Lec1\ Introduction to Stem Cell biology and development

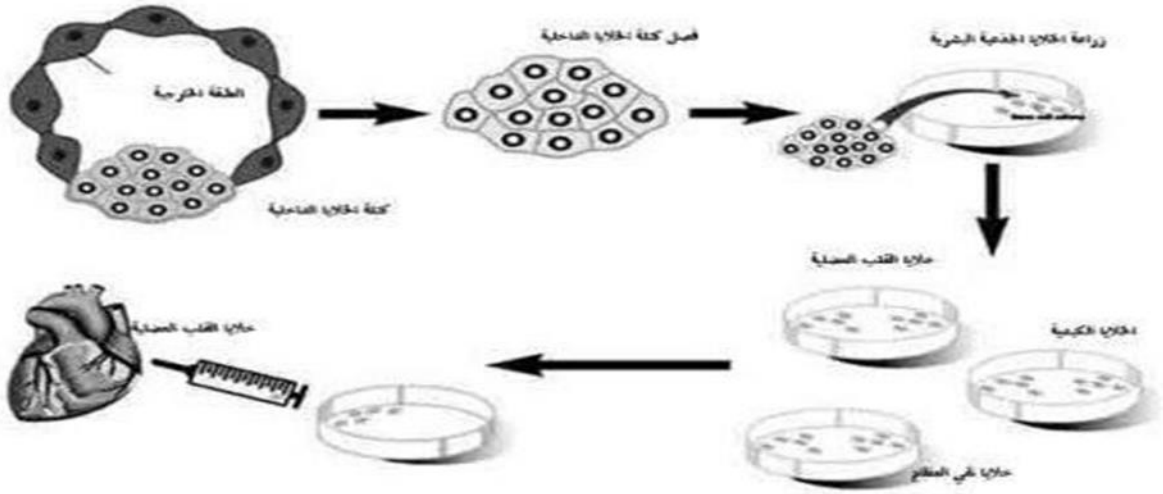
اعداد

م.م ساره رحيم حمزه

الايميل :

رمز الصف :

قصة (الطفل دانيال مع الخلايا الجذعية)



- مصاب بالثلاسيميا الكبرى وكان العلاج الوحيد هو نقل خلايا النخاع الحديثه ومطابقة وبالصدفه كانت خلايا شقيقته مطابقه معه وتم تخزين دم الحبل السري اثناء ولادتها وبعد اشهر من العملية تم تشافي الطفل دانيال من المرض .

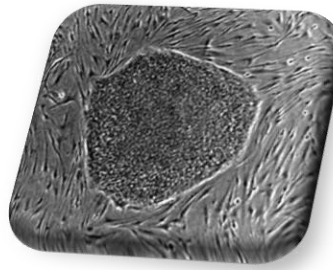
Introduction

Stem cells are immature cells that have the potential to differentiate into specialized cells which have a distinct function.

There are 2 types of human stem cells:

