Role of stem cells in male infertility

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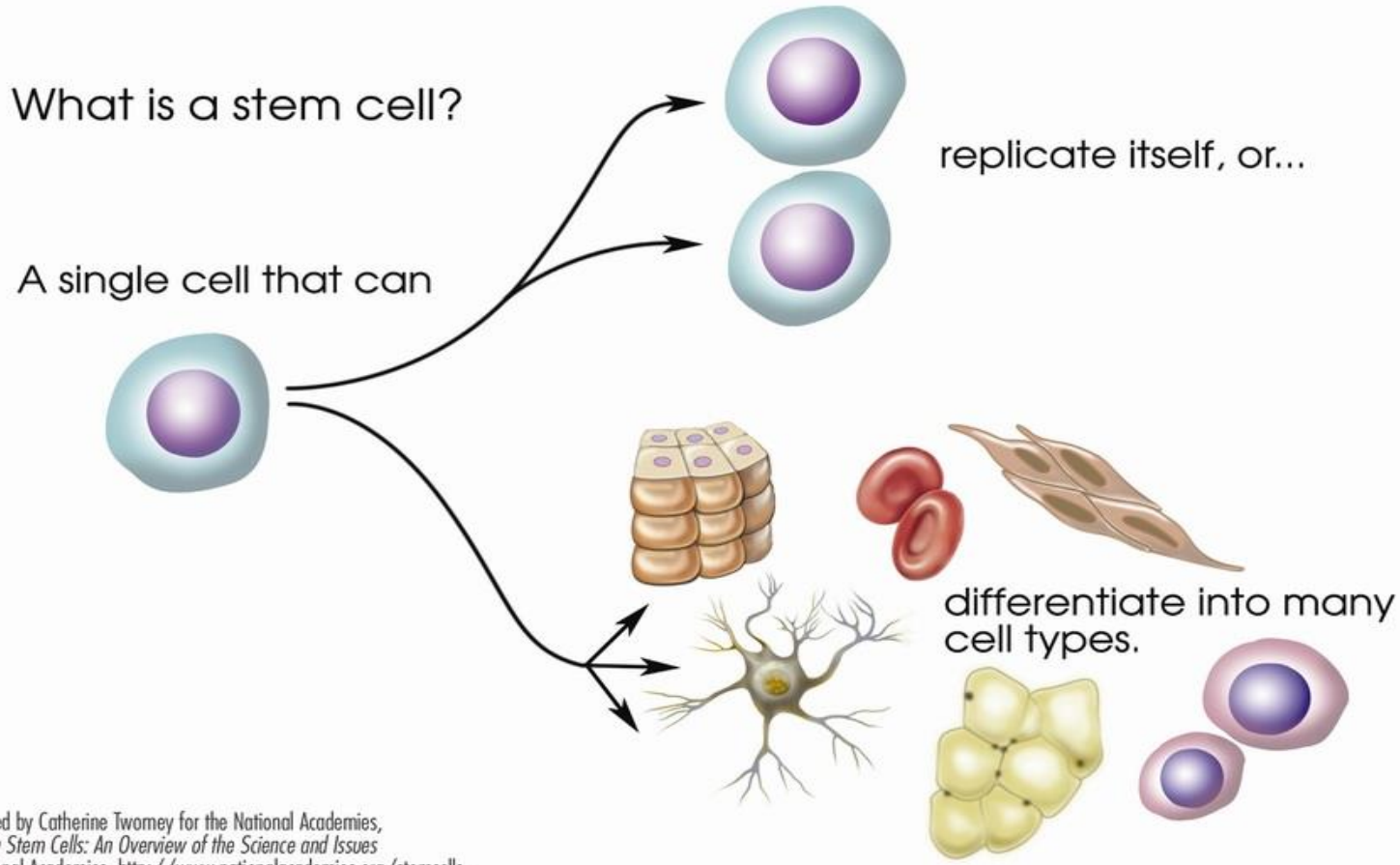
Topic outlines

