VERENIGING VOOR
KLINISCHE EMBRYOLOGIE

De toekomst van fertiliteitspreservatie

In vitro oogenese

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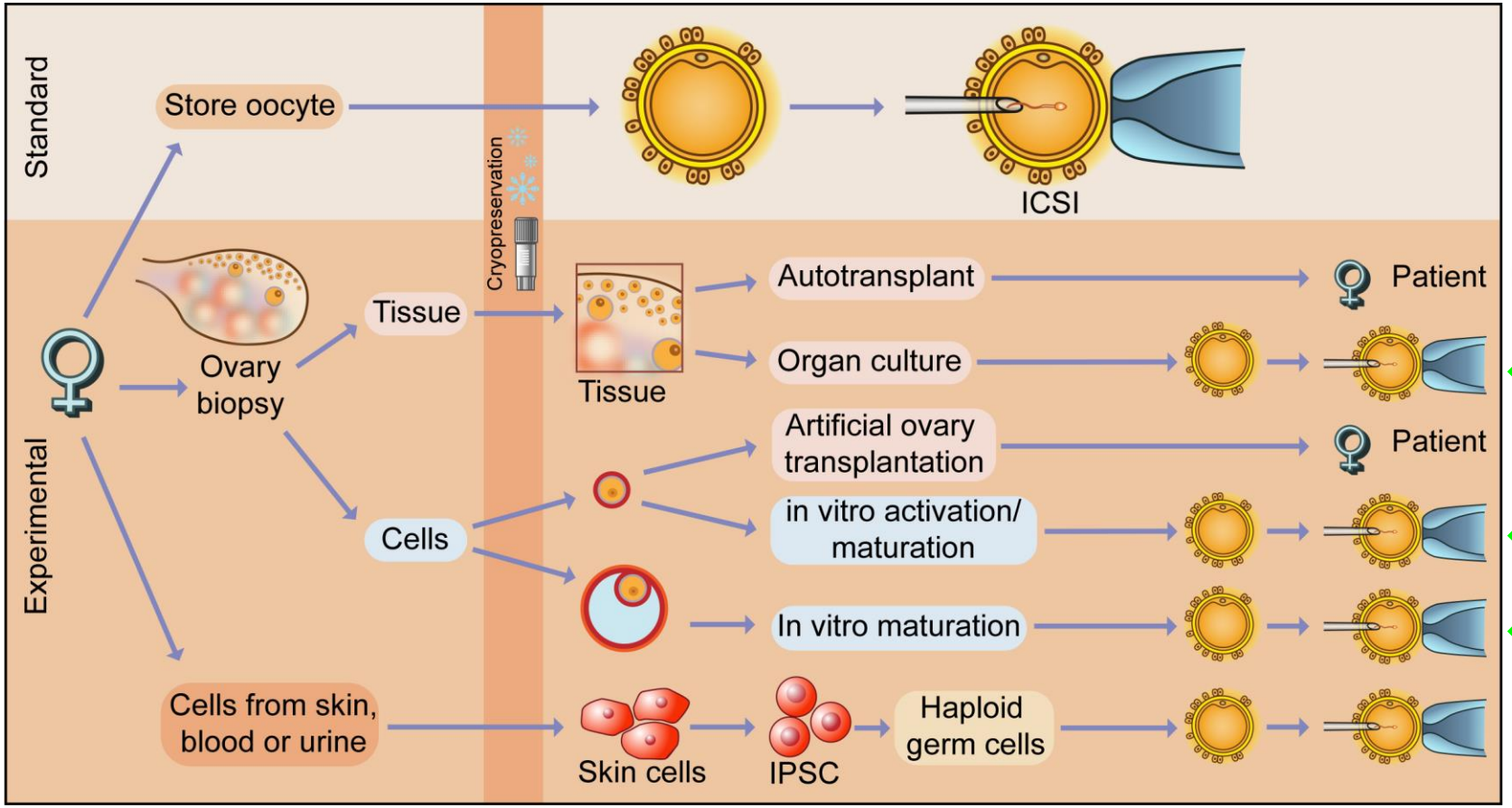
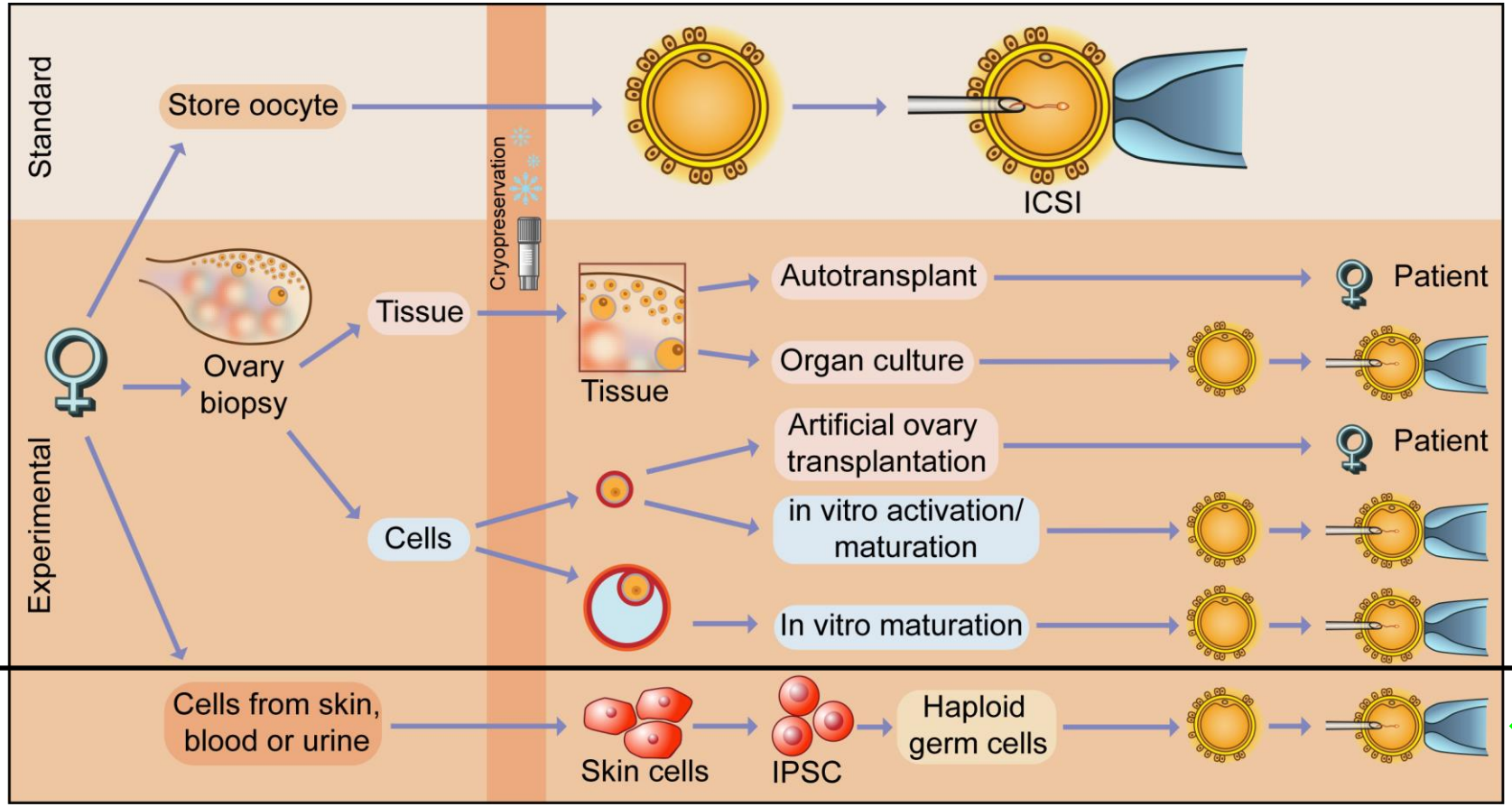
Fertility preservation - women

