

The background of the slide features a central, glowing globe-like structure with a textured, yellow and orange surface, set against a dark blue background. Surrounding this central element are various microscopic cell-like structures, some with green and yellow outlines, and others with red and blue hues, all appearing to be in motion or interacting.

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*)

What is a stem cell?

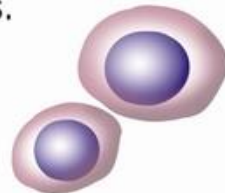
A single cell that can



replicate itself, or...



differentiate into many cell types.

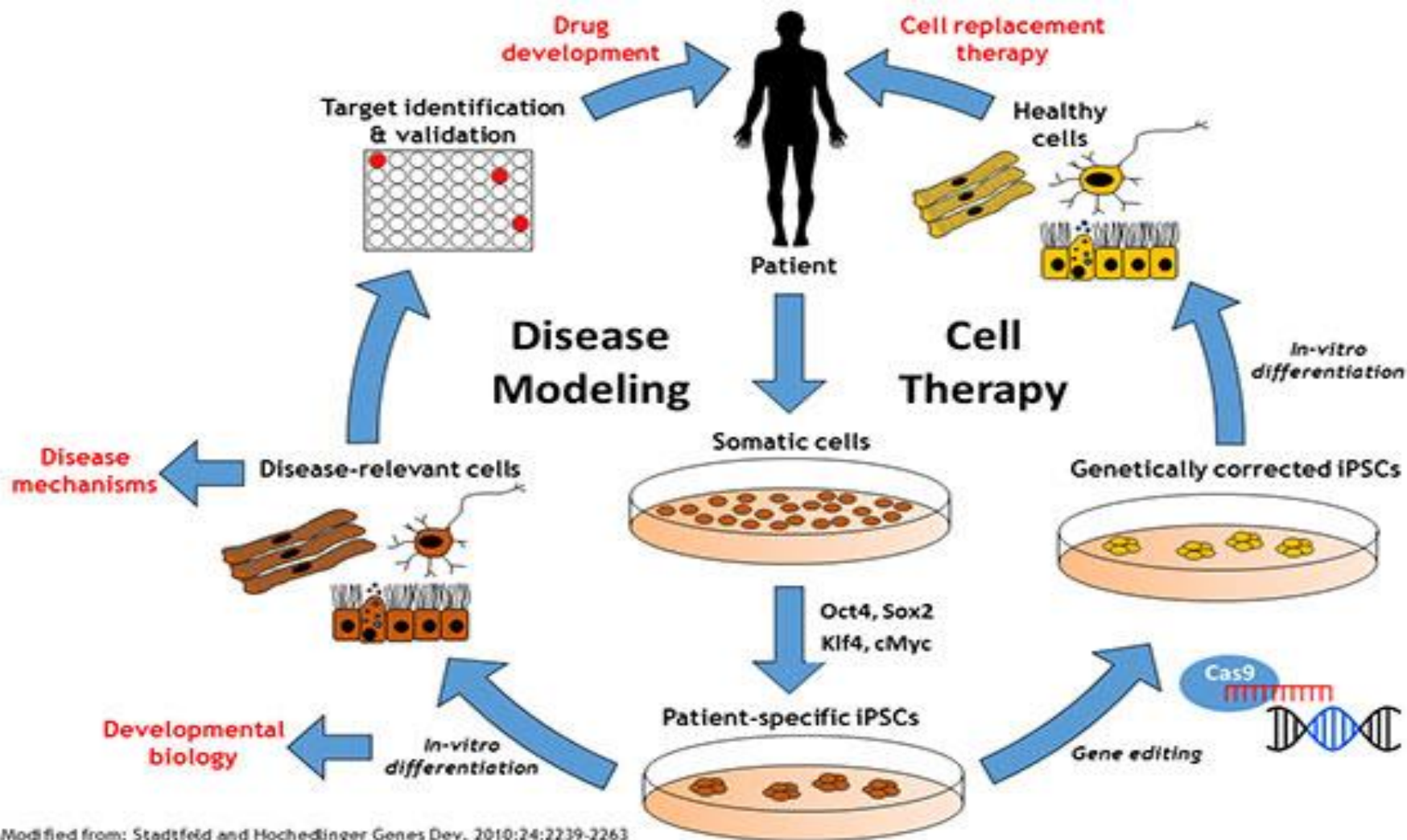


Stem cells: classifications

A microscopic image showing a large, spherical cluster of cells, likely a stem cell colony, with a textured, porous appearance. The cells are colored in shades of yellow, orange, and red, set against a blue and green background. The cluster is the central focus of the image.

