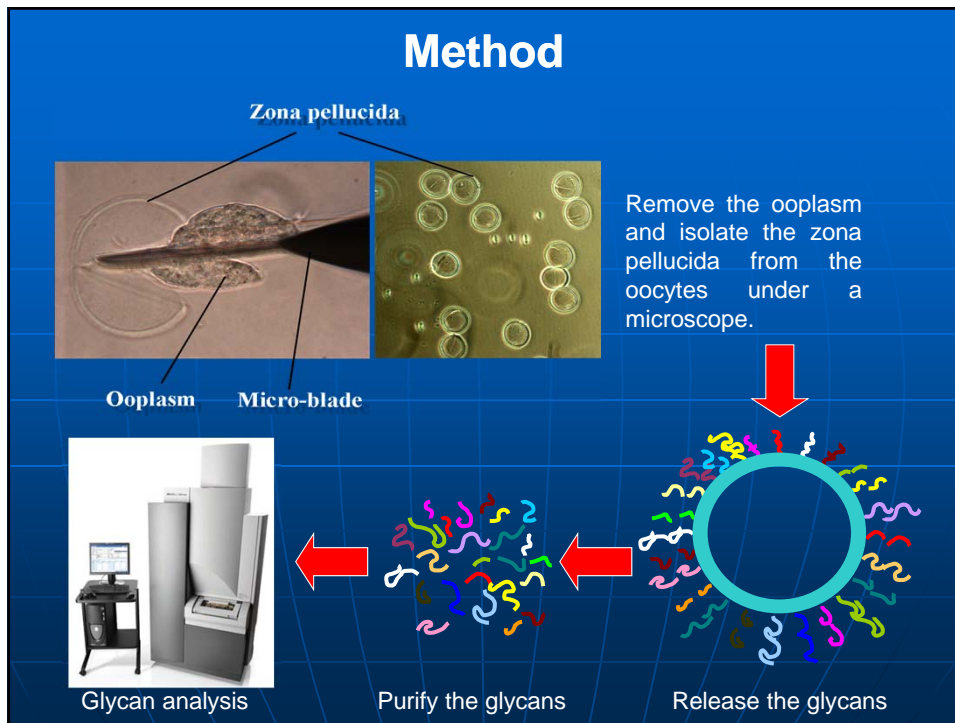


sialyl-Lewisx (SLeX)