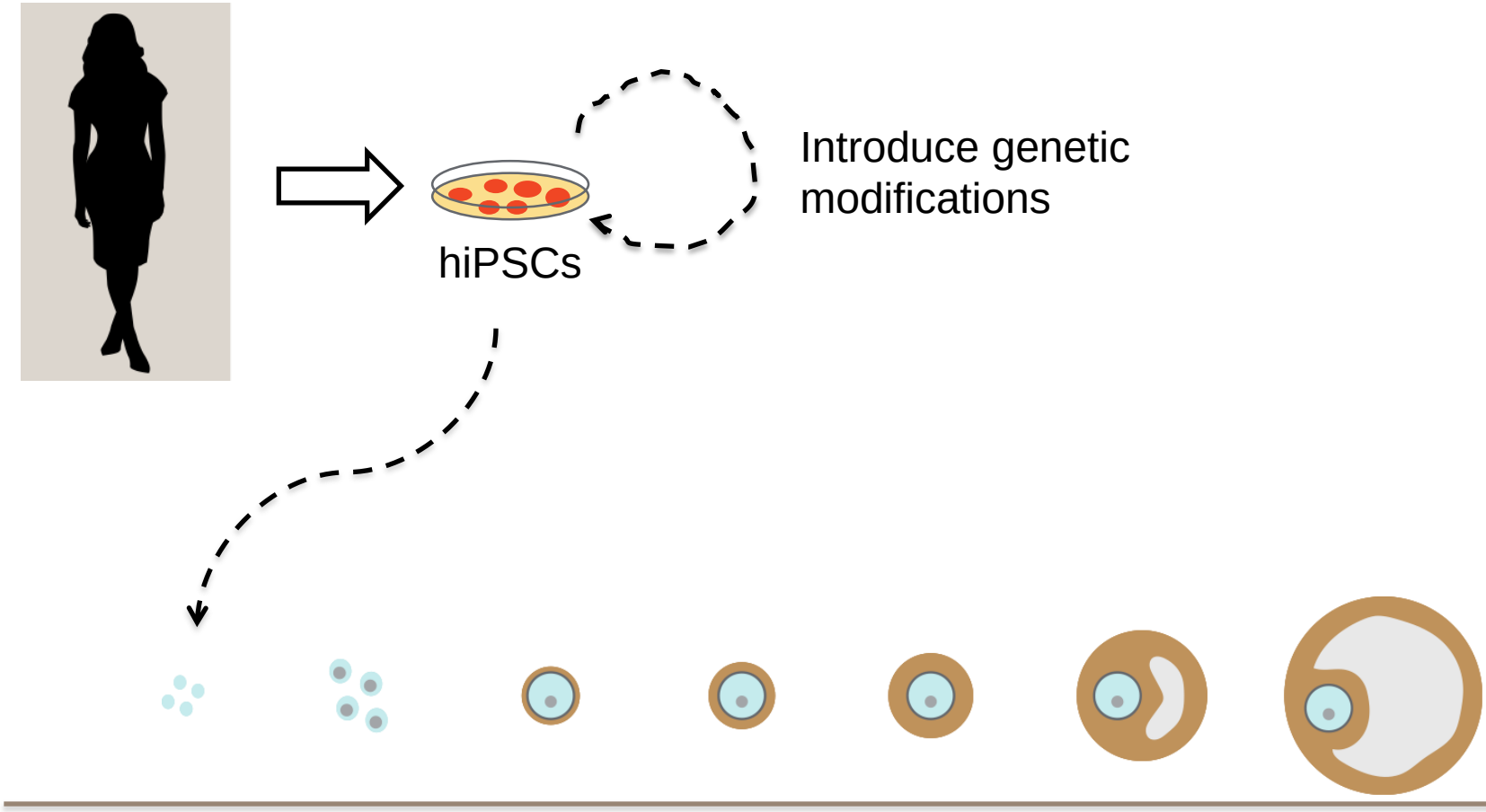


Fertility preservation - women

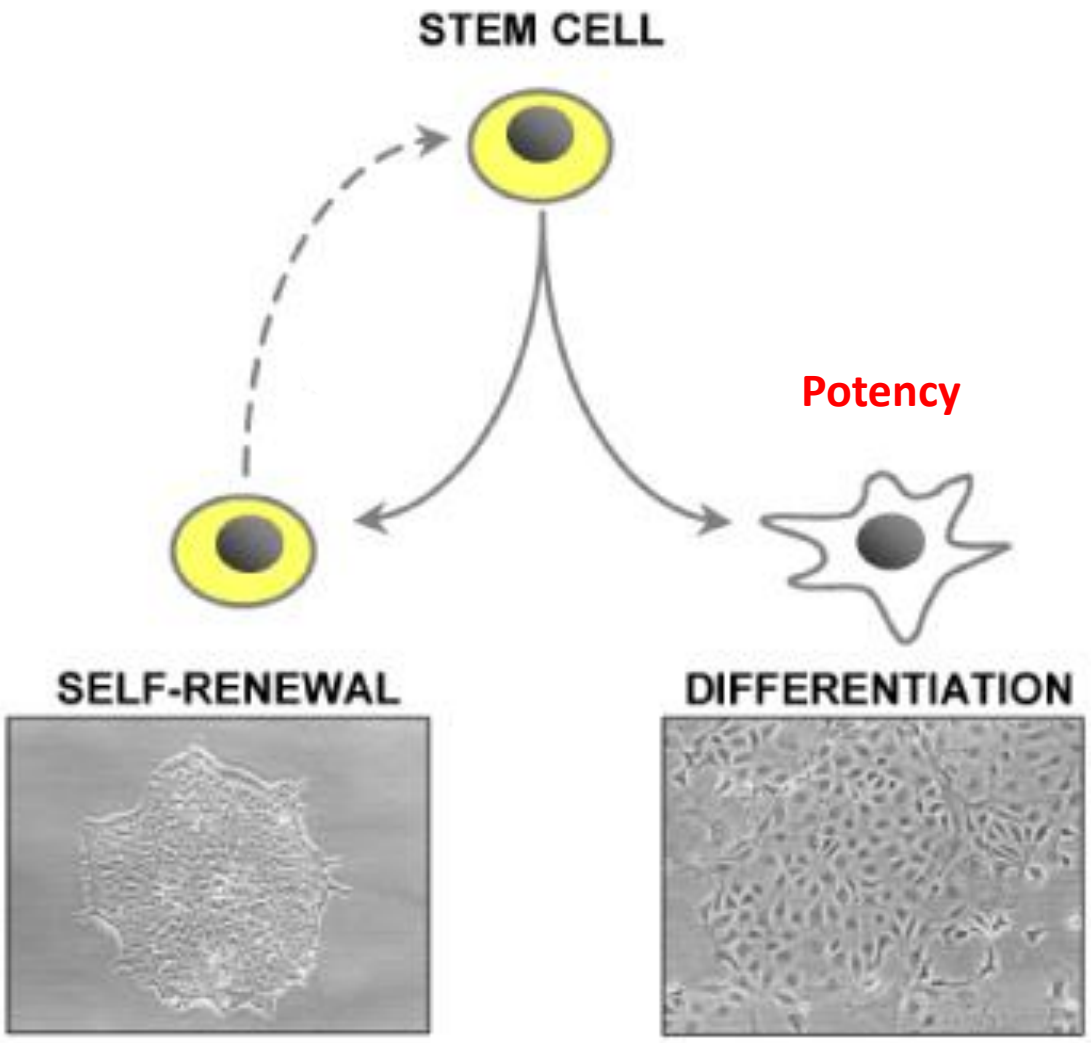


- Source of oocytes
- Independent of age – biological clock
- Not invasive

In the future - oocytes