A) According to potency

B) According to tissue of origin





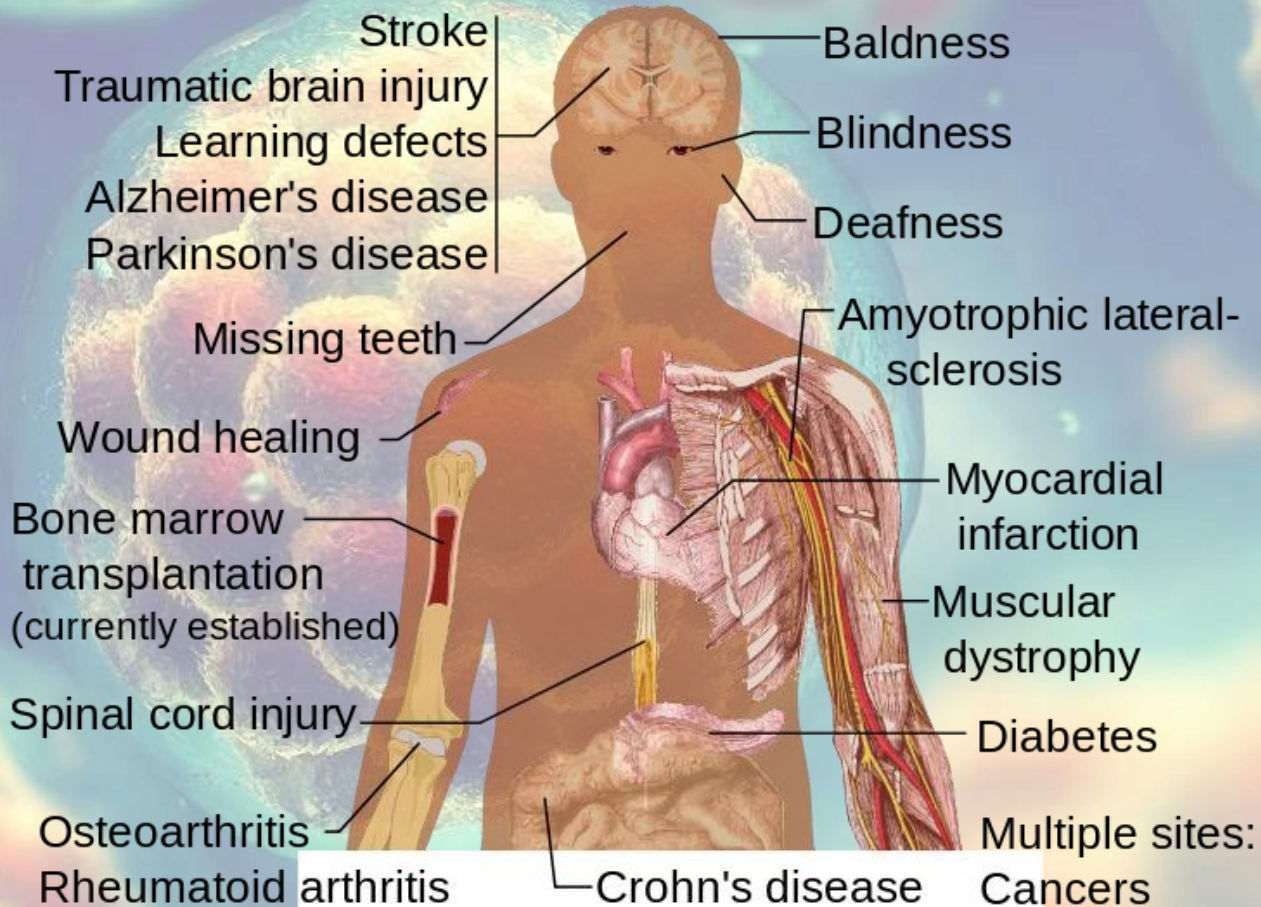
Sir John B. Gurdon



Shinya Yamanaka

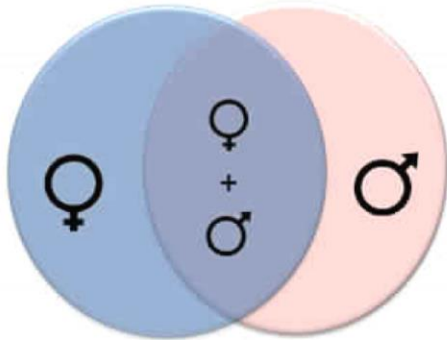
The Nobel Prize in Physiology or Medicine 2012 was awarded jointly to Sir John B. Gurdon and Shinya Yamanaka "for the discovery that **mature cells can be reprogrammed to become pluripotent**"