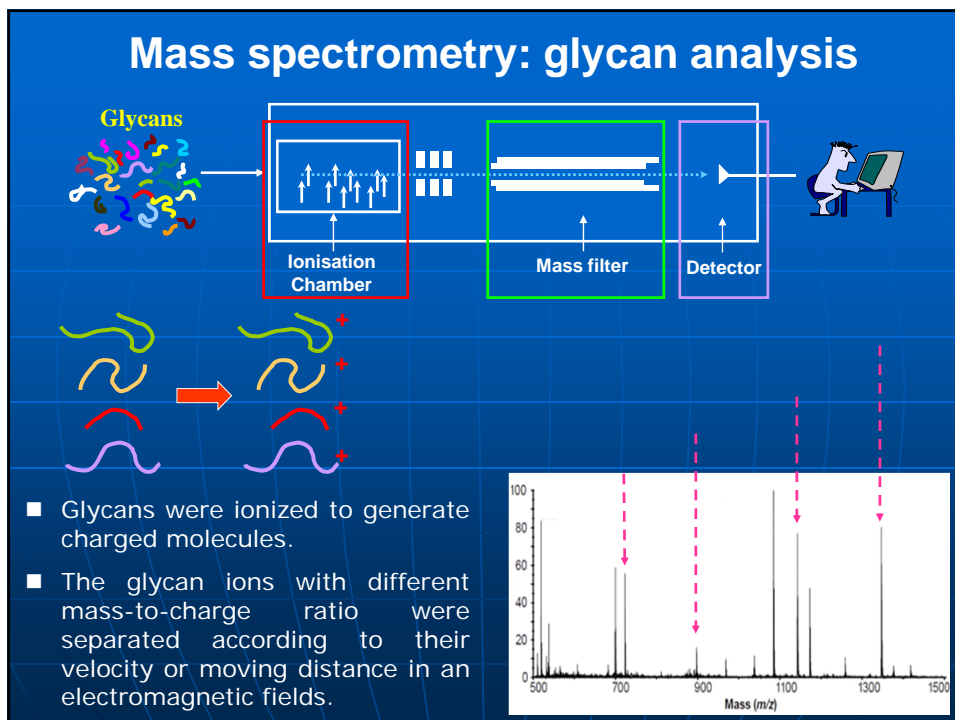
Objective 1

Perform a detailed analysis of the glycans on human zona pellucida

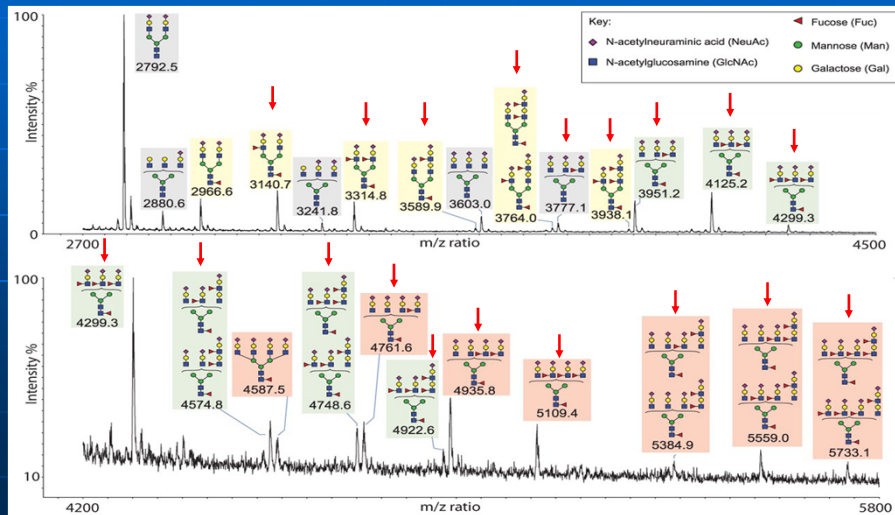
Method



Mass spectrometry: glycan analysis



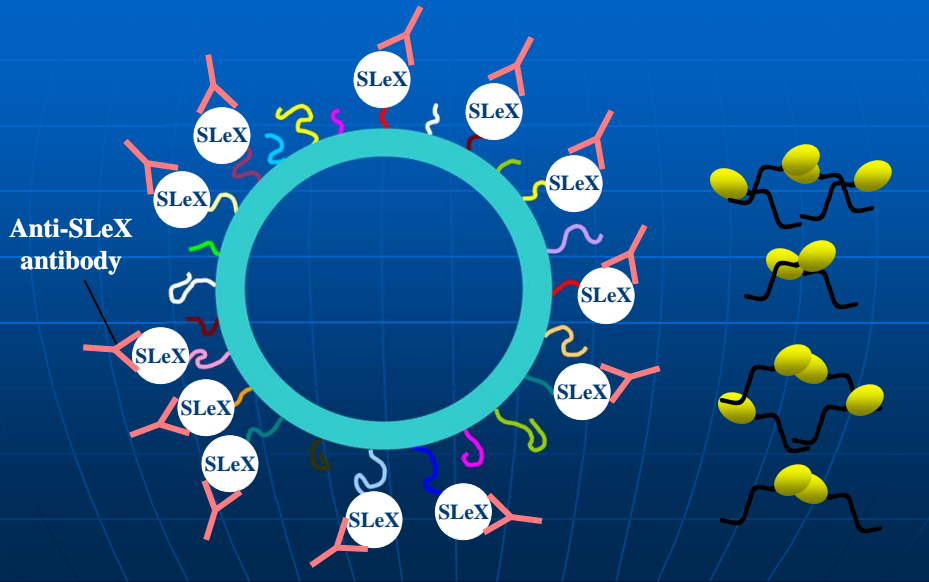
>70% terminal sequences of the zona pellucida glycans are SLeX



Objective 2

Study the role of SLeX on sperm-zona pellucida binding

Hypothesis 1: Anti-SLeX antibodies can recognize the SLeX glycans on zona pellucida and subsequently inhibit the sperm binding to zona pellucida.



