

Lab of Animal Biotechnology



Animal biotechnology Lab.
Department of Animal science and technology
Chung-Ang Univ.

The background of the slide is a dark blue gradient. On the left side, there is a large, detailed illustration of a DNA double helix structure, rendered in a light blue and white color. The DNA is shown in a 3D perspective, with the two strands twisted around each other. The word "Contents" is written in a large, white, sans-serif font, partially overlapping the DNA structure. A yellow square highlights the letter "C" in "Contents". A thick yellow horizontal line is positioned below the word "Contents".

Contents

1. Lab information
2. Major Research Fields
3. Established technology
4. Application

Lab members

1. Lab information



Professor

Buom-Yong Ryu



Research Prof.

Seung Hee Shin



Seok-Man Kim



Buom-Jin Shin



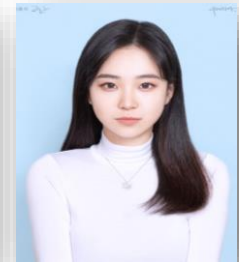
Hyo-Jin Gu



Gil-Un Han



Gi-Jung Ahn



Seul-Gi Kim



Eun-Ji Pang



Daniel C. Varias

Transgenic Animals - Resources



eGFP-C57BL/6 mouse



Balb/c mouse



eGFP SD rat



OG2-GFP mouse



Nude mouse



LacZ SD rat



Acro-GFP mouse



