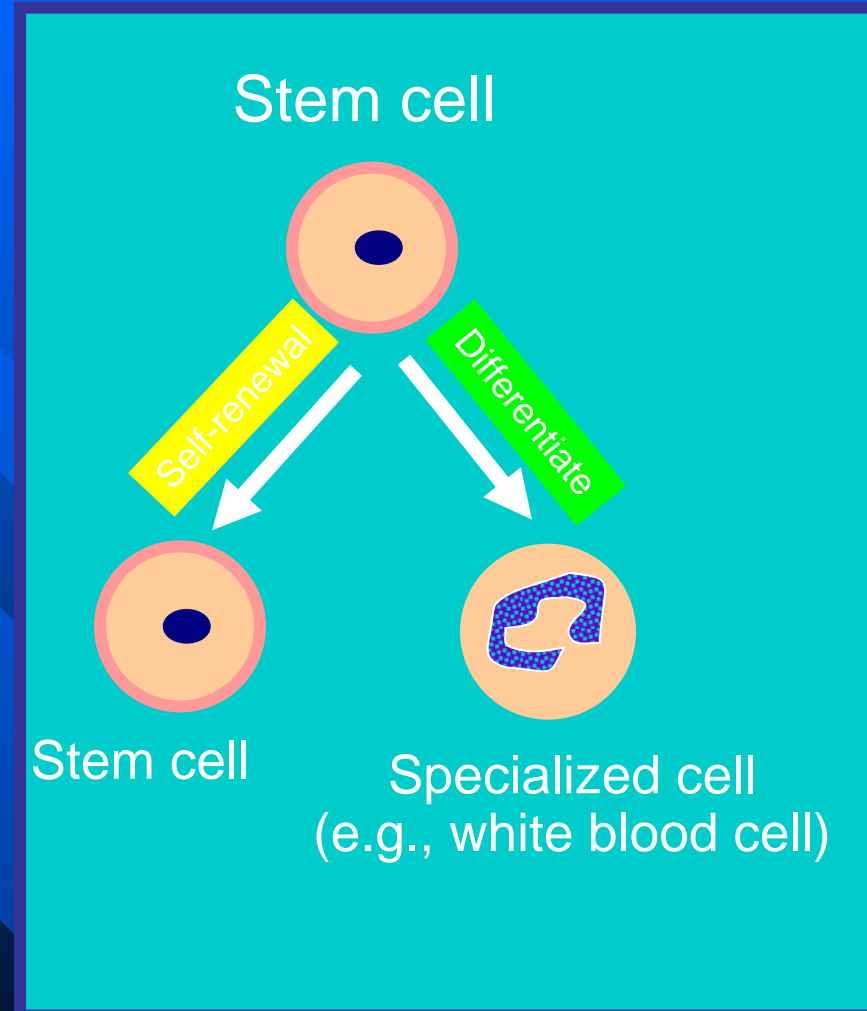
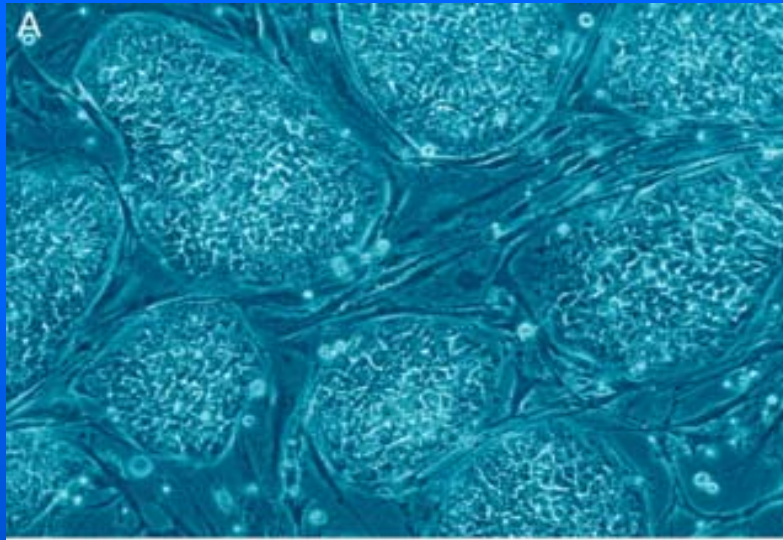