Anti-SLeX antibody can recognize the SLeX glycans on zona pellucida

Fluorescent labeled anti-SLeX

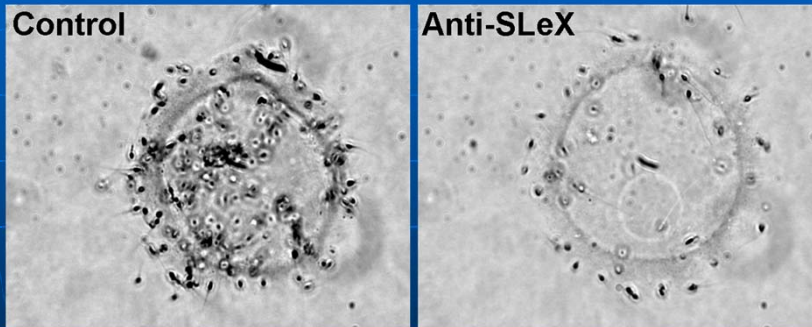
Anti-SLeX

Control

The egg was bisected by micromanipulator resulting in two identical hemizona.

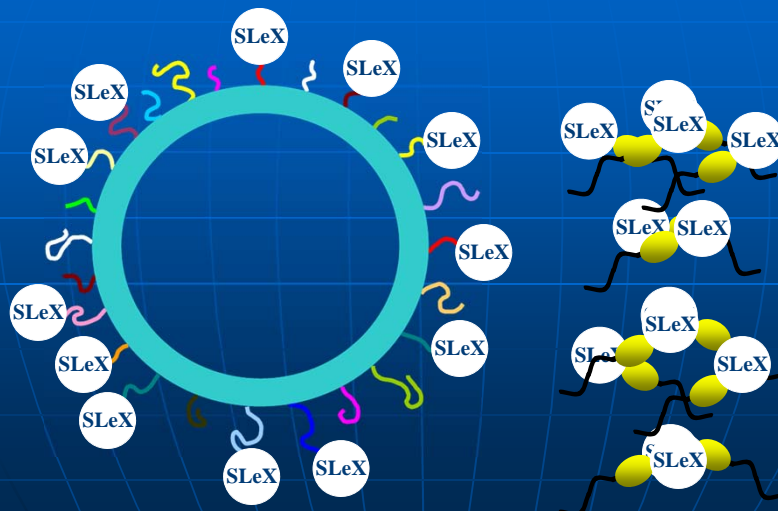
One group is treated with anti-SLeX antibody, while the control group is not.

Anti-SLeX antibody inhibits sperm binding to zona pellucida

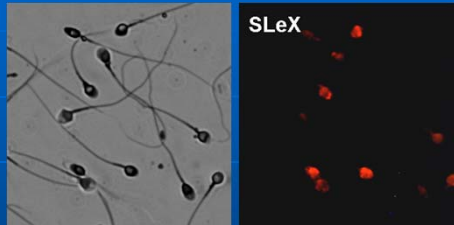
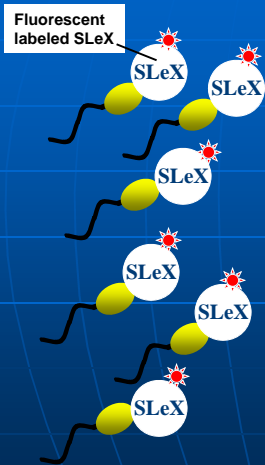


Anti-SLeX antibody treatment reduced the sperm-binding capacity of zona pellucida by about 80%

Hypothesis 2: Exogenous SLeX can bind to the unknown SLeX-binding protein on sperm and subsequently inhibit the sperm binding to zona pellucida.

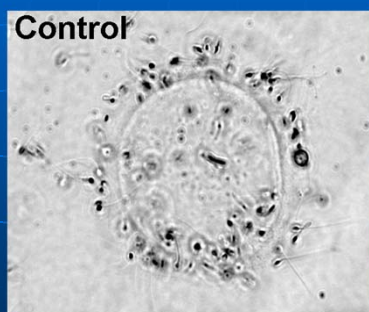


Exogenous SLeX can bind to the unknown SLeX-binding protein on sperm



One group is treated with exogenous SLeX, while the control group is not.