W/Wv mouse



Acomys mouse

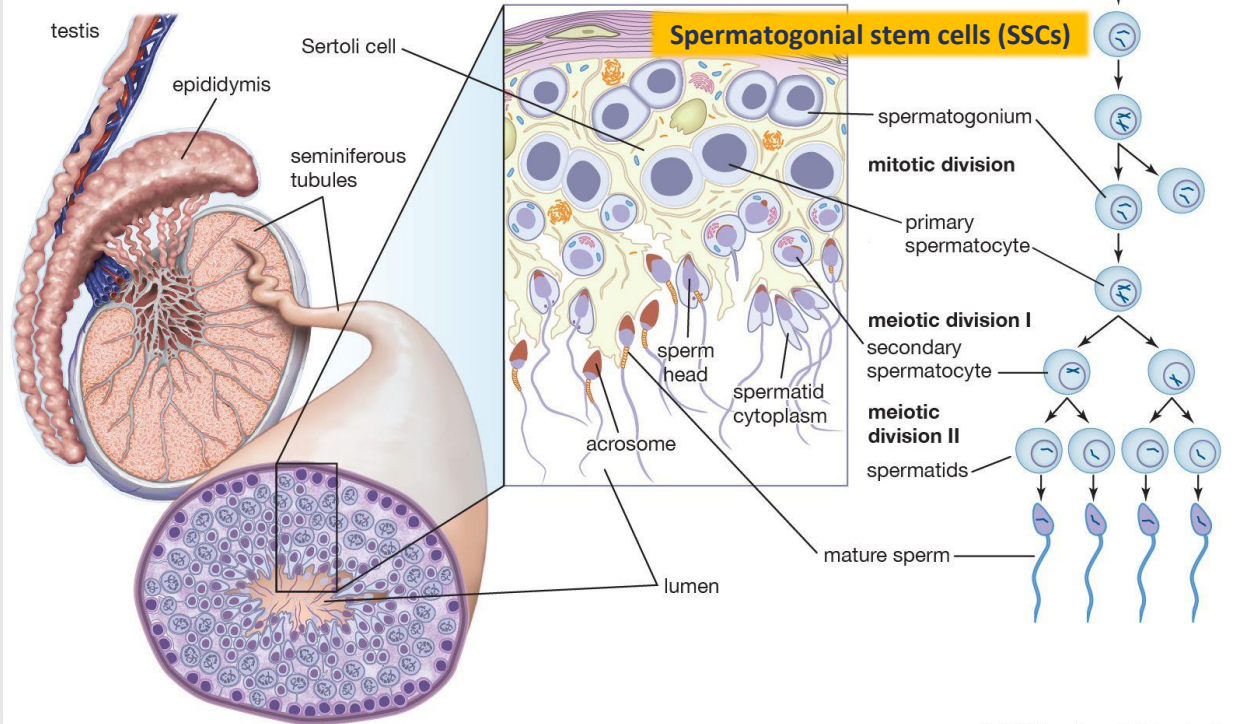
Spermatogenesis

2. Major Research Fields

Spermatogenesis

Male fertility

Spermatogenesis



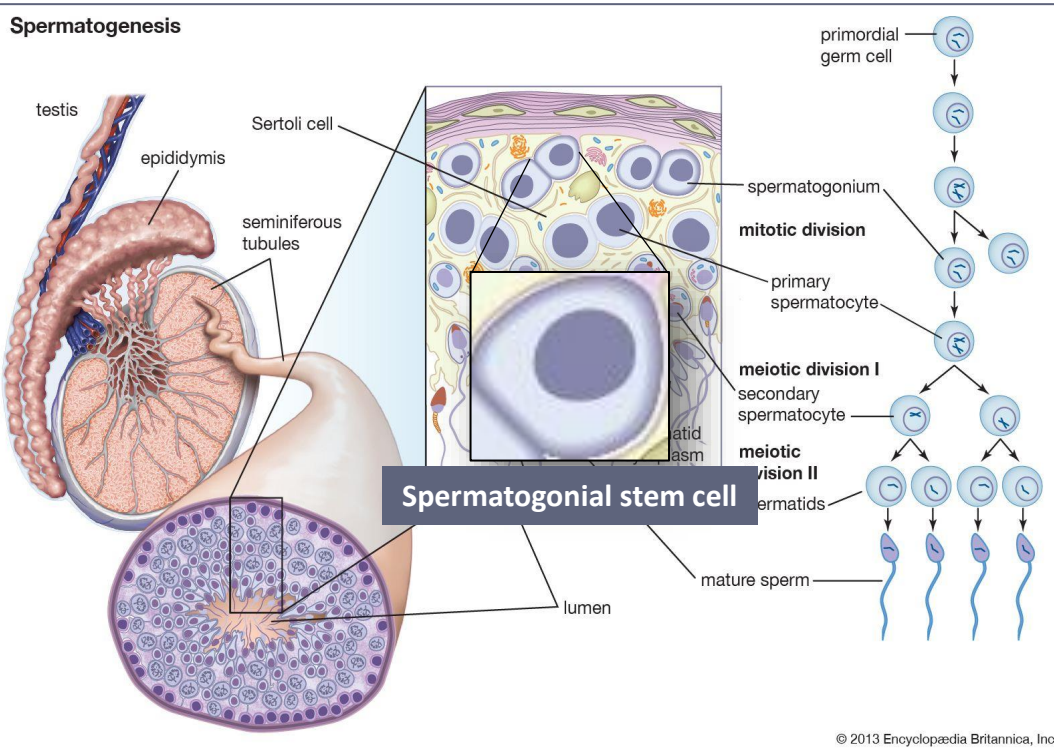
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Spermatogonial stem cells (SSCs)

2. Major Research Fields

Spermatogonial stem cells (SSCs)



01. Maintenance of male fertility

SSC provides the basis for **maintaining male fertility** through the spermatogenesis process.

02. Genetic information transfer

The only adult stem cells are capable of **transmitting genetic information** to the next generation.

03. Species Permanence

SSCs are Cells as a Source of **Species Permanence**.

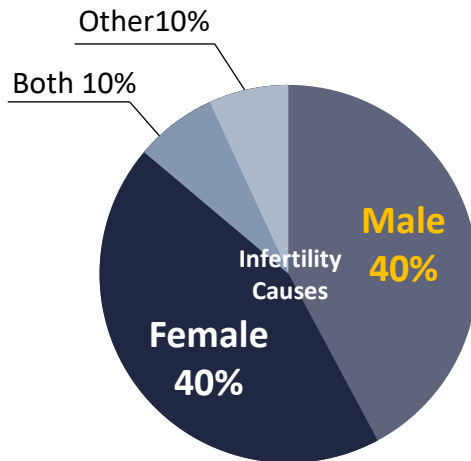
Spermatogonial stem cells (SSCs)

2. Major Research Fields

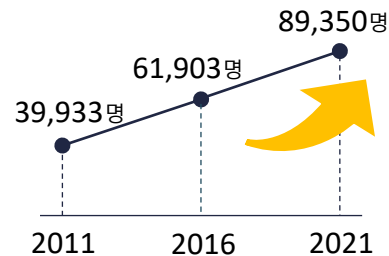
Importance of SSCs Study

Male infertility

[출처: 건강보험 심사 평가원]

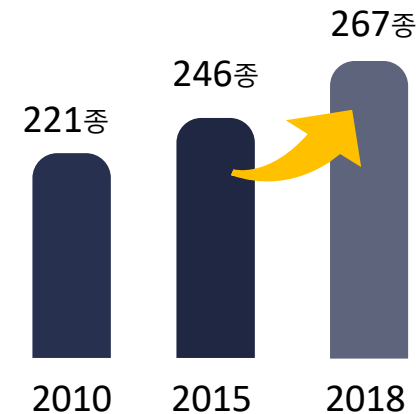


Male infertility



Endangered animals

[출처: 환경부, 2018 통계연감]



- Among the causes of infertility, “male” and “female” have the same incidence.
- “Male” account for 40% of them.