Potential uses of **Stem cells**



Male infertility: where we stand

Causes of Infertility



- One third of infertility cases can be attributed to male factors.
- One third of infertility cases can be attributed to female factors.
- One third of infertility cases are caused by a combination of factors in both partners.

Find our more at www.reproductivefacts.org



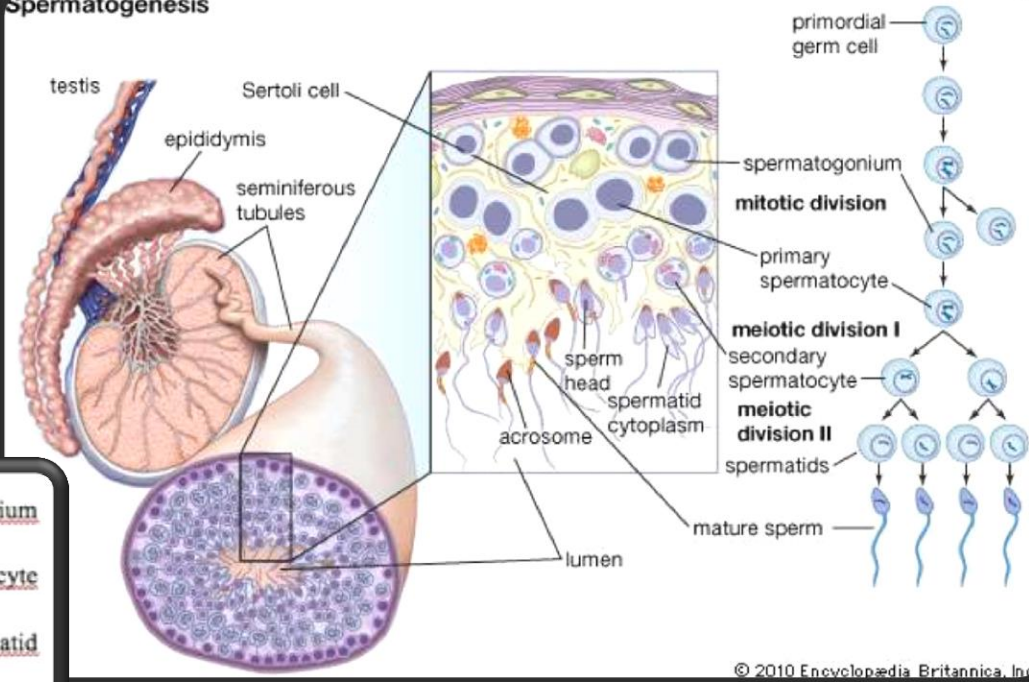
1 in **8** couples experience infertility.