Human pluripotent stem cells



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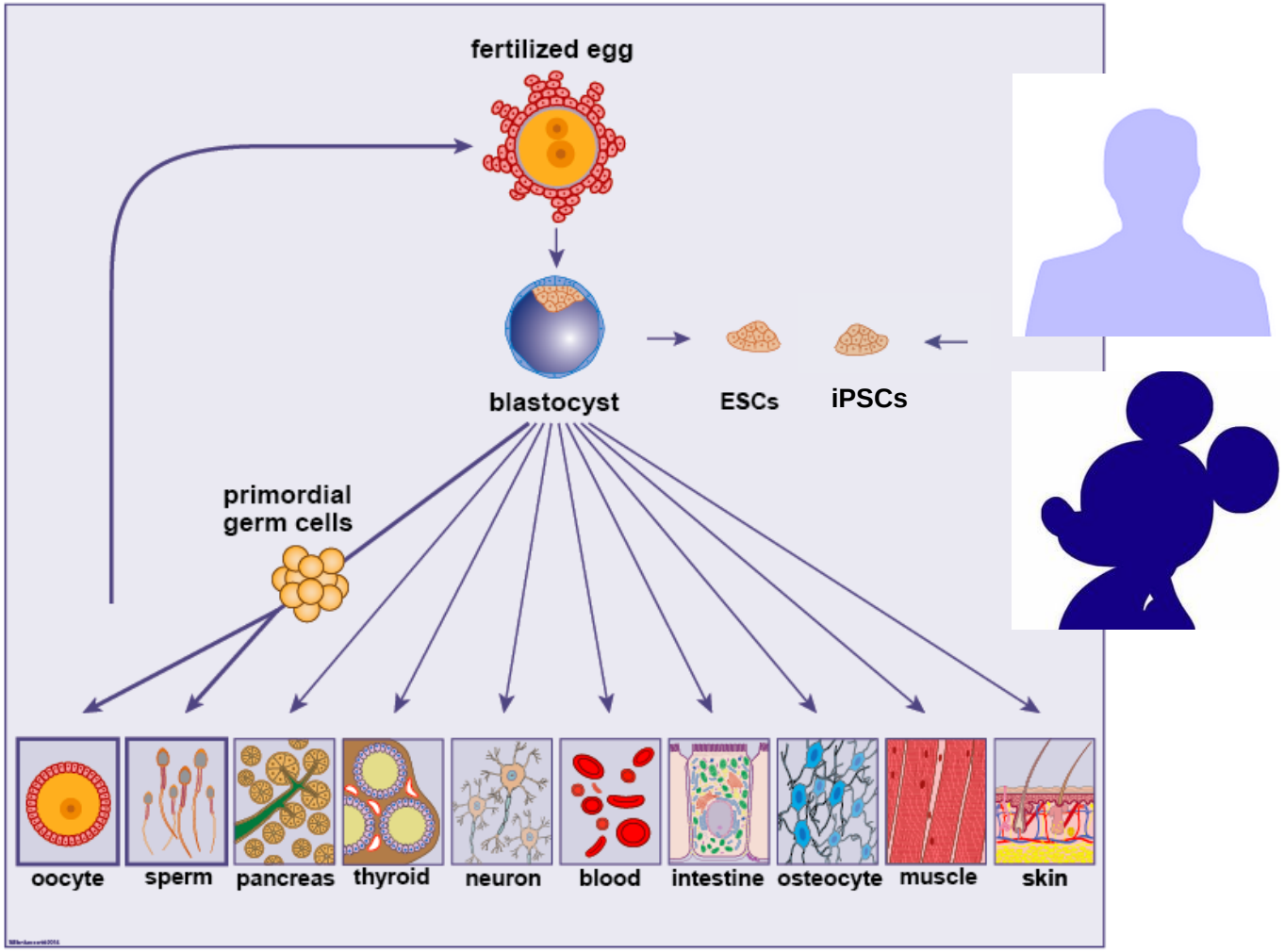

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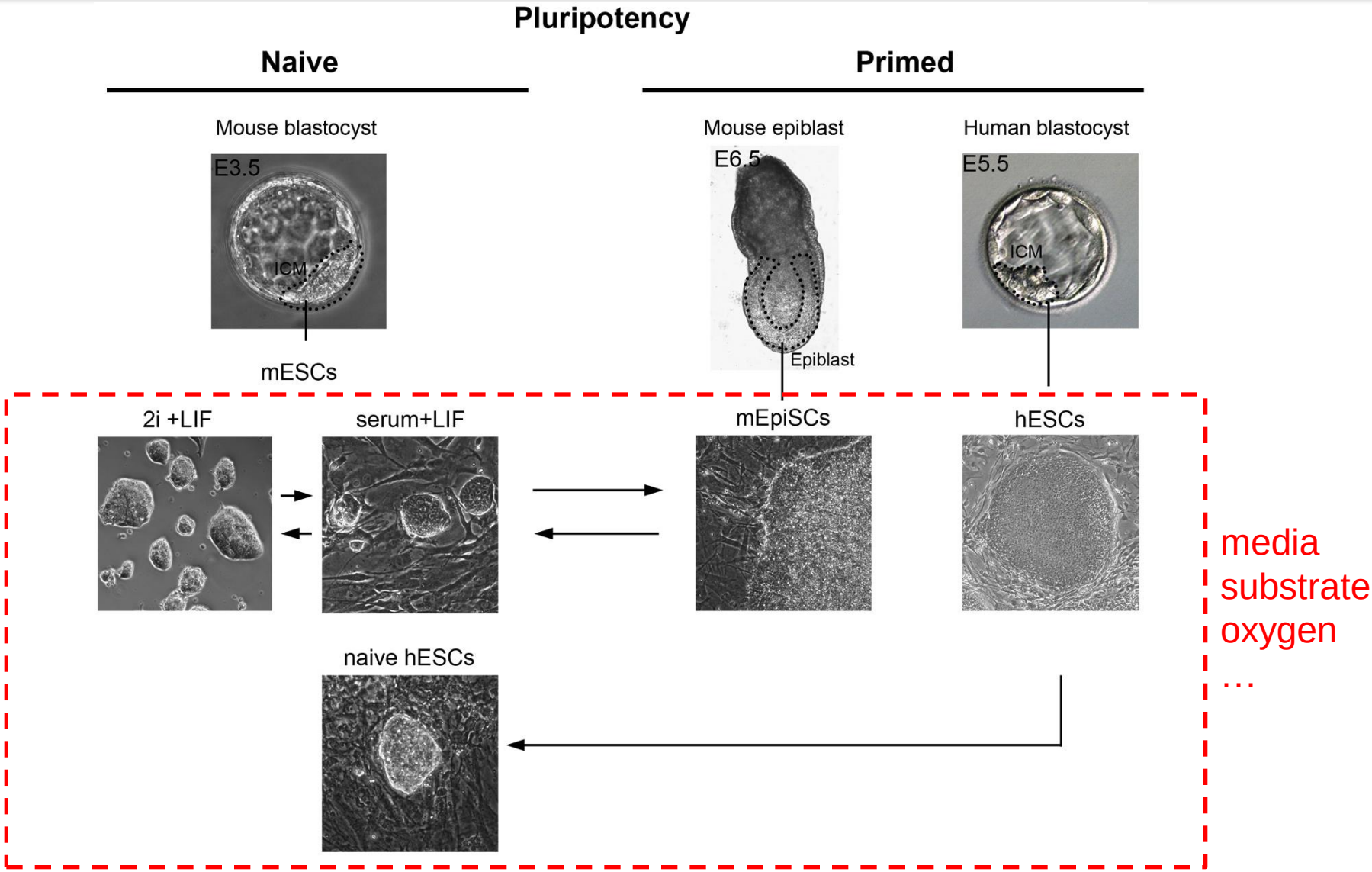


GENE EDITING: what is it?