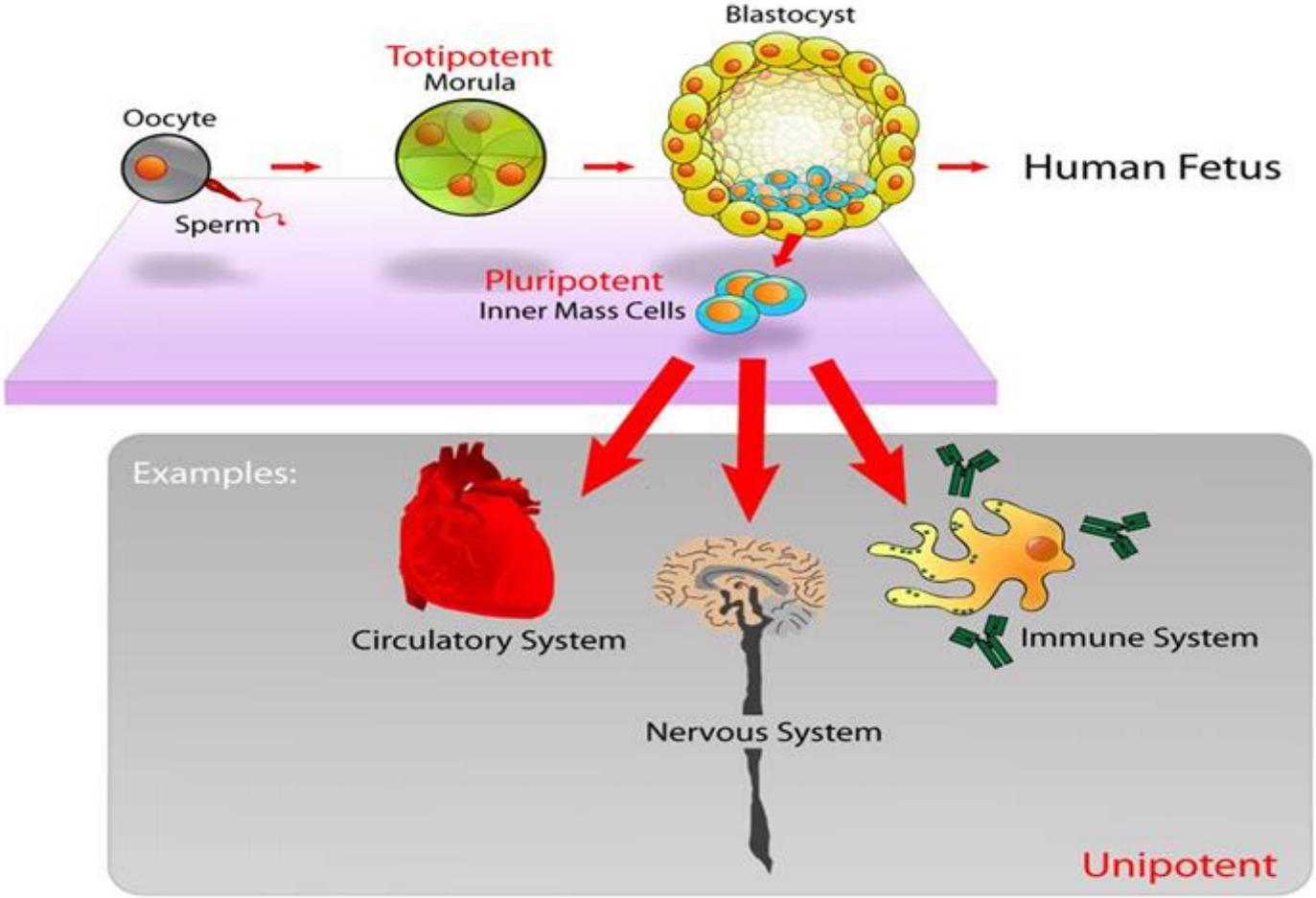
a. those associated with the embryo (or embryonic)

b. those associated with the adult (or somatic)

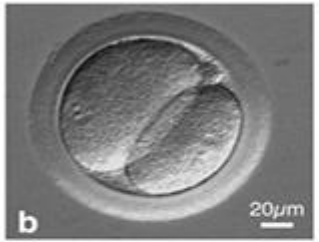



Marrow Stroma
Gene Delivery
Bone
Cardiac Muscle
Adipose
STEM CELLS
Cartilage
Tendon & Ligament
Biopharmaceuticals

Classification of Embryonic Stem Cells

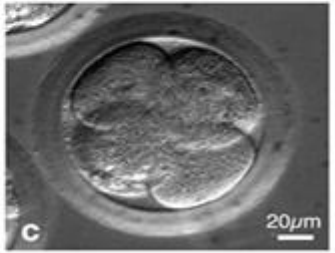


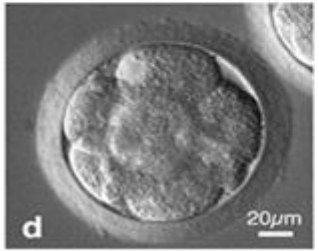
a) Zygote (fertilization)