USATODAY
NETWORK

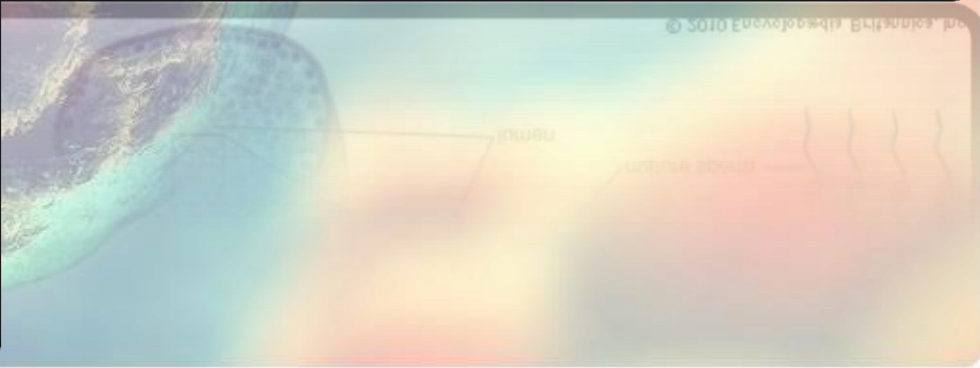
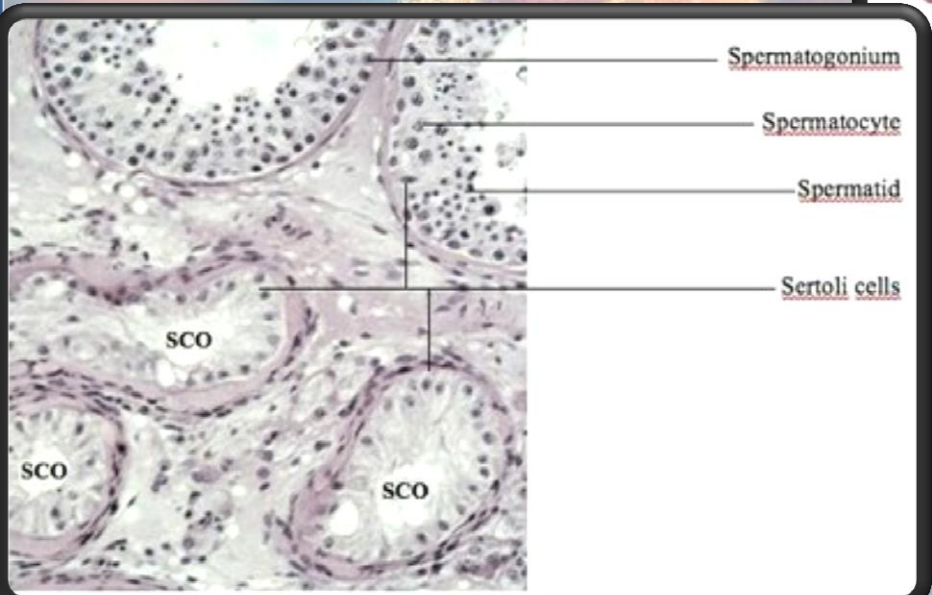


• Testicular failure & Sertoli cell only syndrome ??