I. Introduction to stem cell biology	II. Stem cell and male infertility
Definition	Male infertility: Where we stand
Properties	Era of artificial spermatozoa and potential role of stem cells
Stem cell cycle	Future perspectives
Classifications (types)	Stem cells: The dark side
Clinical applications	

Definition

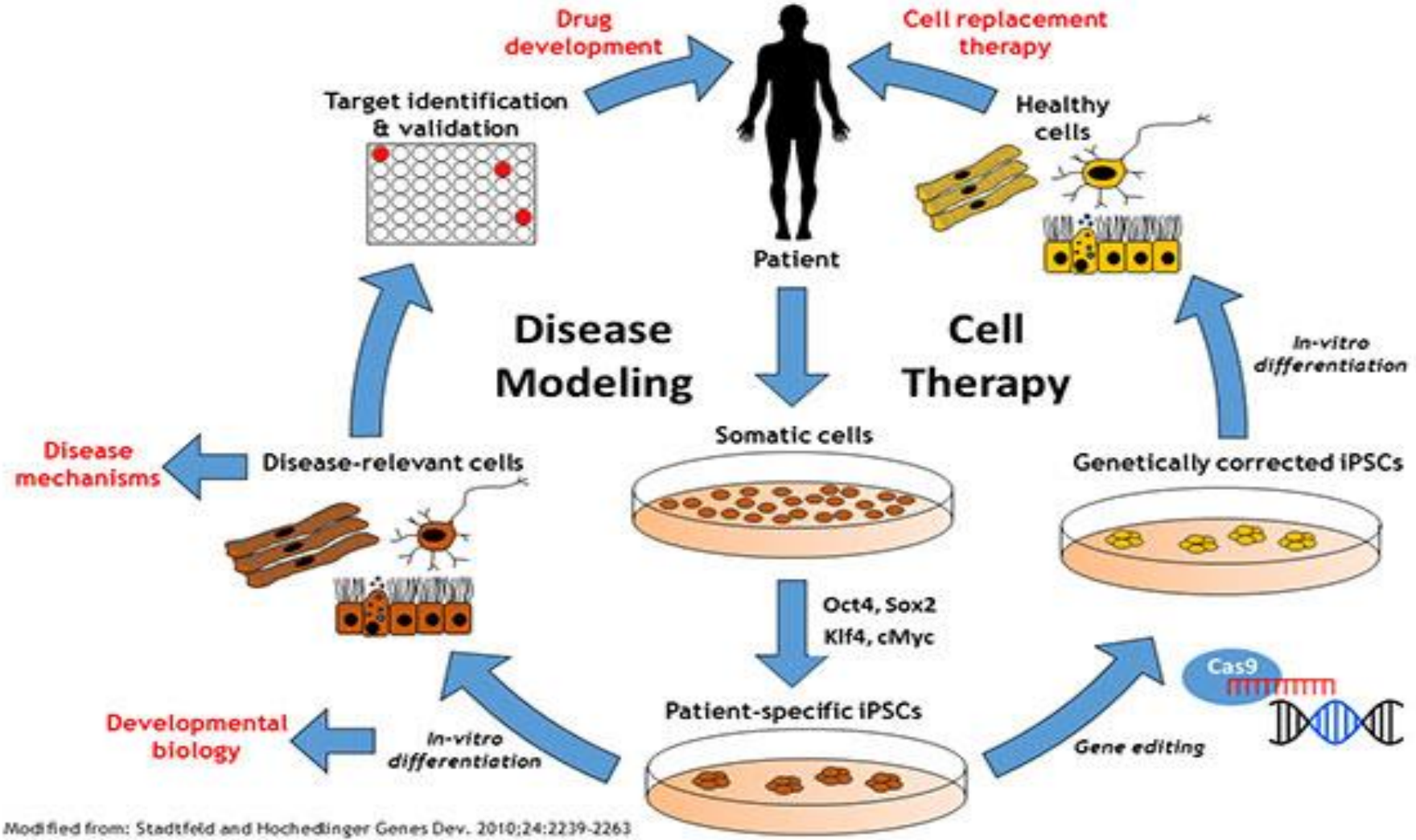
- stem cells are unspecialized (undifferentiated) cells that are characteristically of the same family type (lineage). They retain the ability to divide throughout life and give rise to cells that can become highly specialized and take the place of cells that die or are lost *(Avasthi et al., 2008)*