b) 2-Cell Embryo

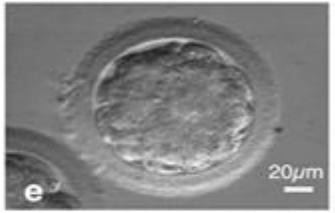
c) 4-Cell Embryo

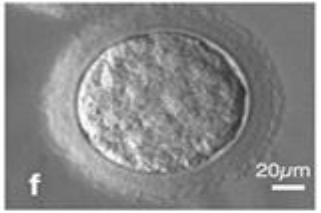




d) 8-Cell Embryo

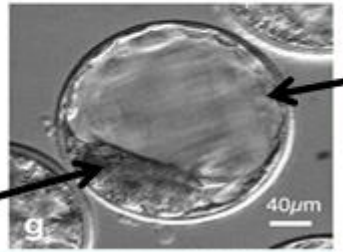
e) 16-to 32-Cell Embryo





f) Morula

g) Blastocyst – Can Implant in Uterus

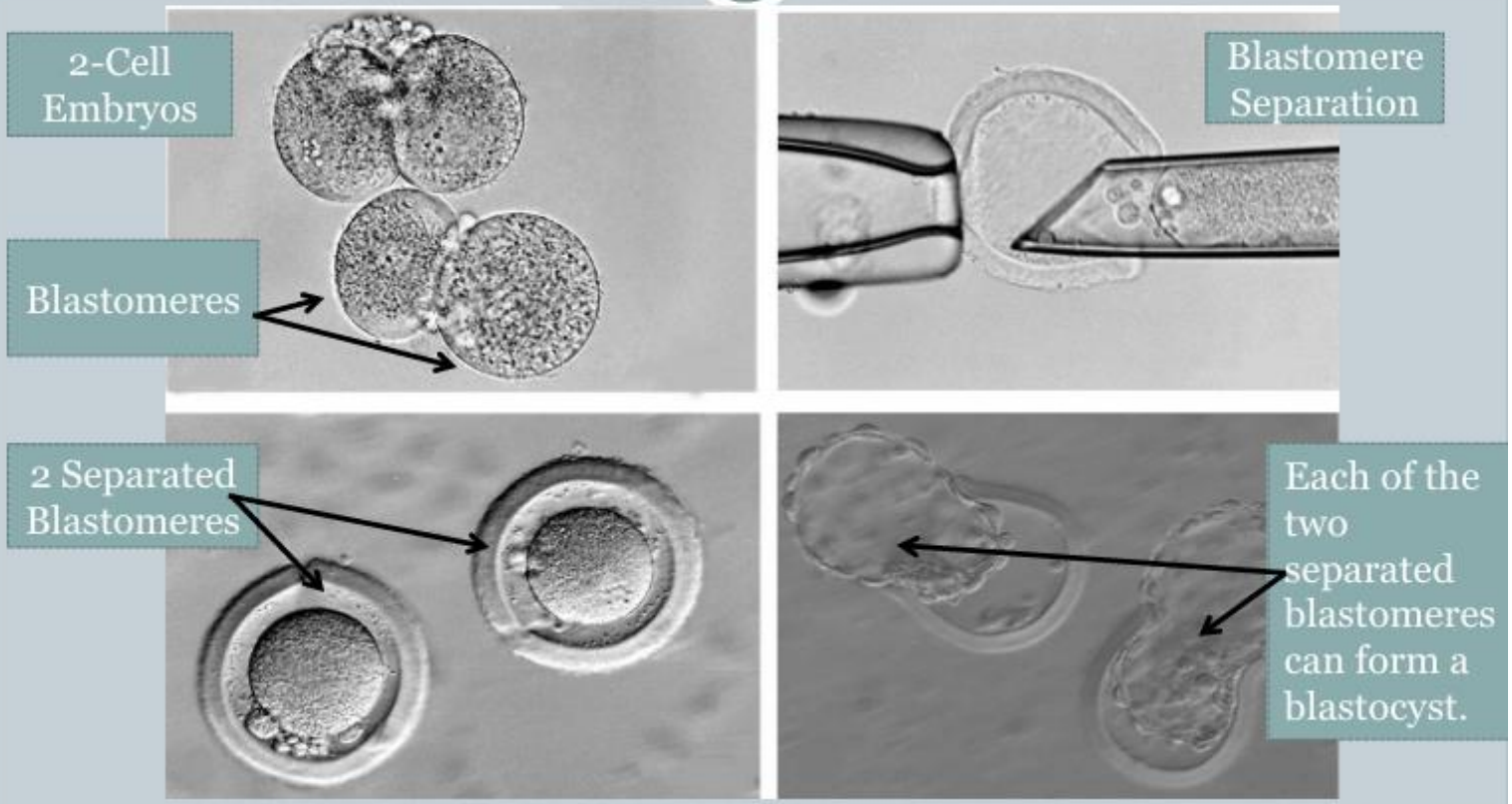


Trophectoderm (Forms the Placenta)