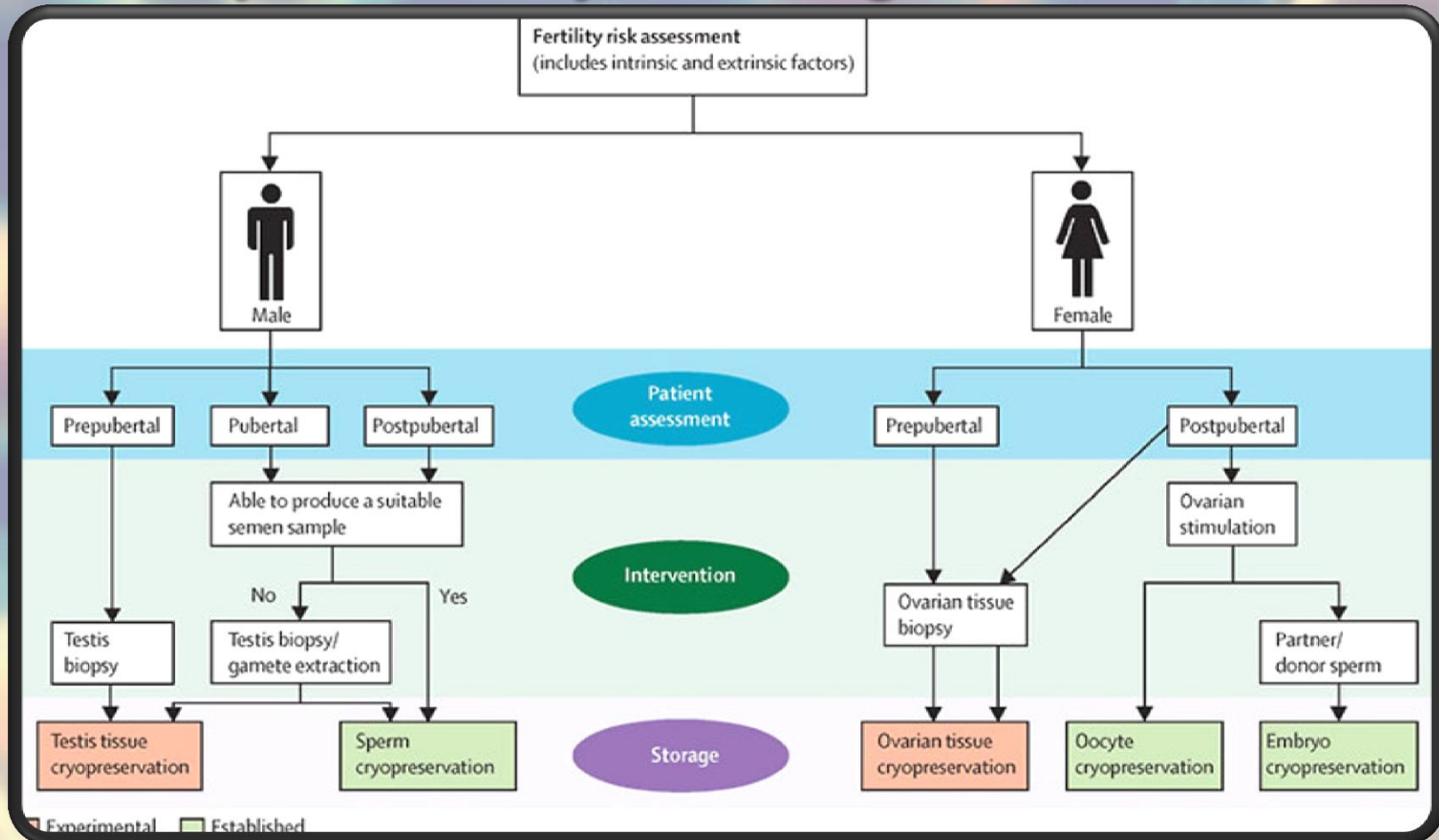
Spermatogenesis



© 2010 Encyclopædia Britannica, Inc.



• 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*):