Stem cells: classifications

A) According to potency

B) According to tissue of origin



Modified from: Stadtfeld and Hochedinger Genes Dev. 2010;24:2239-2263

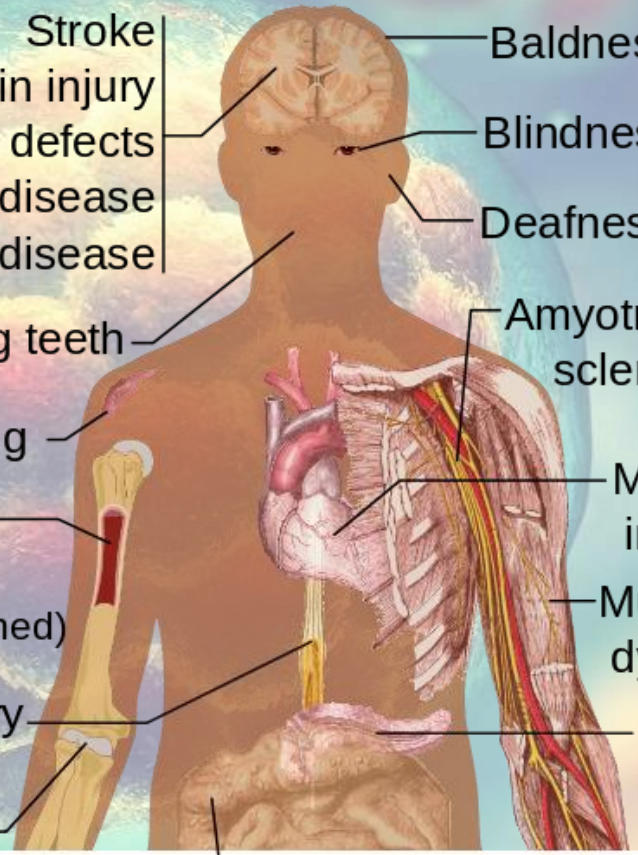
Sir John B. Gurdon

Shinya Yamanaka

The Nobel Prize in Physiology or Medicine 2012 was awarded jointly to Sir John B. Gurdon and Shinya Yamanaka "for the discovery that mature cells can be reprogrammed to become pluripotent"