- The number of endangered species is increasing every year.

Research fields of SSCs

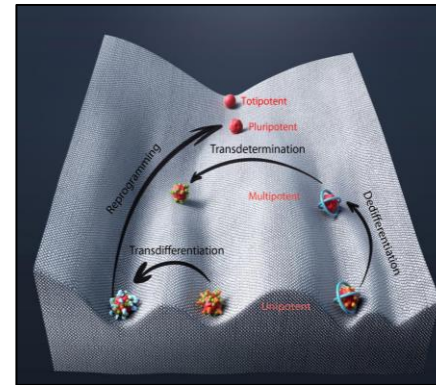
In vitro
culture system



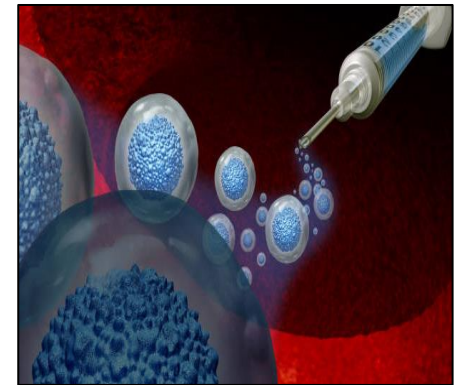
Evaluation of
hazardous materials



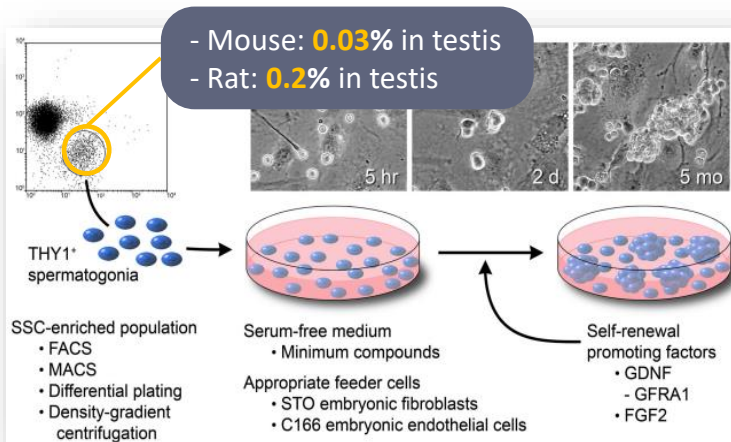
Trans-differentiation



Development of
SSCs specific marker



In vitro culture system



Species	<i>in vitro</i> culture system
Mice & Rat	Established
Hamster	Established
Rabbit	Established
Pig	Only short term, on going
Bovine	Only short term, on going
Monkey	on going
Human	Established

01. Limited number of SSCs

The limited number of SSCs in the testis *hampers studies* that elucidate biological characteristics and for applying SSCs.

02. Long-term culture system

In livestock species, long-term culture systems for SSCs could *reduce the time and costs for producing transgenic animals and to preserve endangered species*.

Most of culture system for livestock species studies *achieved only short-term SSC cultures*.

Research

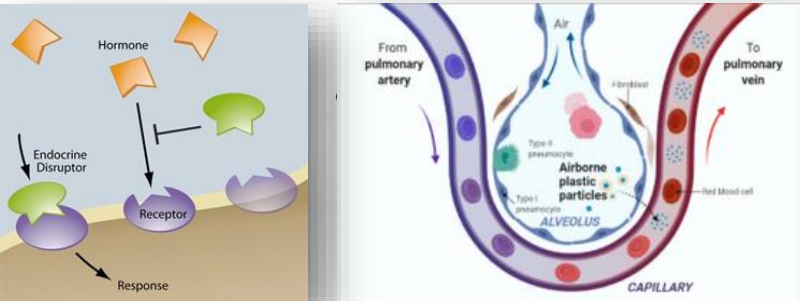
to identification of more stable culture conditions for mice, rats, bovines and monkeys

Major research fields

2. Major Research Fields

Evaluation of hazardous materials

Entrance in human body and animal body



Effects on reproductive system

SCIENTIFIC R

OPEN Bisphenol A Affects Functional Properties of Testis and Spermatogenesis in *in vitro* Culture Model

Paternal Exposure to Bisphenol-A Transgenerationally Impairs Testis Germ Cell Associations, and Size of Mouse Spermatogonial Stem

