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CREATING
A CIRCULAR
FUTURE

Preliminary review of menstrual blood-derived cell therapy to support astronauts in long-term space missions

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OUTLINE

Motivation

Pipeline

Key facts > Naïve calculations

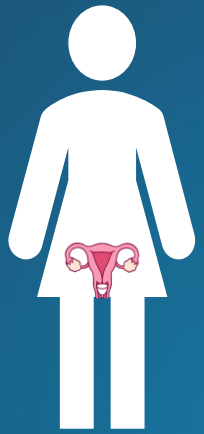
Future research

MOTIVATION

WASTE

RESOURCE

PIPELINE



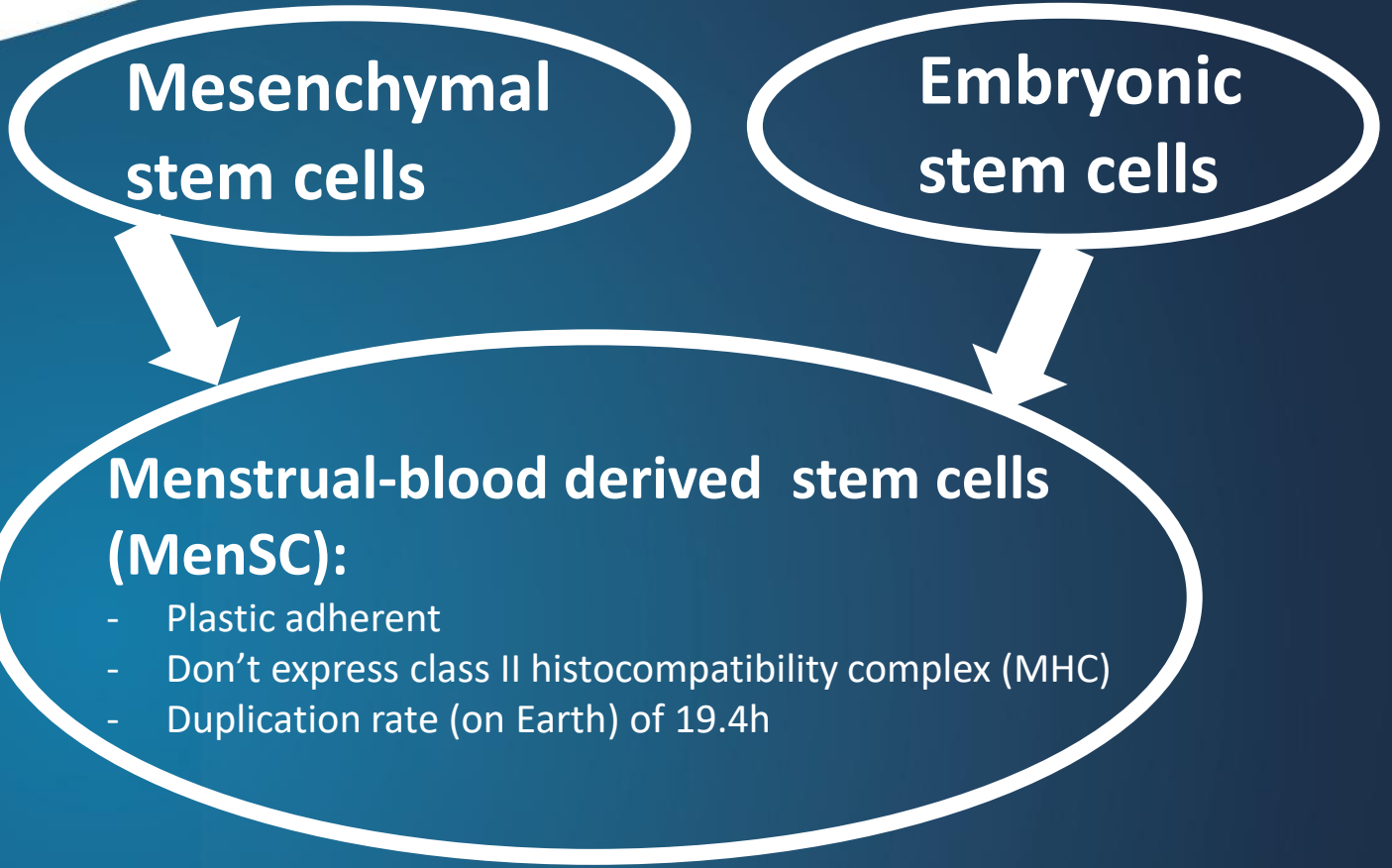
1. Collection of fluid

2. Transfer to on-board lab

3. Isolation of MenSC
4. Cultivation/proliferation
5. (Optional) Storage

6. Injection

WHAT WE KNOW


Mesenchymal stem cells
Embryonic stem cells
Menstrual-blood derived stem cells (MenSC):
- Plastic adherent
- Don’t express class II histocompatibility complex (MHC)
- Duplication rate (on Earth) of 19.4h