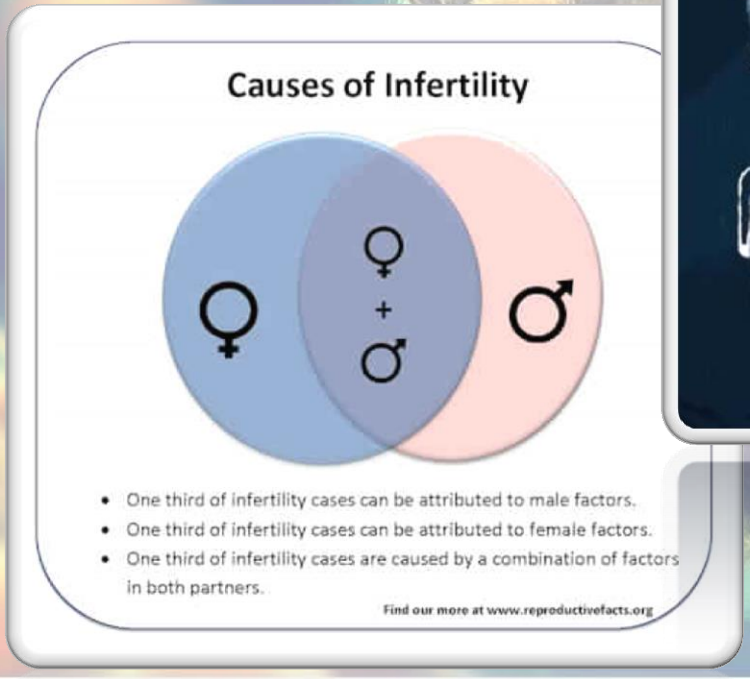
Potential uses of

Stem cells

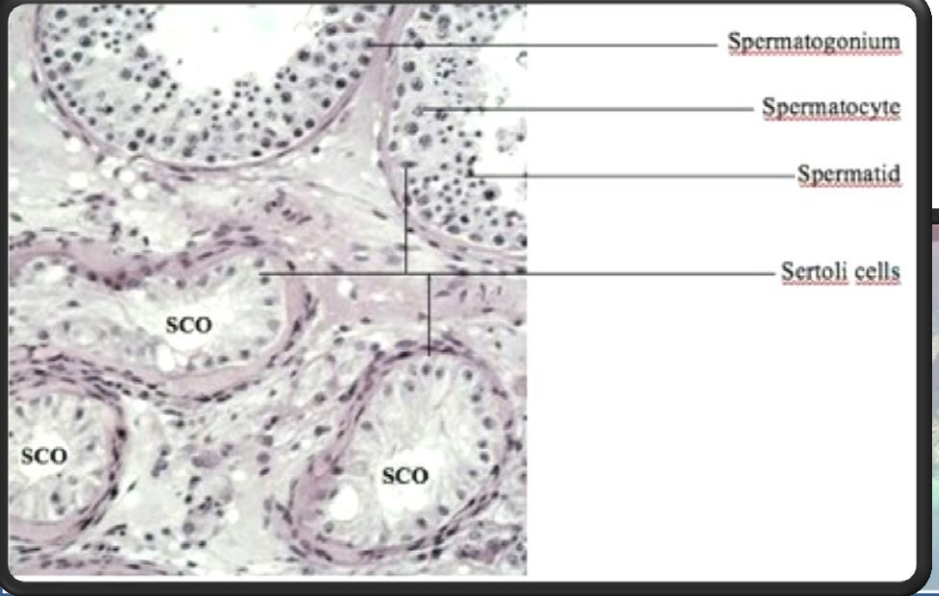


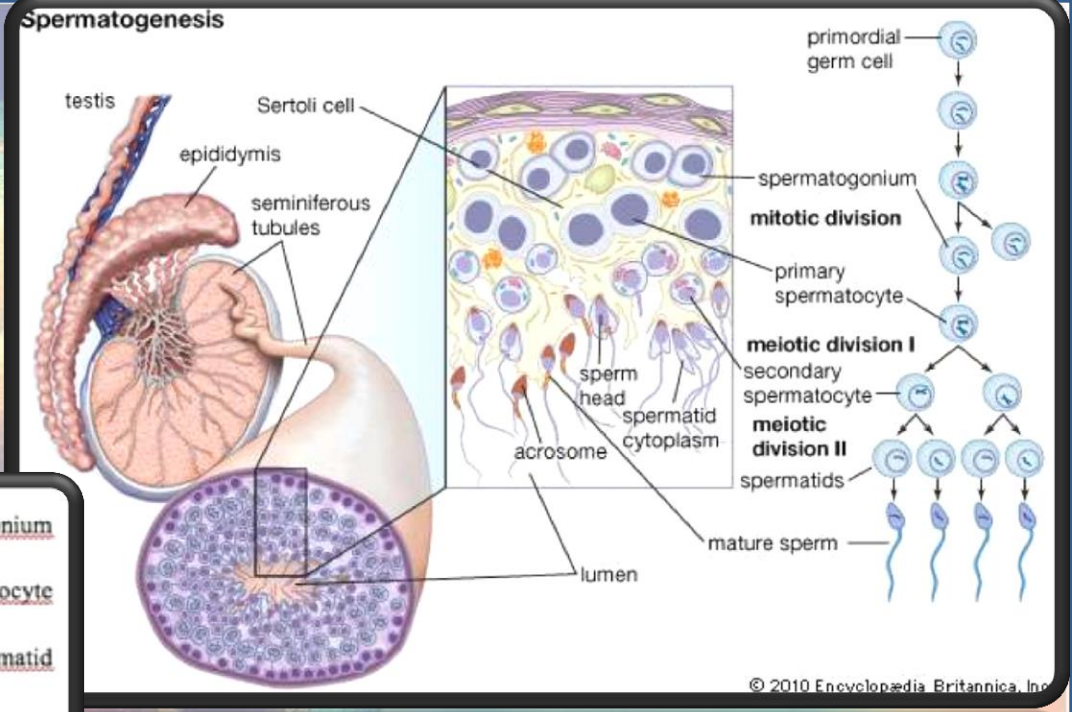
Stroke
Traumatic brain injury
Learning defects
Alzheimer's disease
Parkinson's disease
Missing teeth
Wound healing
Bone marrow transplantation (currently established)
Spinal cord injury
Osteoarthritis
Rheumatoid arthritis
Baldness
Blindness
Deafness
Amyotrophic lateral-sclerosis
Myocardial infarction
Muscular dystrophy
Diabetes
Crohn's disease
Multiple sites: Cancers