Patel Chaitan Kumar^{1,2}, Jin Song Ahn^{1,3,4}, Yang Hui^{1,5}, Hong Joo Kim^{1,6}, Hyeon Goo Lee^{1,7}, Eun Hye Kim^{1,8}, and Eun Hye Kim^{1,9}

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ABSTRACT Bisphenol A (BPA) is a synthetic chemical that is widely used in the production of polycarbonate plastics and epoxy resins. BPA is a known endocrine disruptor and has been shown to affect the reproductive system. In this study, we investigated the effects of BPA on the functional properties of testis and spermatogenesis in an *in vitro* culture model. We found that BPA treatment significantly reduced the number of spermatozoa and the quality of spermatozoa in the culture medium. These results suggest that BPA exposure may have adverse effects on the reproductive system, even in an *in vitro* culture model.

KEYWORDS Bisphenol A, testis, spermatogenesis, *in vitro* culture model

01. Entrance in body

All of these hazardous substances can enter the body through *ingestion, inhalation*, and, in the case of particles, *skin contact*, and reach the testis through blood vessels.

02. Effect on reproductive system

Bisphenol A Affects on the Functional Properties and Proteome of Testicular Germ Cells and Spermatogonial Stem Cells *in vitro* Culture Model

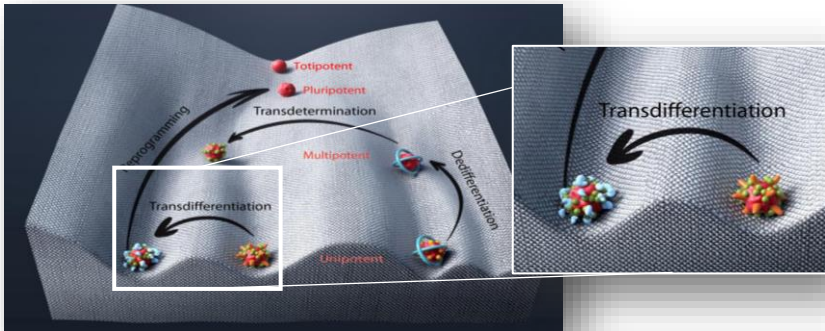
Restoration of PM2.5-induced spermatogonia GC-1 cellular damage by parthenolide via suppression of autophagy and inflammation: An *in vitro* study

Research
to evaluate the effects of these hazardous substances on SSC, GC1 (B spermatogonia), and GC2 (spermatocyte) cells and to find a way to restore cytotoxicity

Major research fields

2. Major Research Fields

Trans-differentiation



01. Trans-differentiation

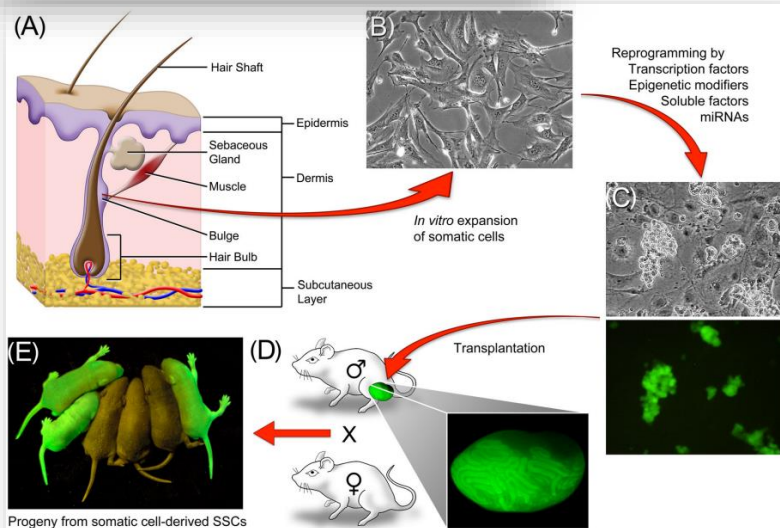
Trans-differentiation, also known as *lineage reprogramming*, is the process in which one mature somatic cell is transformed into another mature somatic cell without undergoing an intermediate pluripotent state or progenitor cell type.

02. Induced-SSCs

It can present a new paradigm for male infertility treatment by producing SSCs using autologous adult stem cells and expand the usability of adult stem cells.