- Controlled change in the DNA of an organism
- GMO – genetically modified organism

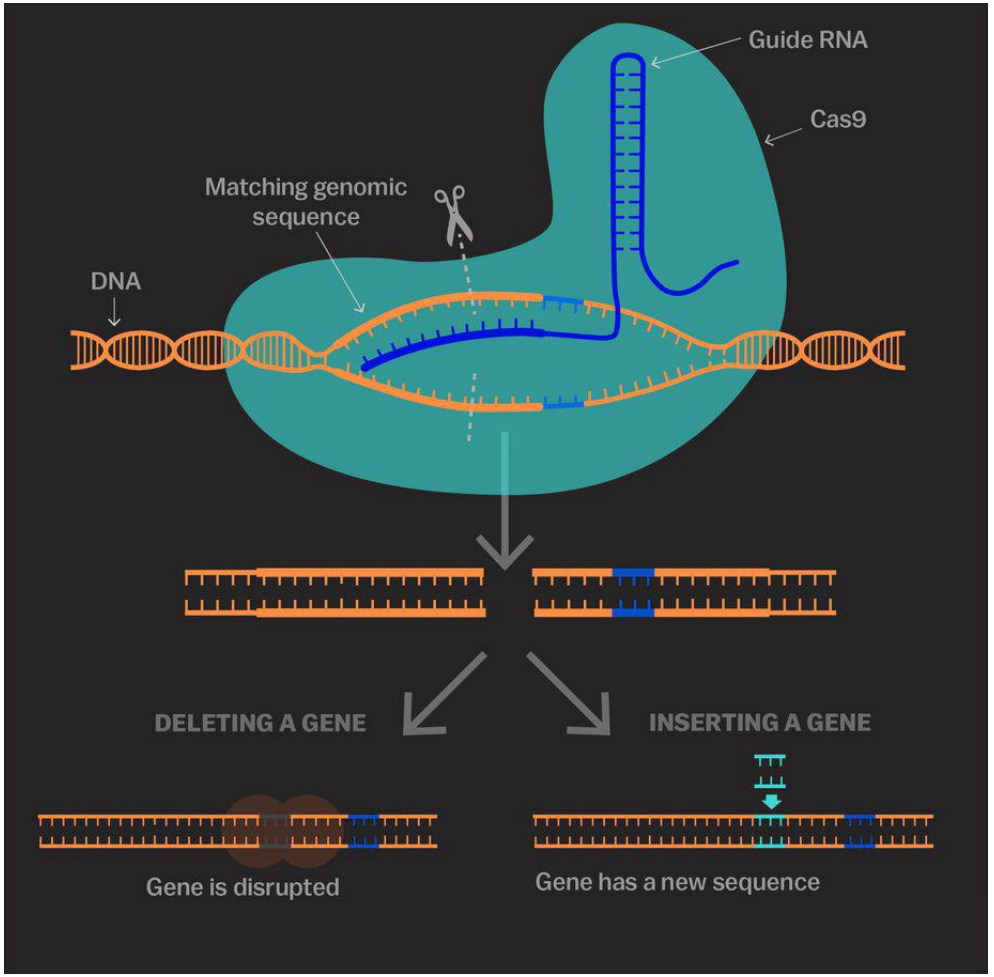
- Repair/introduce a gene/characteristic
- Plants or animals (or bacteria) + progeny

- Industry: food or medication
- Academia: disease models

GENE EDITING: CRISPR-CAS9

- New gene-editing
- Simple
- Cheap
- Fast
- Cut = precise

- Repair
  -NHEJ – indels
  -HDR - template



GENE EDITING: CRISPR-CAS9 in food

NATURE | VOL 560 | 2 AUGUST 2018

In the EU, gene-edited crops and food will be treated in the same way as genetically modified organisms.

GENE EDITING

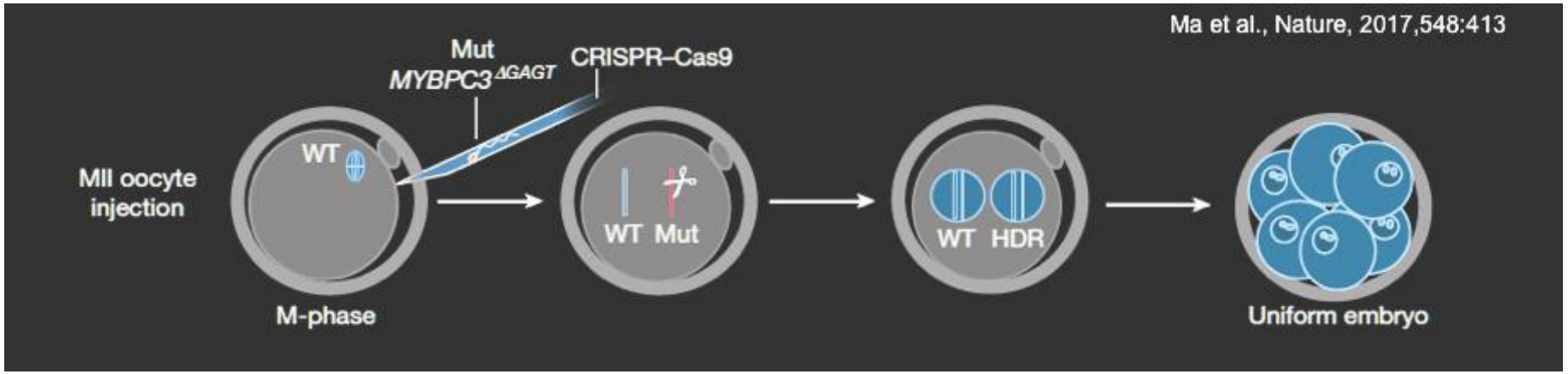
EU law deals blow to CRISPR crops

Jansson also has practical concerns about the ruling. He developed a 'CRISPR cabbage' that he has consumed, and which was growing in his home garden as he spoke to *Nature*. "I took a photo yesterday, and I took another after the ruling. It's still the same plant. Yesterday it wasn't a GMO, and now it's a GMO. I'm a bit curious what I have to do. Do I have to remove it?"

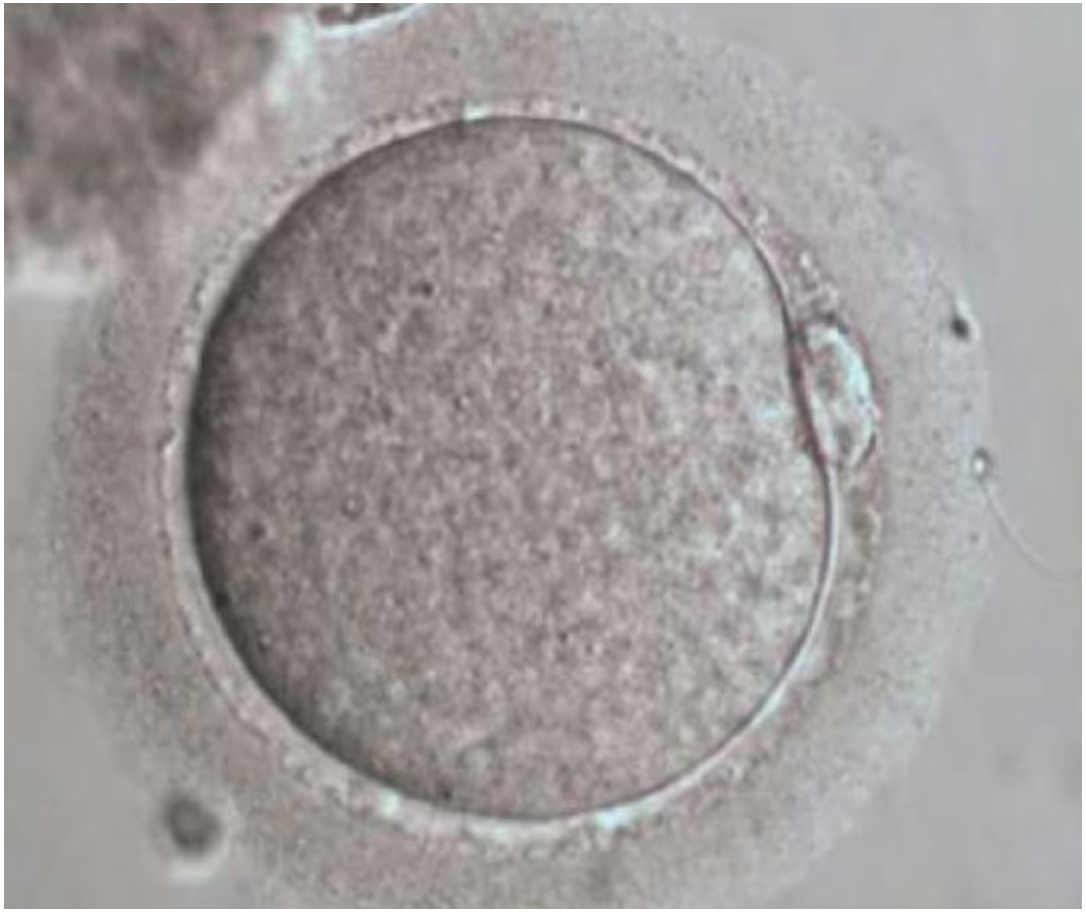
GENE EDITING: CRISPR-CAS9 in reproduction

- Repair monogenetic diseases
- Include in IVF treatments

- Off-target? Safe?
- Where to stop?