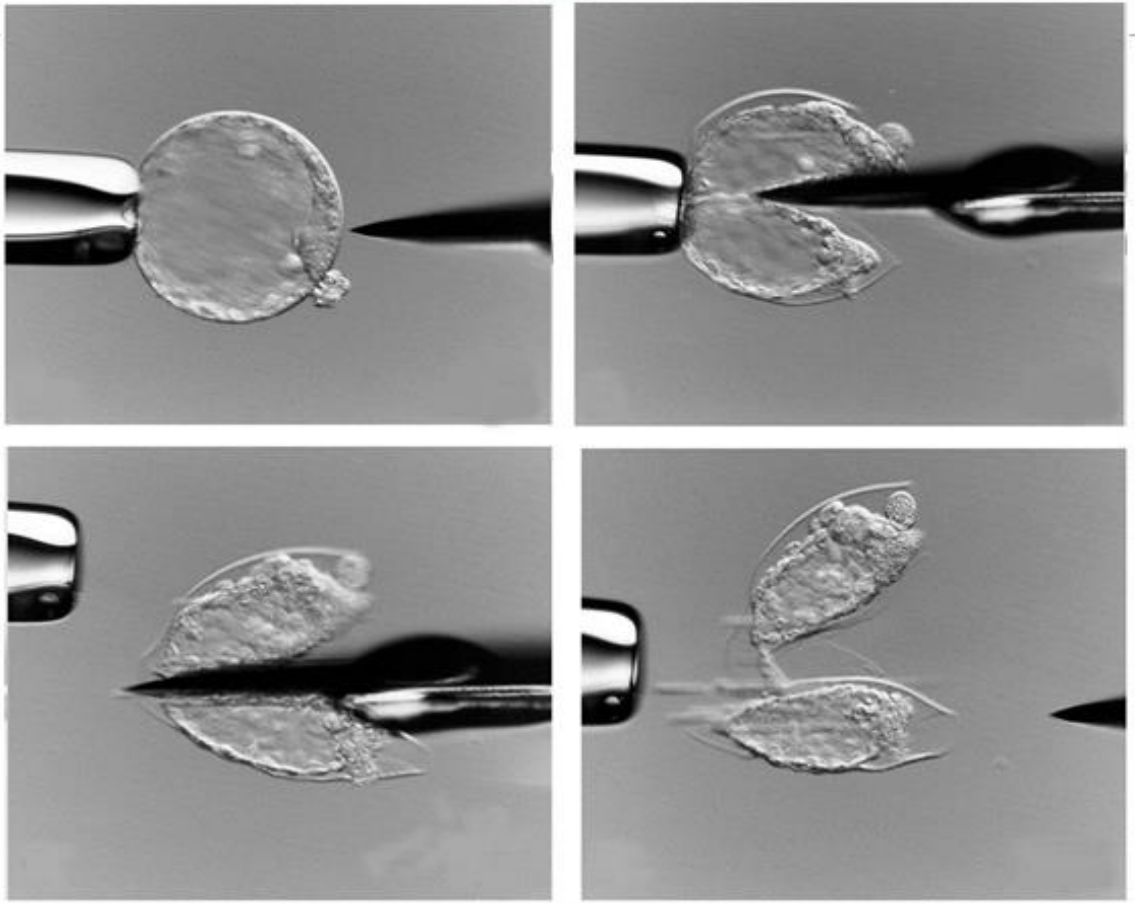
Inner Cell Mass (Forms the Fetus)