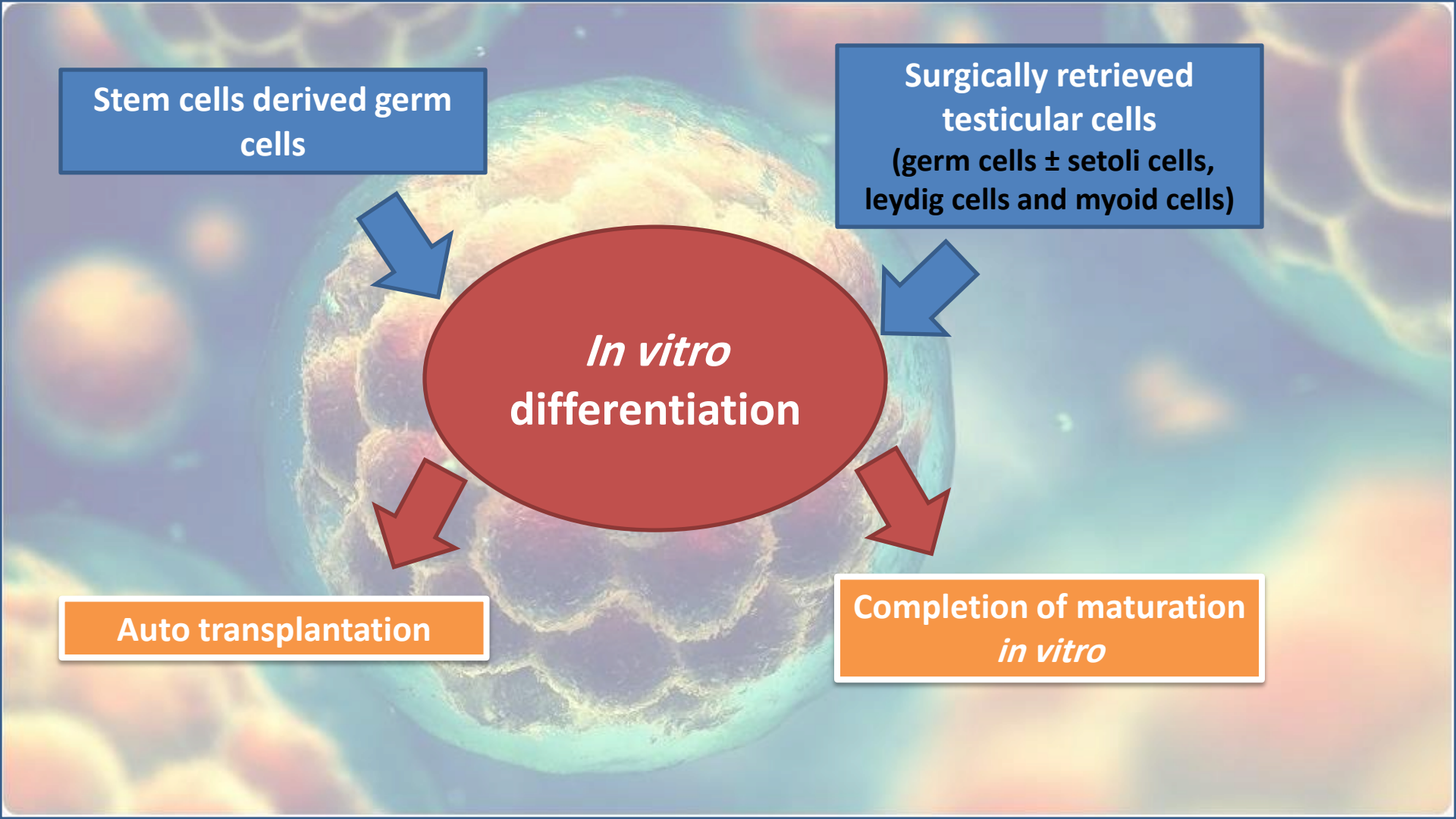
Stem cells derived germ cells

Surgically retrieved testicular cells
(germ cells ± setoli cells,
leydig cells and myoid cells)

In vitro
differentiation

Auto transplantation

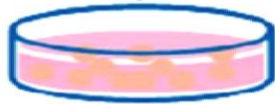
Completion of maturation
in vitro



CM of the blastocysts



Isolation

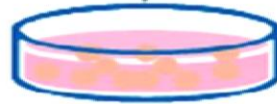


ES cells

Skin or other tissue cells



Induction

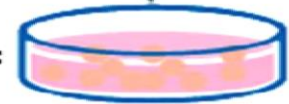


iPS cells

Testis issue



Isolation



SSCs

Differentiation

Differentiation

Differentiation

Spermatocytes

Round spermatids

Elongating spermatids

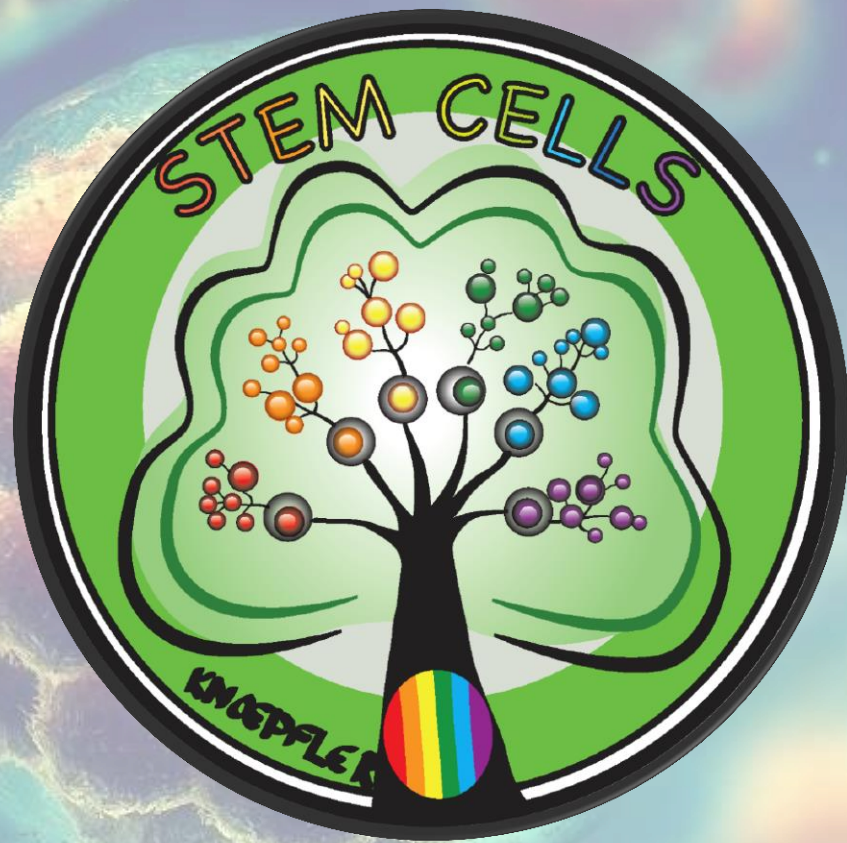
Phenotype, Ploidy assay, FISH, ICSI

Phenotype, Ploidy assay, FISH, ROSI

Differentiation

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