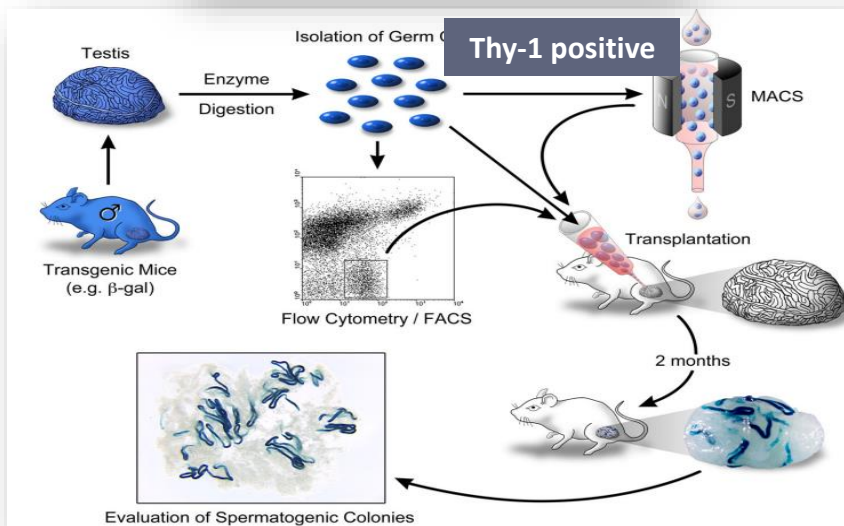
Research

to Induction intercellular conversion of different types of stem cells like hair follicle stem cell, Neuronal stem cell, adipocyte stem cell



Development of SSCs specific marker

Mouse: **0.03%** in testis
Rat: **0.2%** in testis



01. Limited number of SSCs

The limited number of SSCs in the testis *hampers studies* that elucidate biological characteristics and for applying SSCs.

02. Need for new marker

The most widely used SSCs specific marker (antigen) is *thy-1*.

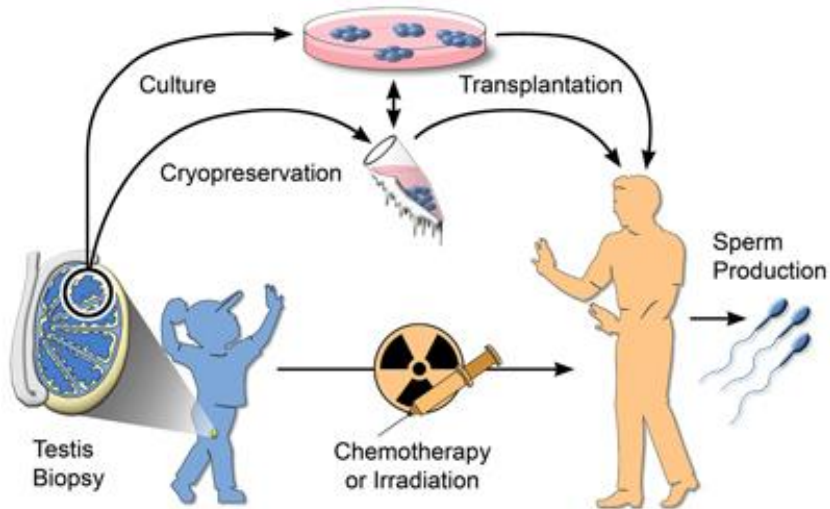
Efficient purification is essential.

Research

to develop new SSC specific markers that increase the efficiency.

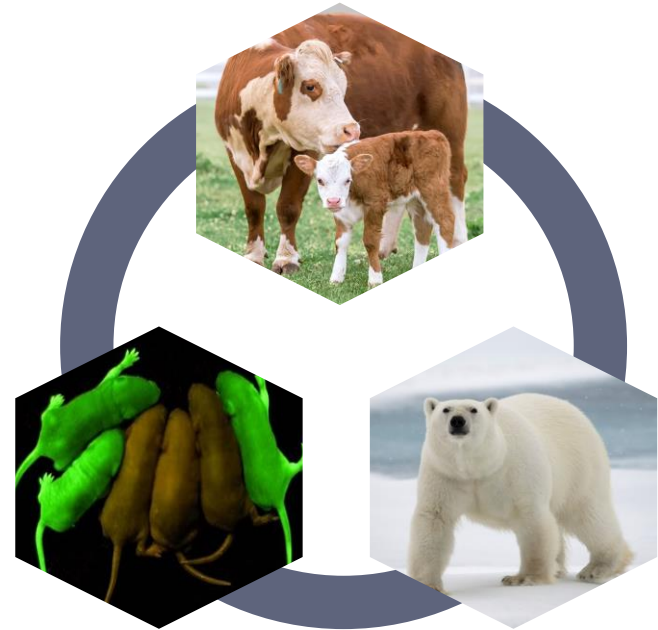
Importance of SSC Study

Clinical Application



- Preserve male fertility of cancer survivor
- Treat male infertility

Animal Application



- Preserve and provide valuable animal resource

Thank You