Development of the Zygote into a Blastocyst

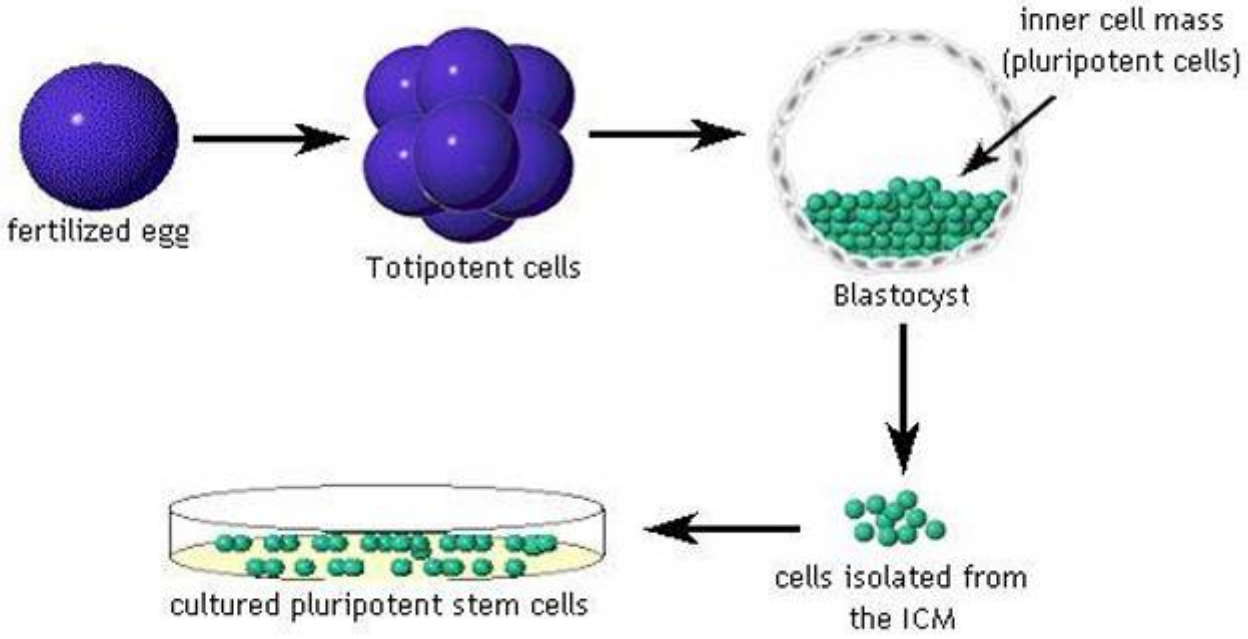
Each Blastomere (Cell from a 2- to 8-Cell Embryo) Can Become an Individual (Blastocyst)



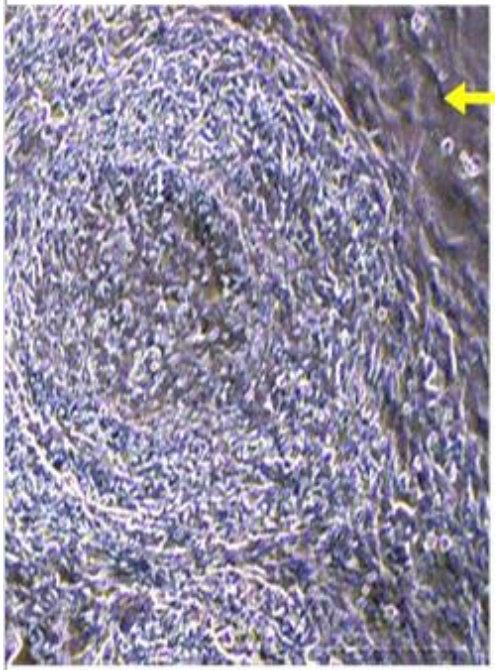
Blastocyst Splitting Into Two Potential Individuals – Development Is Less Successful



Rhesus Monkey Embryonic Stem Cell Derivation

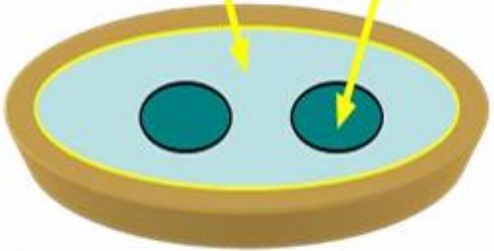


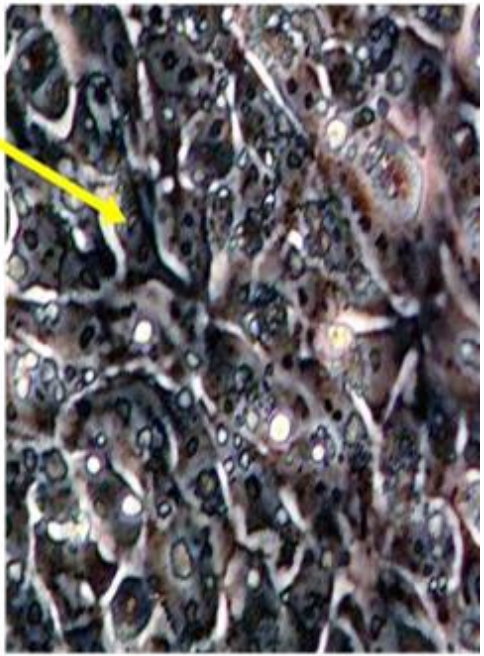
Embryonic Stem Cells Can Incorporate Into Host Embryos