Male infertility: where we stand

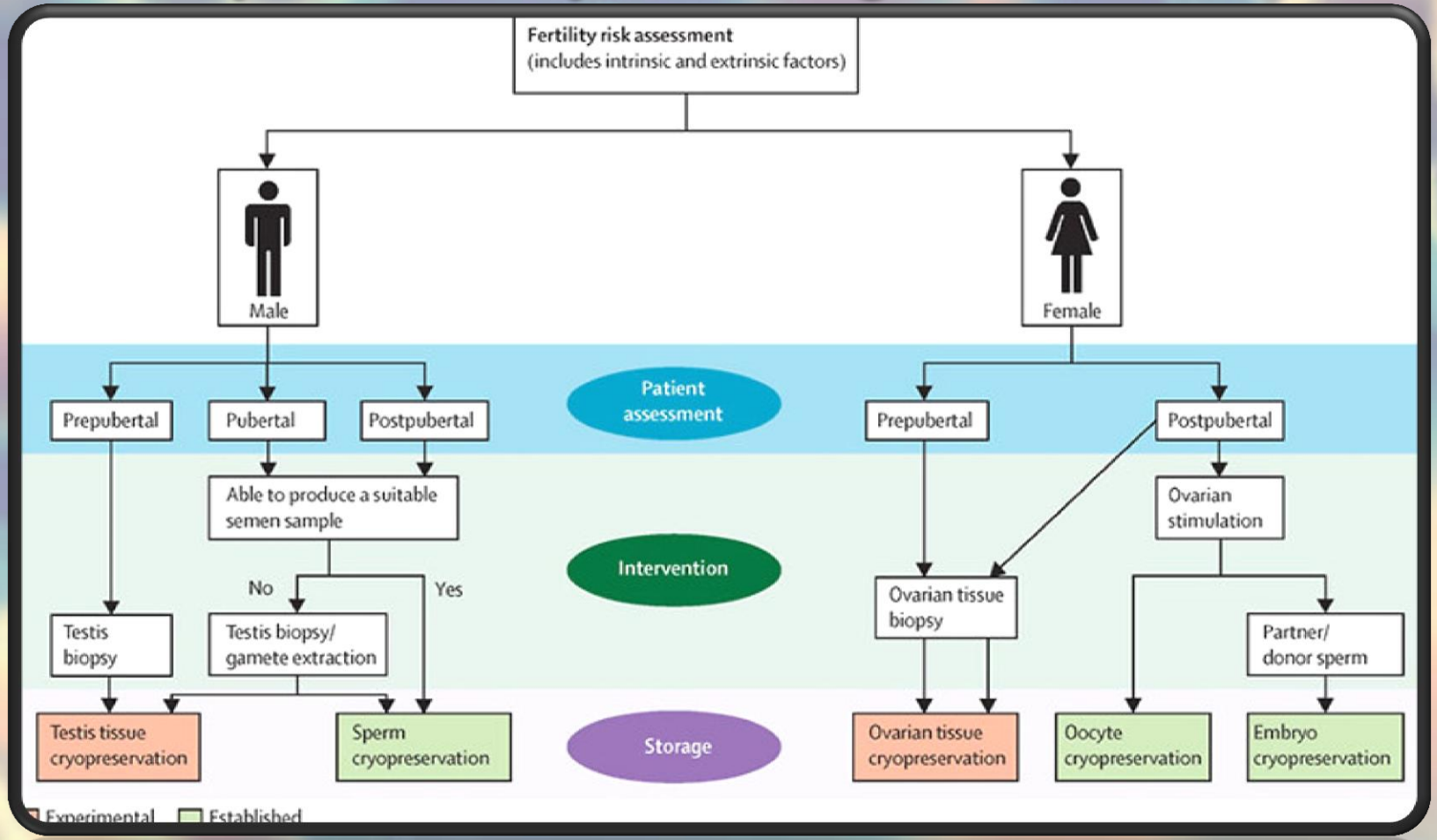


- **Testicular failure & Sertoli cell only syndrome ??**





• Prepubertal boys suffering from cancer??