Exogenous SLeX can inhibit that sperm binding to zona pellucida



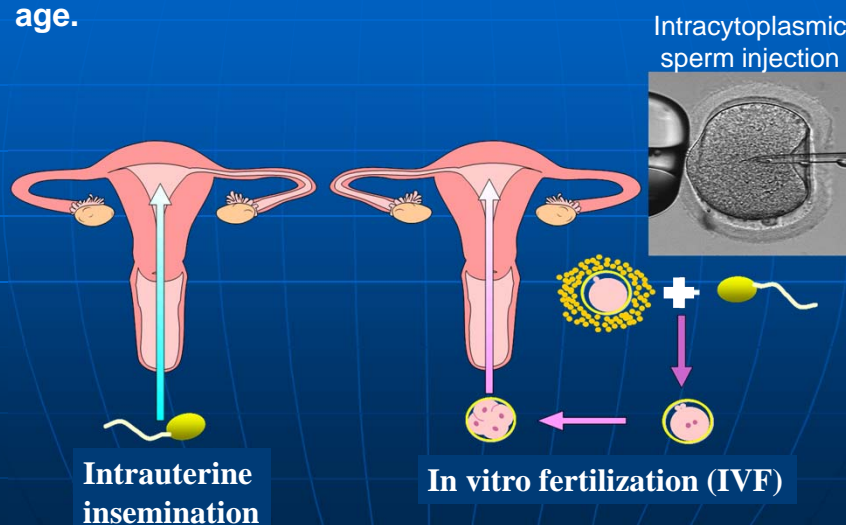
Exogenous SLeX treatment reduced the zona pellucida binding capacity of sperm by about 70%

Significance of the findings 1

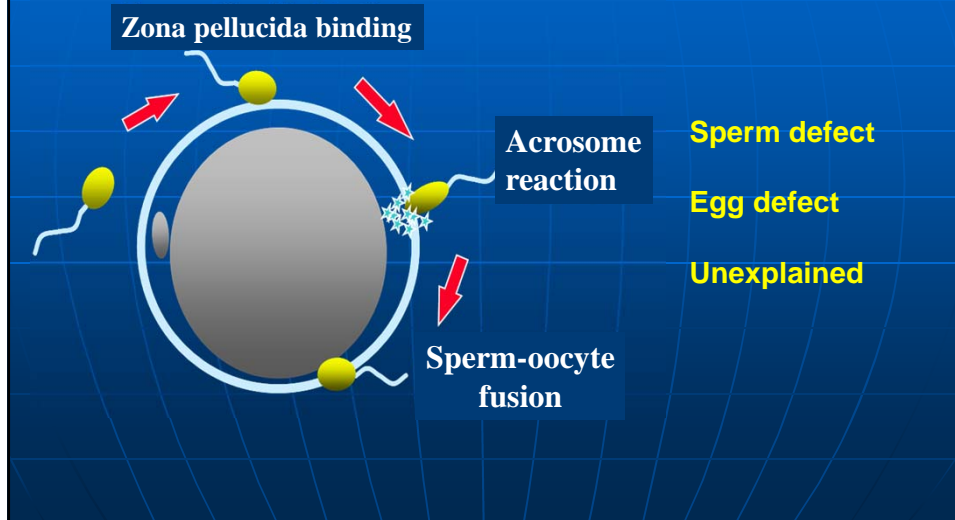
- Provides insight to the key interaction essential for natural human fertilization.

Treatment of infertility

- Infertility affects about 15% of couples of reproductive age.



Fertilization failure



Defective sperm-egg binding

- Defective sperm-zona pellucida binding is an important cause of fertilization failure in clinical assisted reproduction.
- Defective sperm-zona pellucida binding occurs
 - in men with poor sperm morphology: more than 25%
 - in men with normal sperm: about 15%
- The identification of patients with such defect is difficult
 - lack of knowledge on sperm-egg binding
 - current diagnostic methods are difficult

Significance of the findings 2

- Develop diagnostic method for defective sperm-egg binding and novel methods for fertility regulation.

The international research team

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Purification of
zona pellucida
and SLeX
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Academia Sinica, Taiwan

Professor Kay-Hooi KHOO

University of Missouri, Missouri

Professor Gary CLARK

Glycan analysis

Q & A Session