From stem cells to oocytes? – Part I



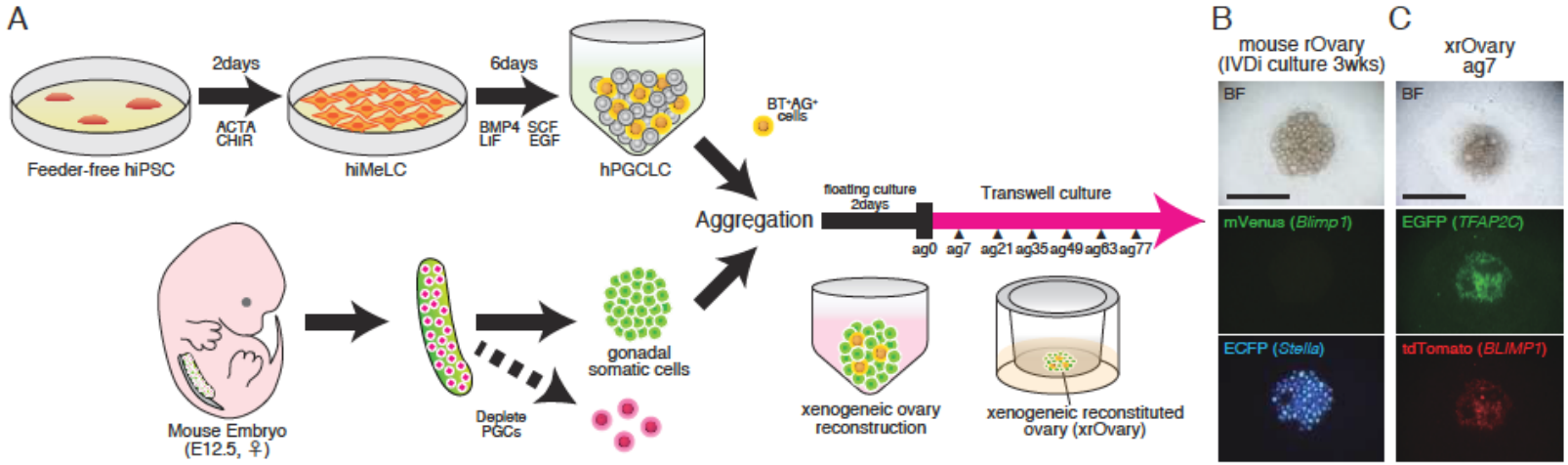
Rienzi et al., Human Reproduction, 2012

From stem cells to oocytes?

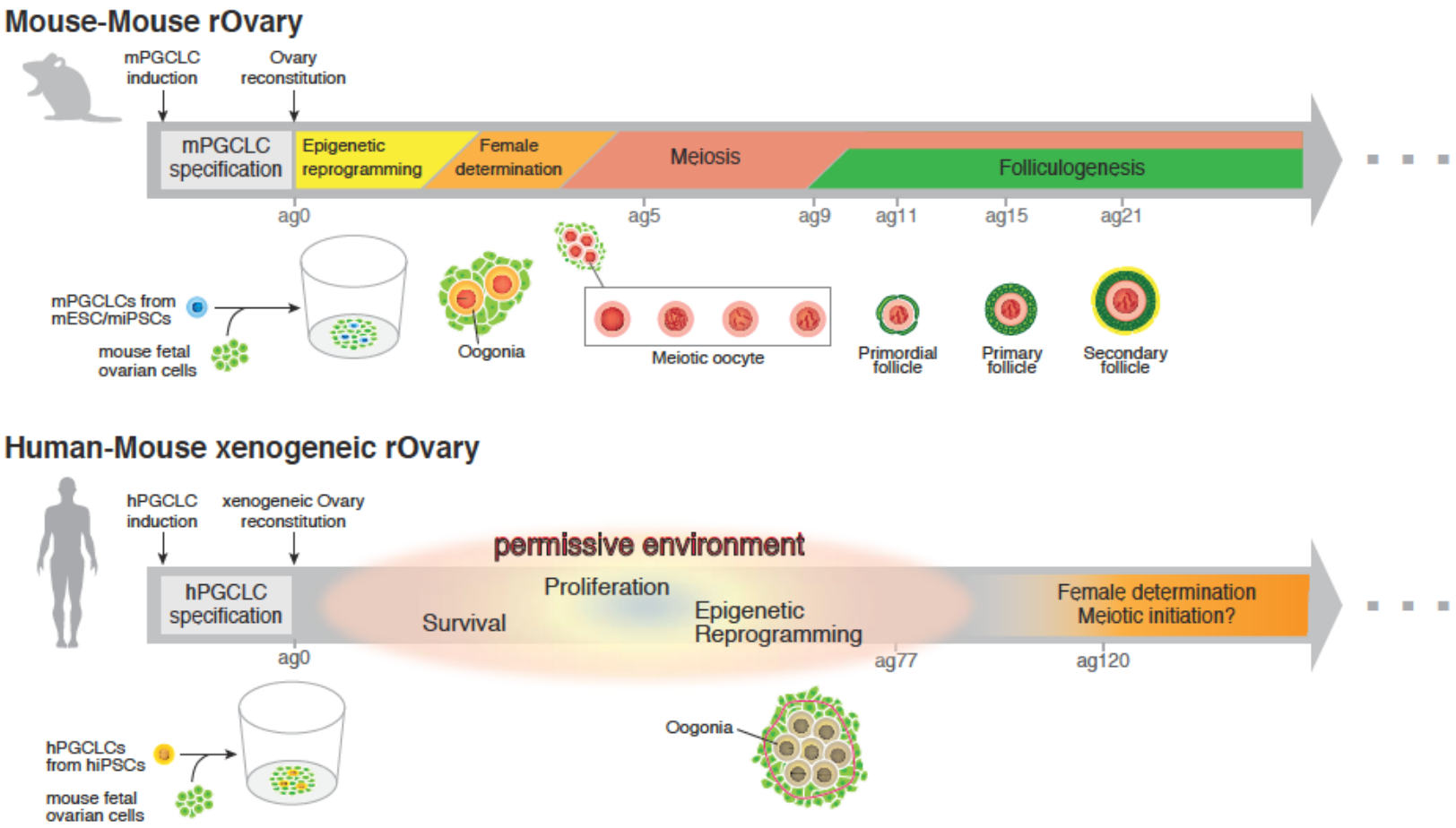
Cite as: C. Yamashiro *et al.*, *Science* 10.1126/science.aat1674 (2018).