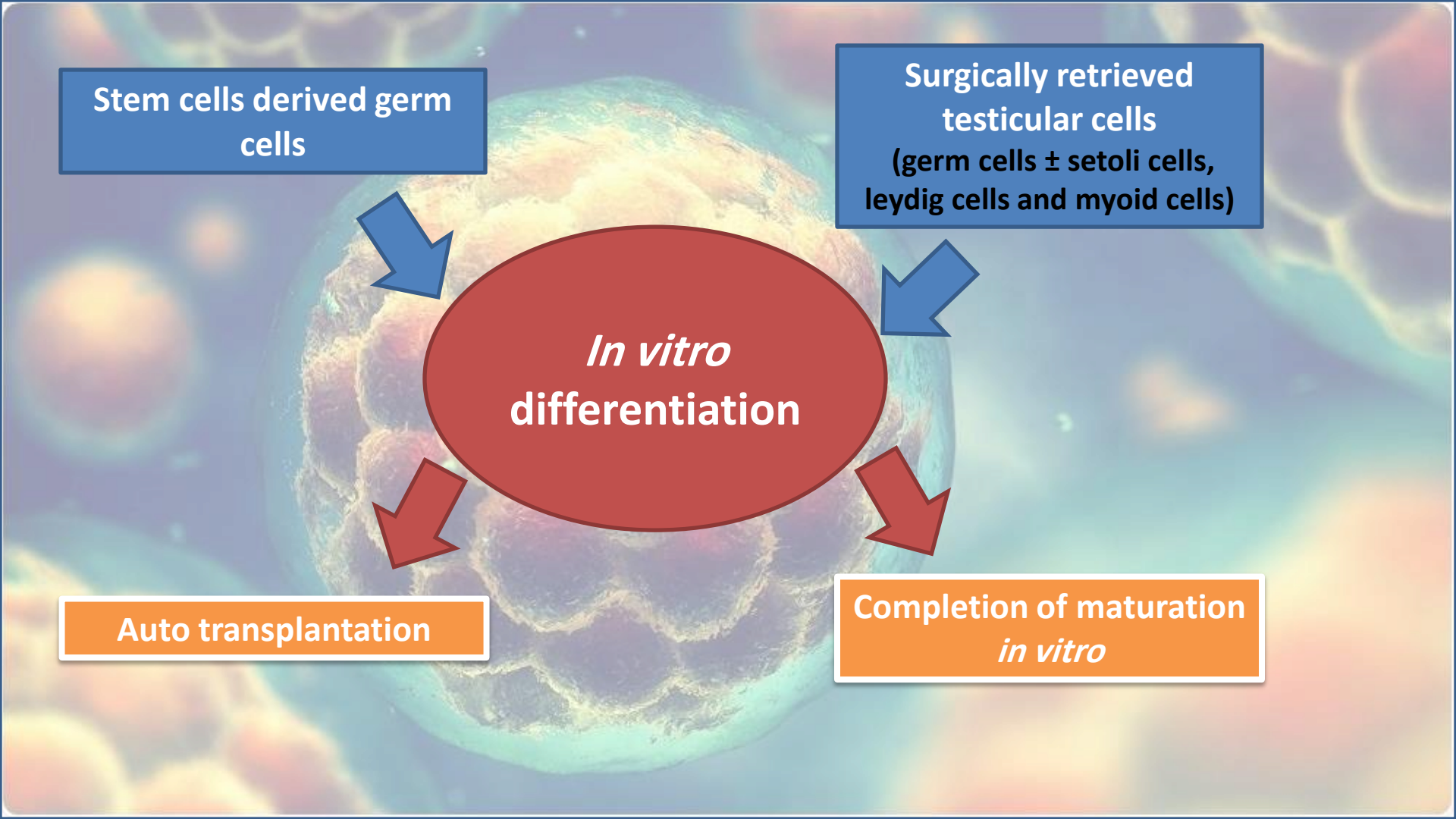