Menstrual blood key facts

Menstruating astronauts

35 years old average

Duration

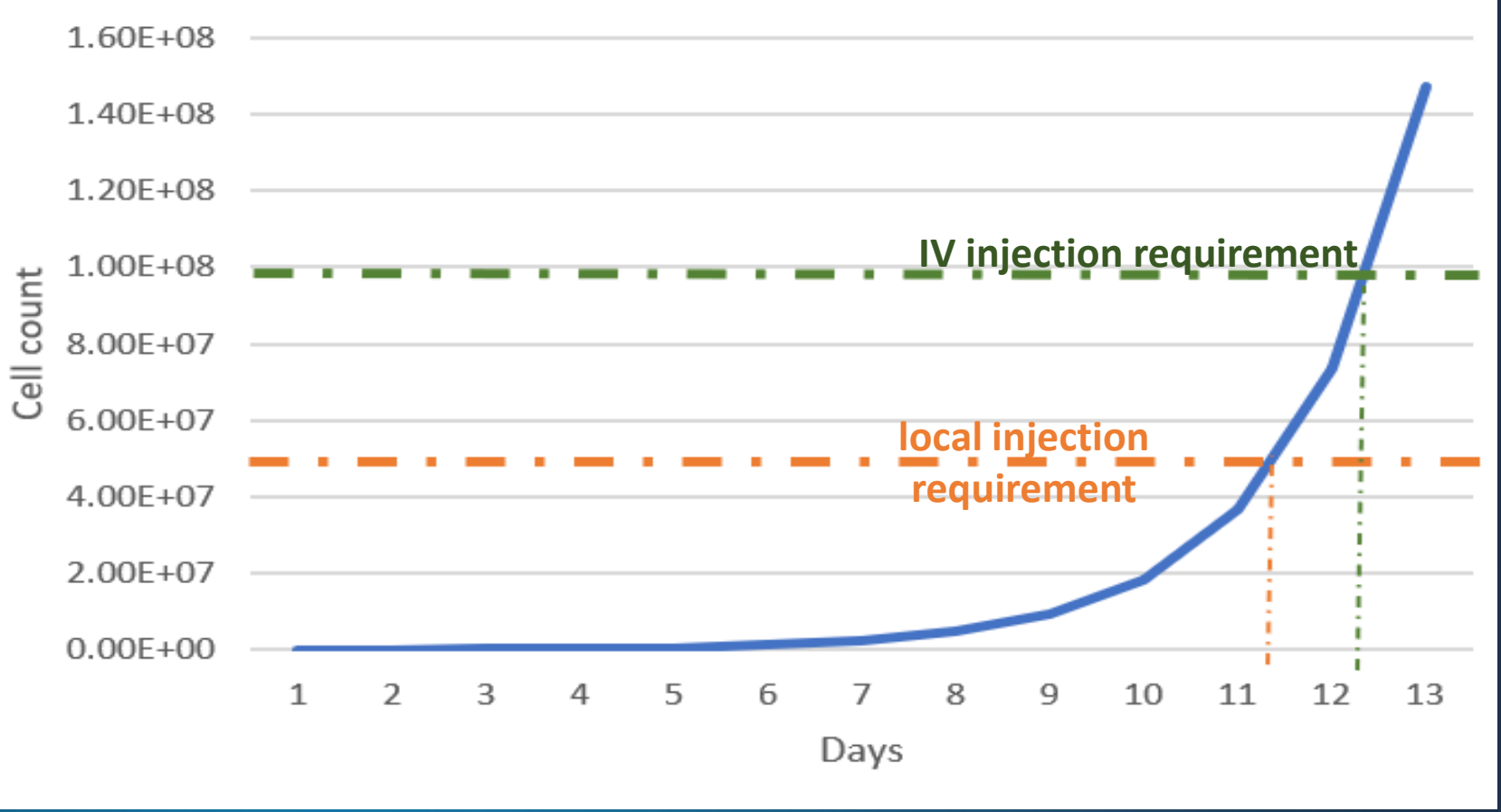
Average periods during 5-7 days for a cycle of around 28 days

Quantity

60ml of menstrual fluid per period

MenSC/Stem cell key facts

- Content
  - 600 CFU-F per ml of menstrual fluid
- Duplication rate of MenSC
  19.4h
- Injection requirements
  - Local injection
    - ~20 to 50 million stem cells
  - IV injection
    - ~70 to 190 million.



Cell count from one menstruation cycle as a function of days

NAIVE CALCULATIONS

Assumption #1:

Periods in space are analog to those on Earth

Assumption #2:

Microgravity cell mechanisms analog to those on Earth

Assumption #3:

Stem cell therapy is appropriate for crewed missions

IS IT FEASIBLE?

Insights from this prelim. review

- Naively, quantities and timeframe 
- More research needed
  - Periods in micro-gravity (quantity, quality but also comfort and psychology of the menstruating astronauts)
  - MenSC mechanisms in space
  - Development of required apparatus (e.g micro-gravity menstrual cup, isolation of MenSC)

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THANK YOU.

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