Generation of human oogonia from induced pluripotent stem cells in vitro

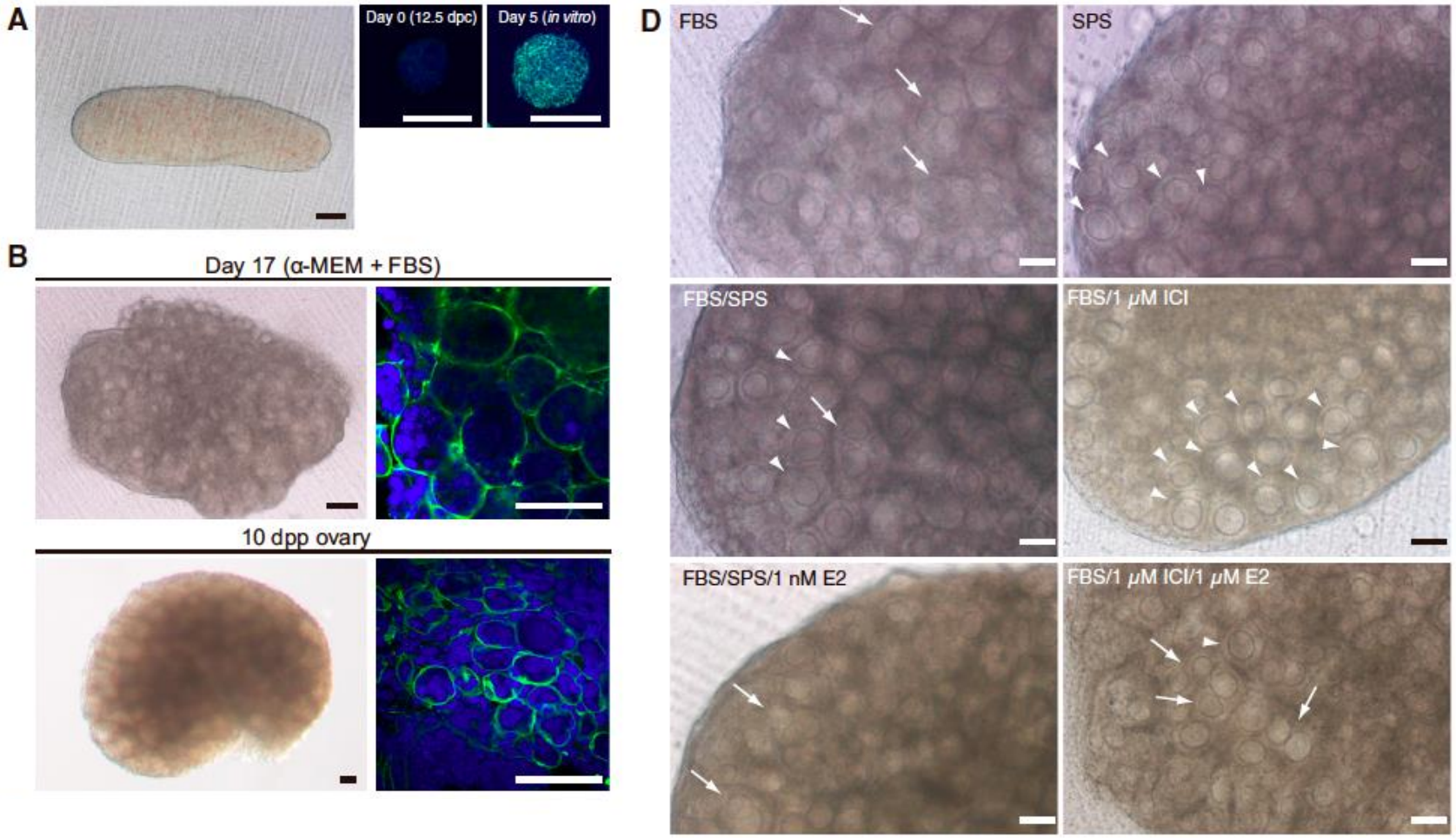
Chika Yamashiro[1,2], Kotaro Sasaki[1,2], Yukihiro Yabuta[1,2], Yoji Kojima[1,2,3,4], Tomonori Nakamura[1,2], Ikuhiro Okamoto[1,2], Shihori Yokobayashi[1,2,4], Yusuke Murase[1,2], Yukiko Ishikura[1,2], Kenjiro Shirane[5,6], Hiroyuki Sasaki[5,6], Takuya Yamamoto[3,4,7], Mitinori Saitou[1,2,3,4]*



From stem cells to oocytes?



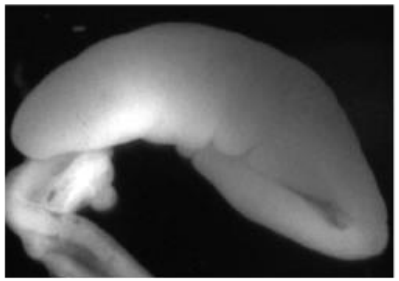
From stem cells to oocytes?

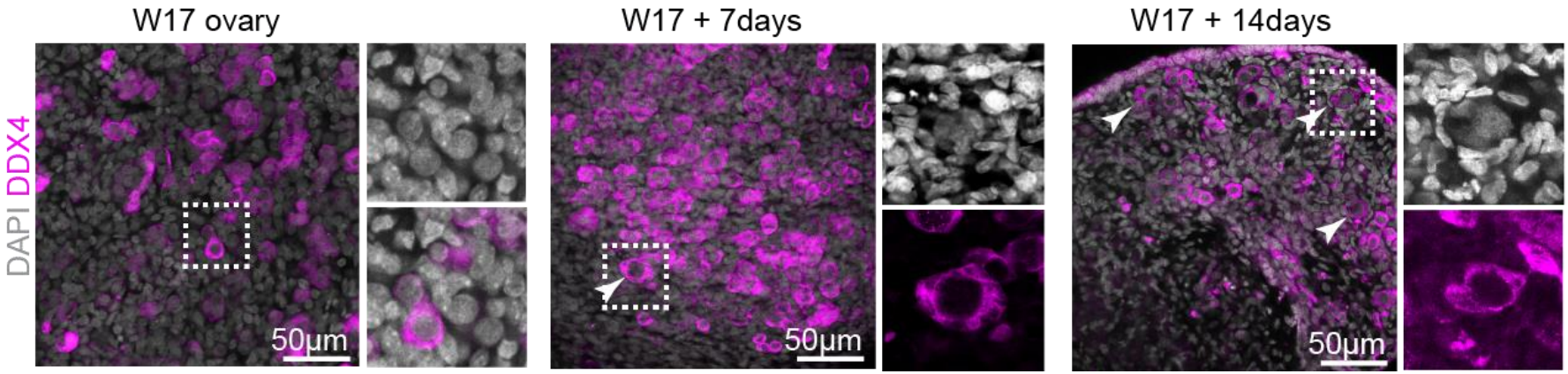


Morohaku et al., PNAS, 2016

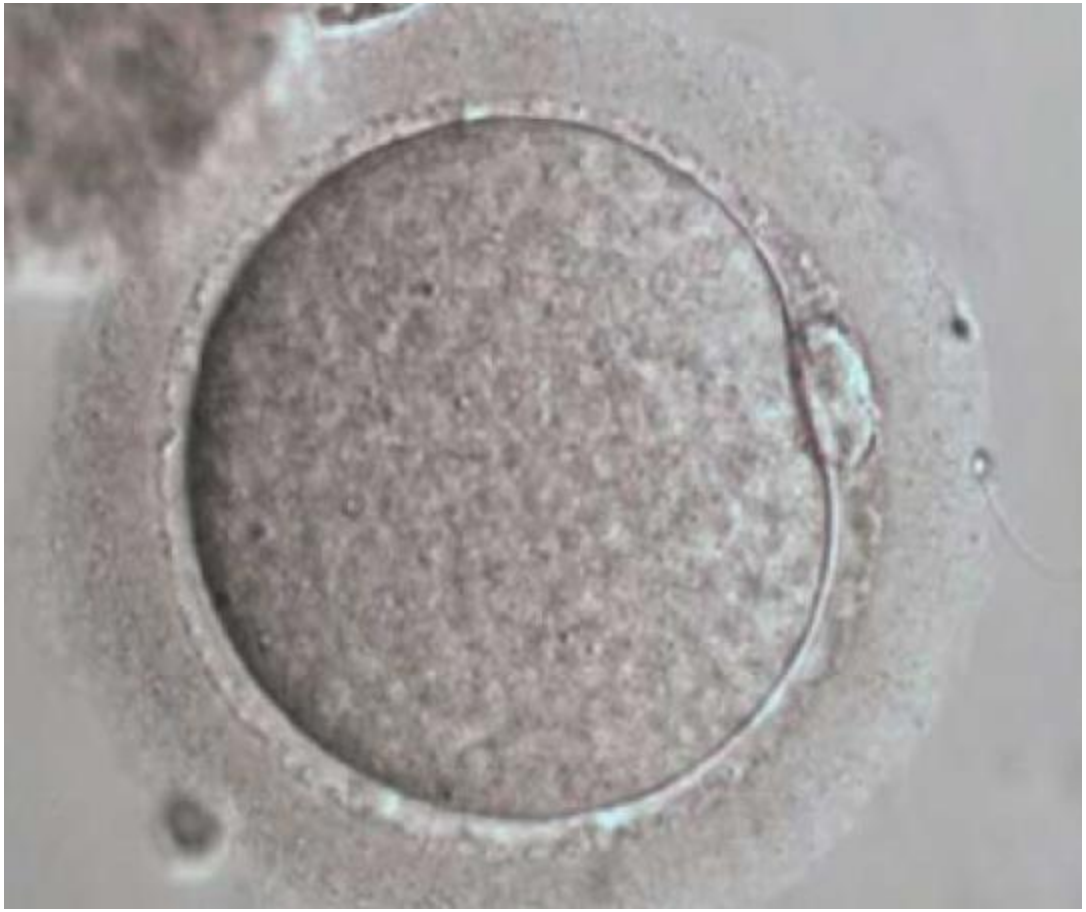
From stem cells to oocytes?