Mouse Embryonic Fibroblast (feeder cells)

Monkey ES Cells





Photos & Graphics: Dr. Don Wolf, PhD, ONPRC

Stem Cells Vary in their Developmental capacity

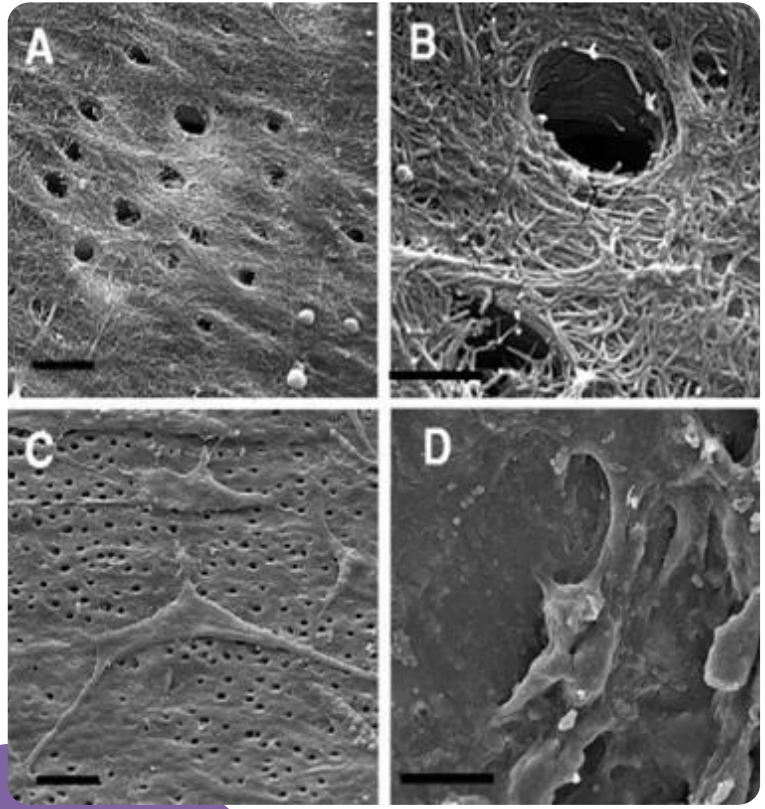
A multipotent cell can give rise to several types of mature cell.

A pluripotent cell can give rise to all types of adult tissue cells plus extraembryonic tissue: cells which support embryonic development.

A totipotent cell can give rise to a new individual given appropriate maternal support.

Adult stem cells include:

- hematopoietic stem cells which give rise to all of the types of blood
- mesenchymal stem cells which give rise to osteocytes, chondrocytes, adipocytes, and other connective tissue
- neural stem cells which give rise to neurons, astrocytes, and oligodendrocytes
- epithelial stem cells which give rise to cells lining the **digestive tract** such as absorptive cells, goblet cells, Paneth cells, and enteroendocrine cells .
- skin stem cells which occur in the basal layer of the epidermis and at the base of the hair follicles and give rise to new epidermal layers of skin.



Also included in the category of adult stem cells are cord blood stem cells in the umbilical cord of a baby which give rise to platelets, red and white blood cells, and mesenchymal cells.

سؤال جماعي للمناقشة

تتم الإجابة برفع الايدي

أي نوع من الخلايا الجذعية أكثر أمانًا برأيكم؟

Use of Human Adult Stem Cell Therapy

In 1968, human adult stem cells were used in the first successful bone marrow transplant.

 The process includes irradiating the bone marrow to destroy the faulty stem cells (often causing cancer) and replacing them with normal bone marrow stem cells from a healthy and immune compatible donor.