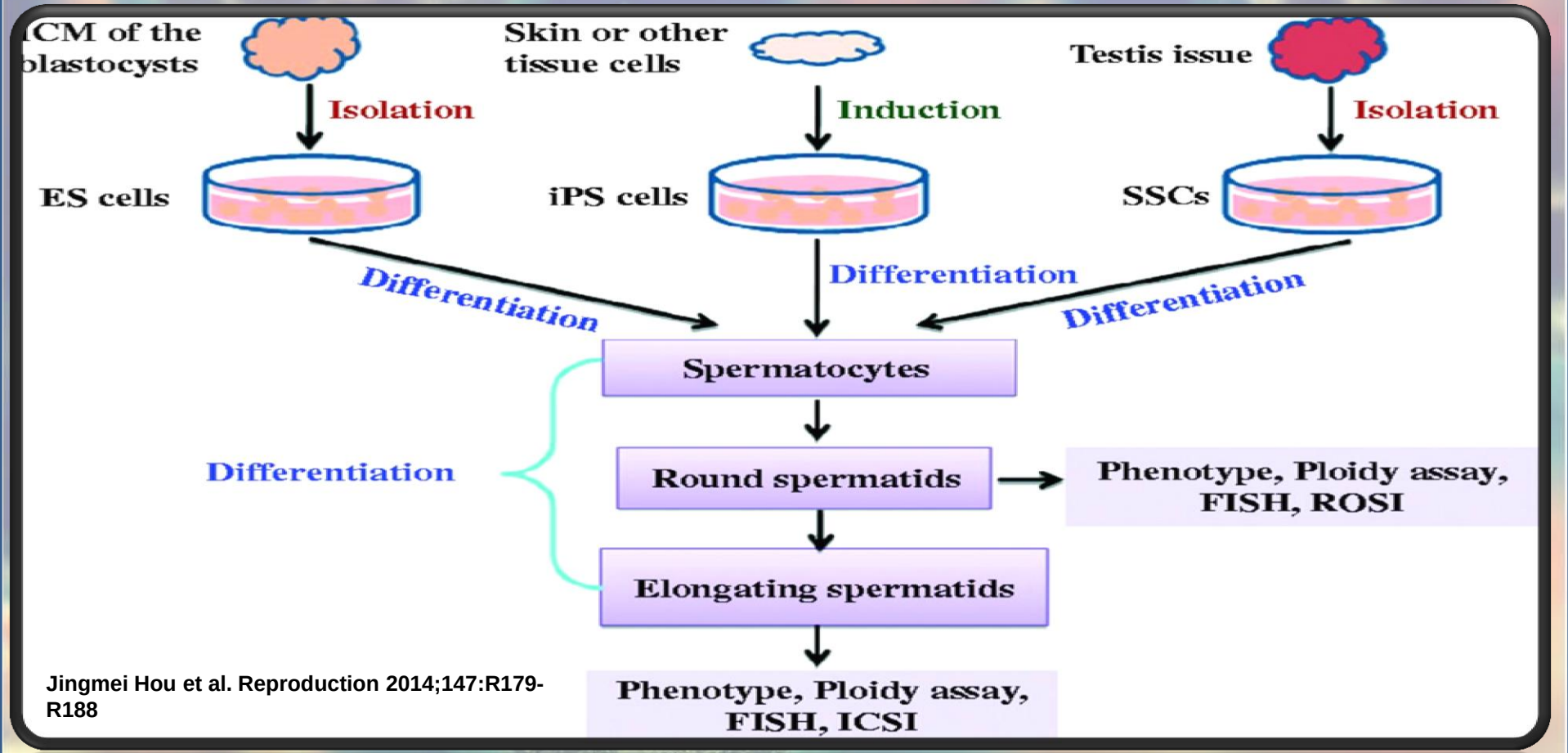
Adoption: is it a solution?