W17 ovary





From stem cells to oocytes? – Part II



Rienzi et al., Human Reproduction, 2012

Future – fusion of gametes and **stem cells**?

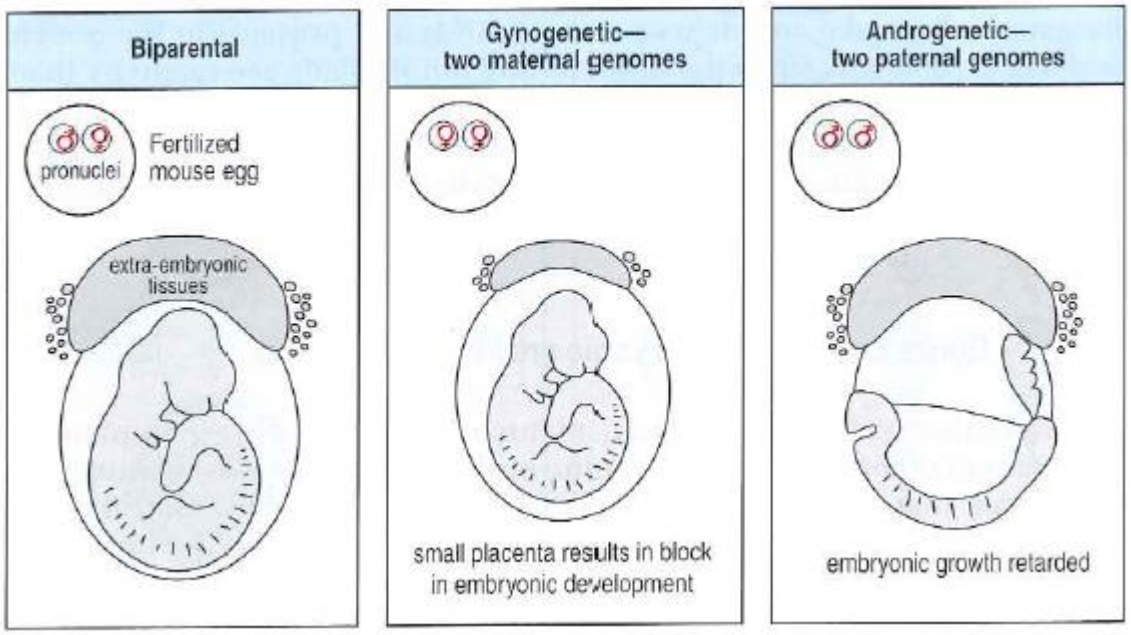
Cell Stem Cell

Article

Generation of Bimaternal and Bipaternal Mice from Hypomethylated Haploid ESCs with Imprinting Region Deletions

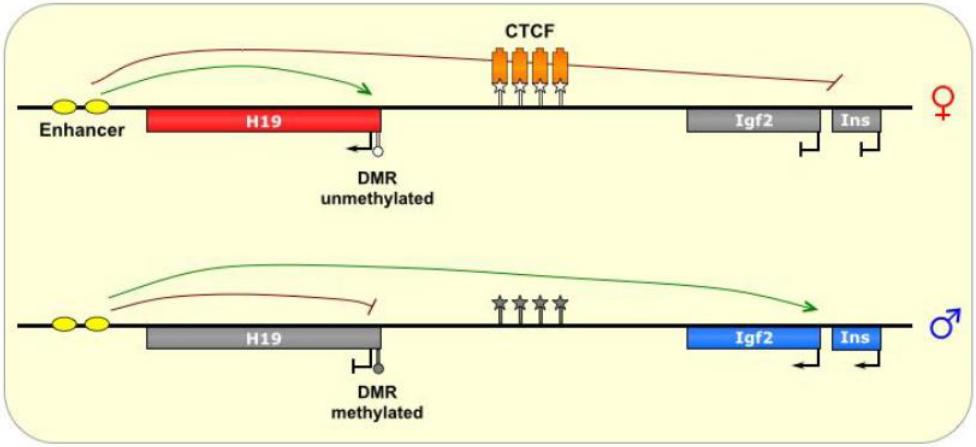
Zhi-Kun Li,[1,2,5] Le-Yun Wang,[1,2,5] Li-Bin Wang,[1,2,3,5] Gui-Hai Feng,[1,2,5] Xue-Wei Yuan,[1,2,4,5] Chao Liu,[1,2,3] Kai Xu,[1,2,3] Yu-Huan Li,[1,2,3] Hai-Feng Wan,[1,2] Ying Zhang,[1,2] Yu-Fei Li,[1,2,3] Xin Li,[1,2] Wei Li,[1,2,3,*] Qi Zhou,[1,2,3,6,*] and Bao-Yang Hu[1,2,3,*]

Imprinting?

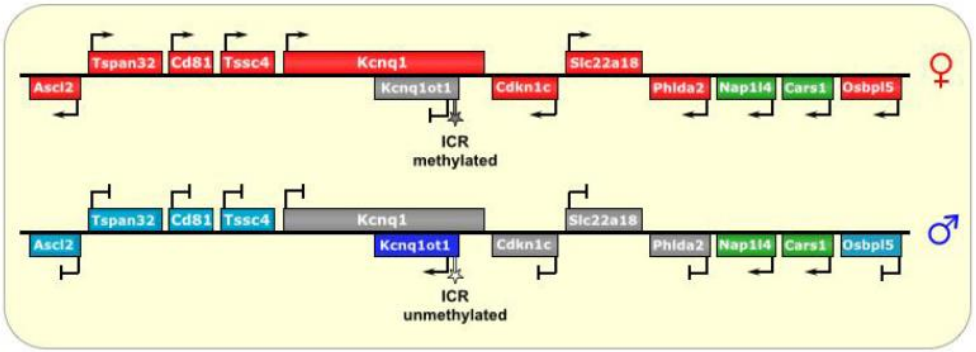


"Battle of the sexes":
Maternal imprints: smaller placenta
Paternal imprints: smaller embryo

Imprinting?



Imprint erasure?