نشاط : سؤال فردي

3 دقائق

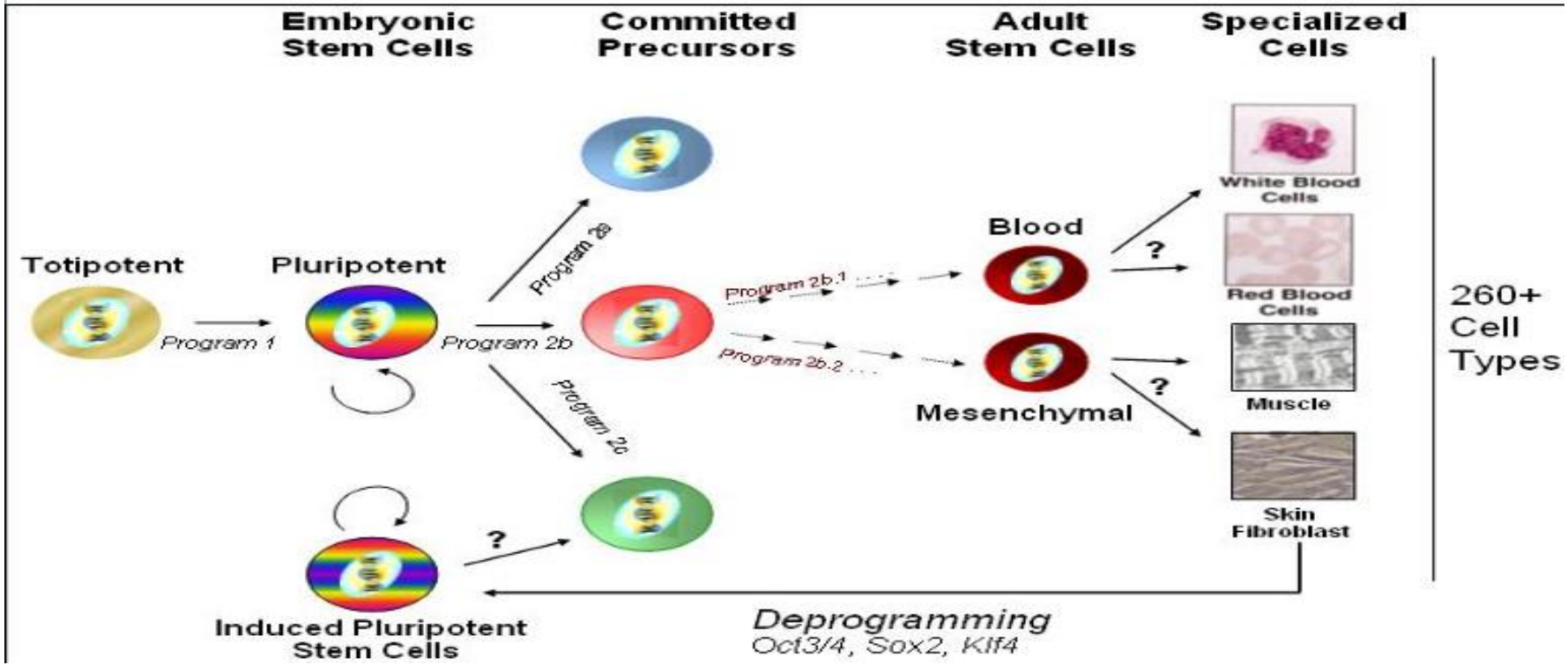
ما المرض الذي تتمنى أن يُعالج بالخلايا الجذعية في المستقبل؟

تتم الإجابة عن طريق مسح الباركود QR او الدخول على الرابط ادناه :

https://docs.google.com/forms/d/e/1FAIpQLScysqk0Gfg7gXcNJxVKFdto-lONEFw3tRLD0syTJuez7jf9ew/viewform?usp=header

Embryonic Stem Cell Research

http://stemcells.nih.gov/policy/statements/pages/SC_2008.aspx



This diagram illustrates the range of stem cell potency, based upon the cells' state of differentiation. The more potent a cell, the less differentiated it is. The most differentiated cells are specialized cells, which have assumed only one fate from the more than 260 different types of specialized adult cells.

Also illustrated is the deprogramming of specialized cells using "stemness" genes (Oct3/4, Sox2, and Klf4) to take them back to a pluripotent state, known as induced pluripotent stem cells.

Successful treatment of animal models of disease with mouse ES derived cells

Severe immune deficiency

Diabetes

Parkinson’s disease

Spinal injury

Demyelination

Myocardial infarction

Challenges for transplantation therapy

Production of required cell type in sufficient numbers and pure form

What cell to transplant

Delivery

Problems of tissue rejection