The use of donated sperm seems only to be a palliative solution. In fact, most couples wish to have their own genetically related child *(Ishii, 2014)*.

bypassing in vivo spermatogenic failure: The era of artificial spermatozoa

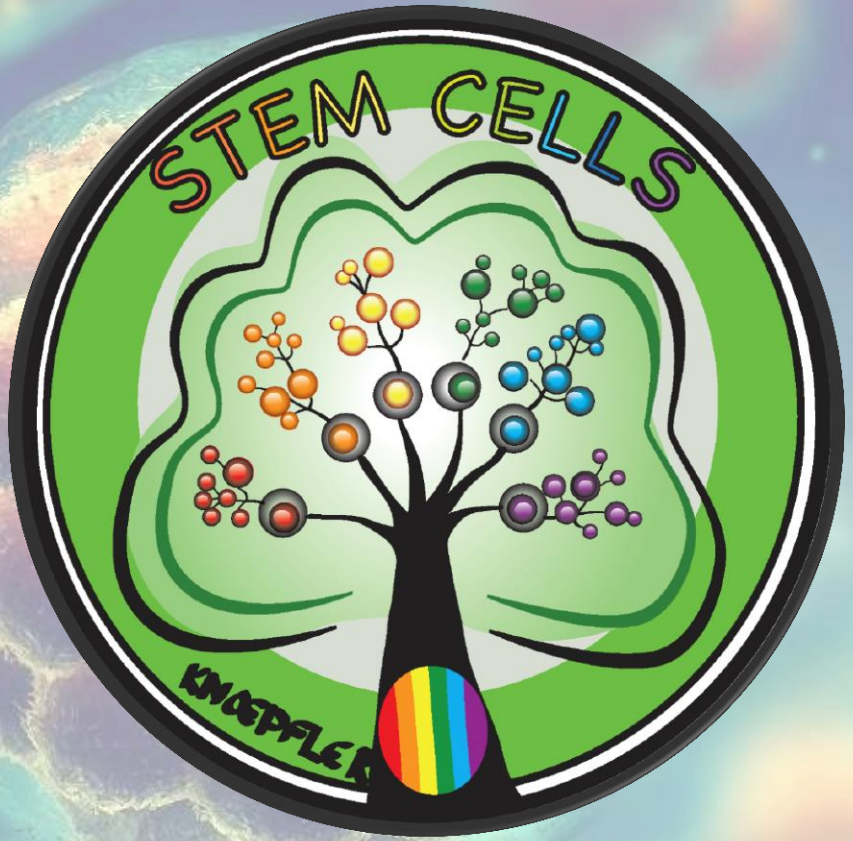
- An extensive research has been carried out since the 20th century to bypass in vivo spermatogenic failure, trying to create what is called “artificial spermatozoa”.
- Those research efforts can be summarized as follows *(Hendriks et al., 2015; Shabataev and Tal, 2017; Alves-Lopes and Stukenborg, 2017)*:


Stem cells derived germ cells
Surgically retrieved testicular cells (germ cells ± setoli cells, leydig cells and myoid cells)
In vitro differentiation
Auto transplantation
Completion of maturation *in vitro*



Jingmei Hou et al. Reproduction 2014;147:R179-R188

Schematic diagram shows the derivation of male differentiated germ cells from various types of stem cells.



Thank you