Artuoro et al., Biomolecules, 2014

Bimaternal mice

Cell Stem Cell
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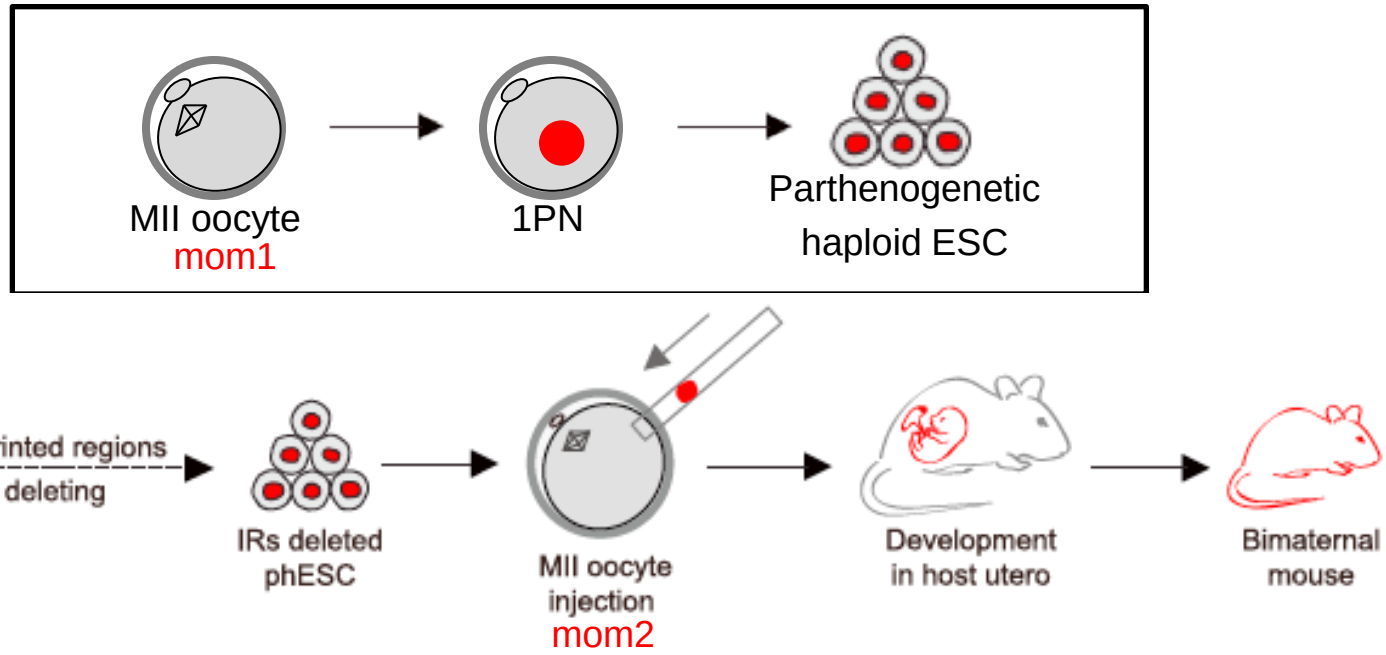

Bipaternal mice

Cell Stem Cell
Article

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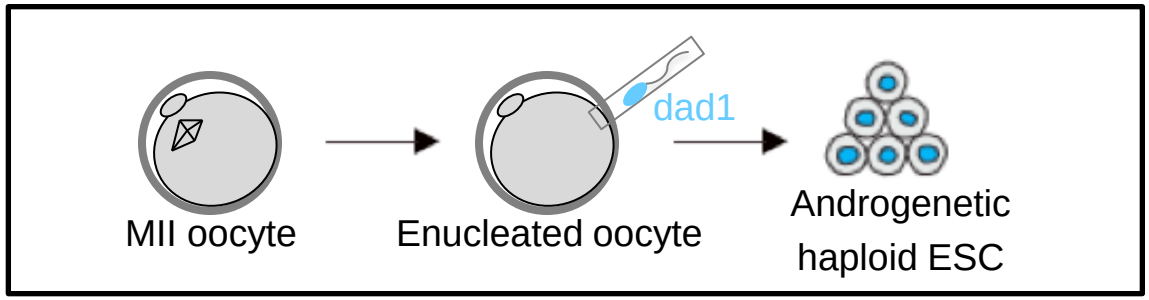
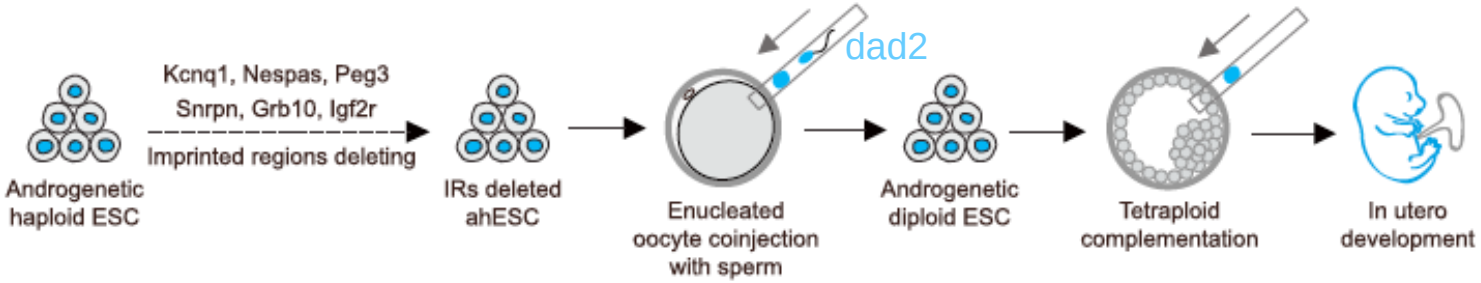
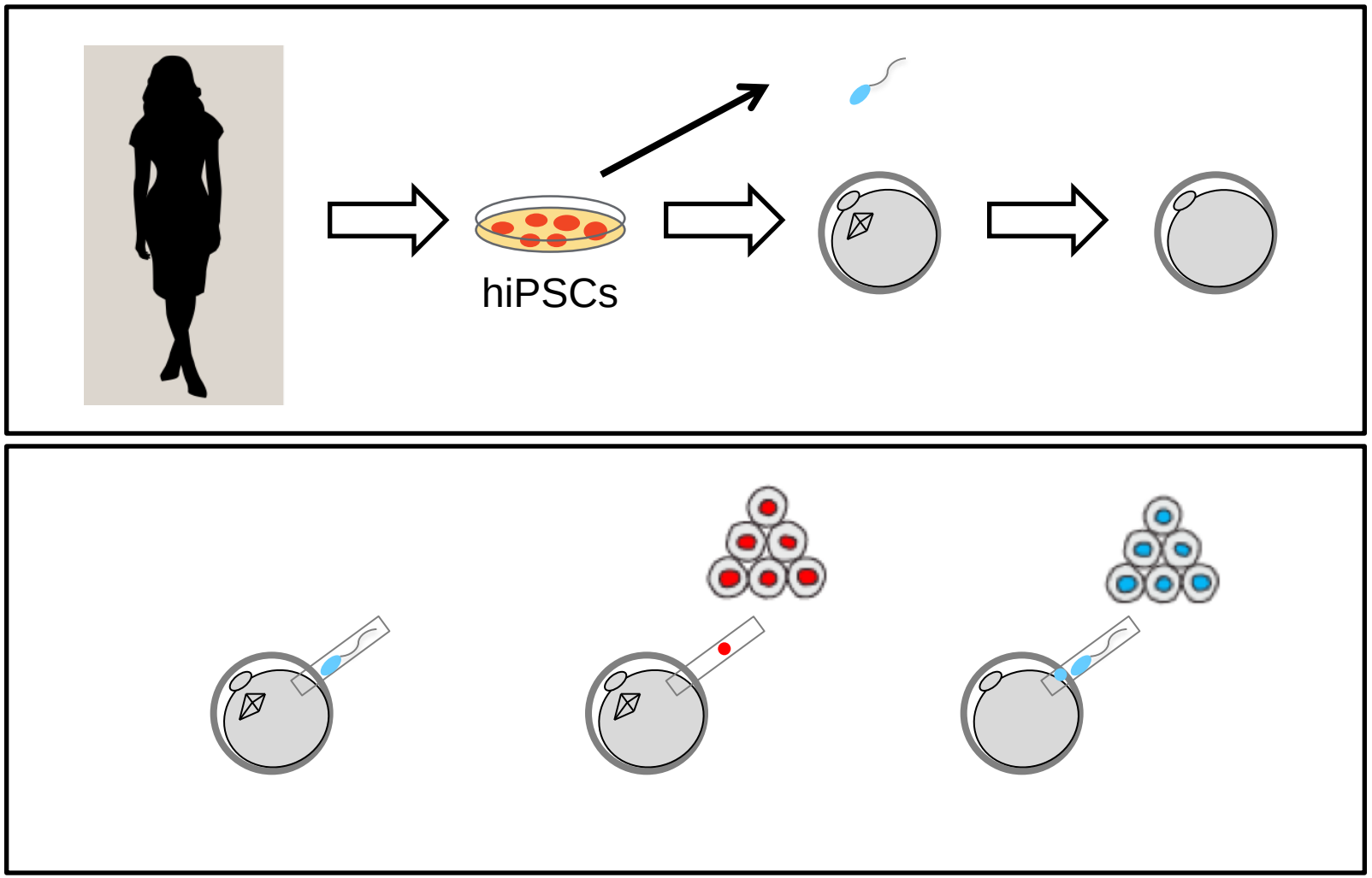




Die E8.5

Future – fusion of gametes and stem cells?



Gene editing?

Thank you!

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