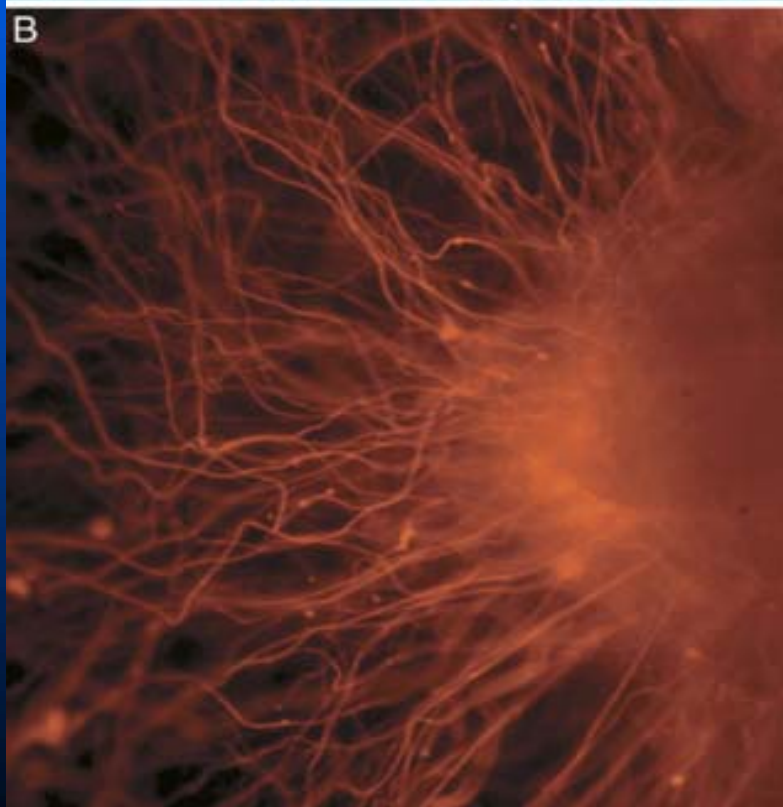
Stem Cells (幹細胞) - Definition

- ‘Master cells’ (unspecialized)
- Capable of dividing and renewing themselves for long periods of time (proliferation and renewal)
- Have the potential to give rise to specialized cell types (differentiation 分化)





← 人類胚胎幹細胞



← 由胚胎幹細胞分化而成的神經元細胞

The Major Types of Stem Cells

A. Embryonic Stem Cells (胚胎幹細胞 ESC)

- From blastocysts left over from In-Vitro Fertilization in the laboratory

B. Fetus Stem Cells (胎兒幹細胞)

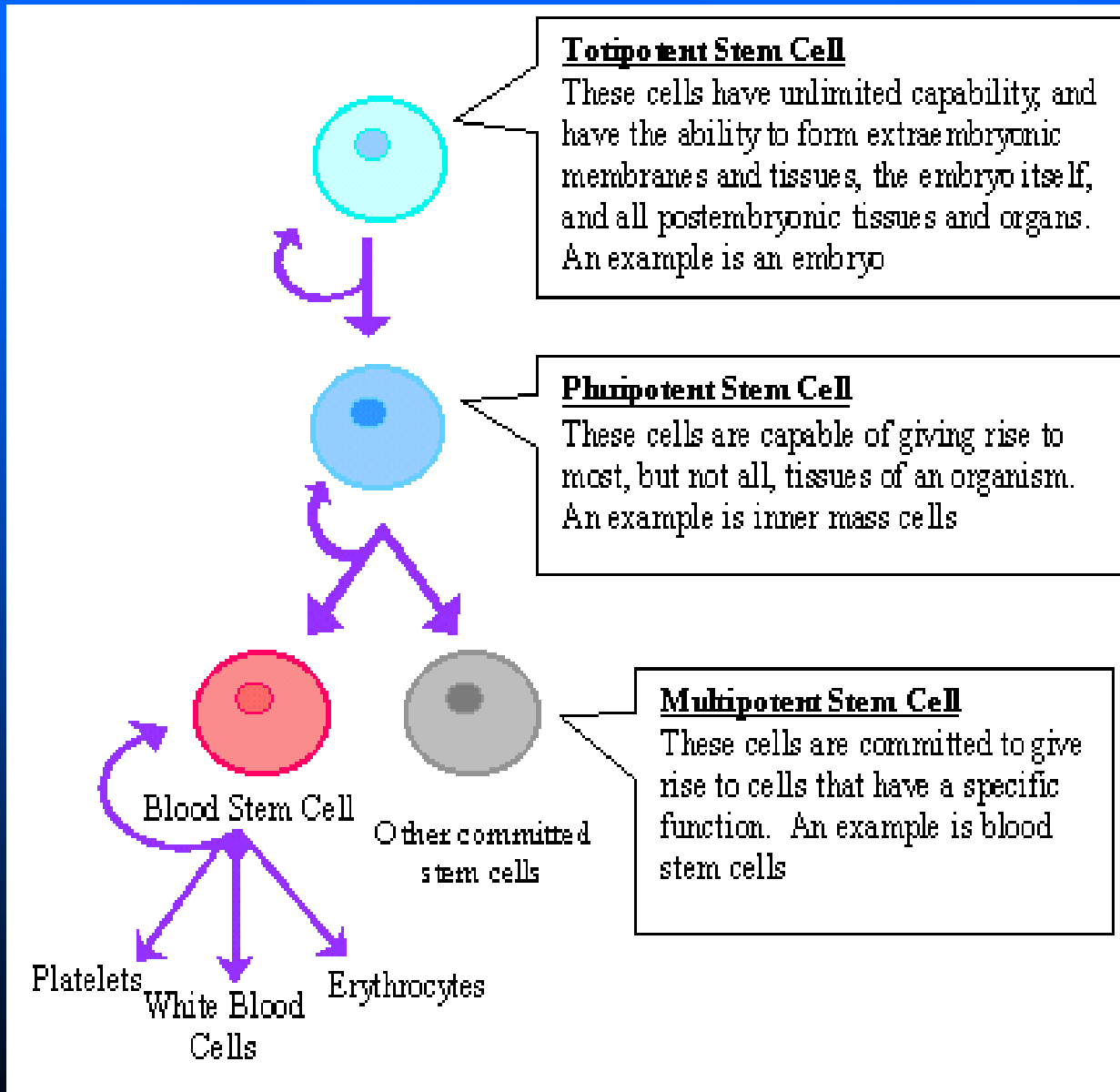
- From aborted fetuses

C. Umbilical Cord Stem Cells (臍帶幹細胞)

B. Adult Stem Cells (成體幹細胞)

- Stem cells have been found in the blood, bone marrow, liver, kidney, cornea, dental pulp, umbilical cord, brain, skin, muscle, salivary gland

Stem Cell Differentiation

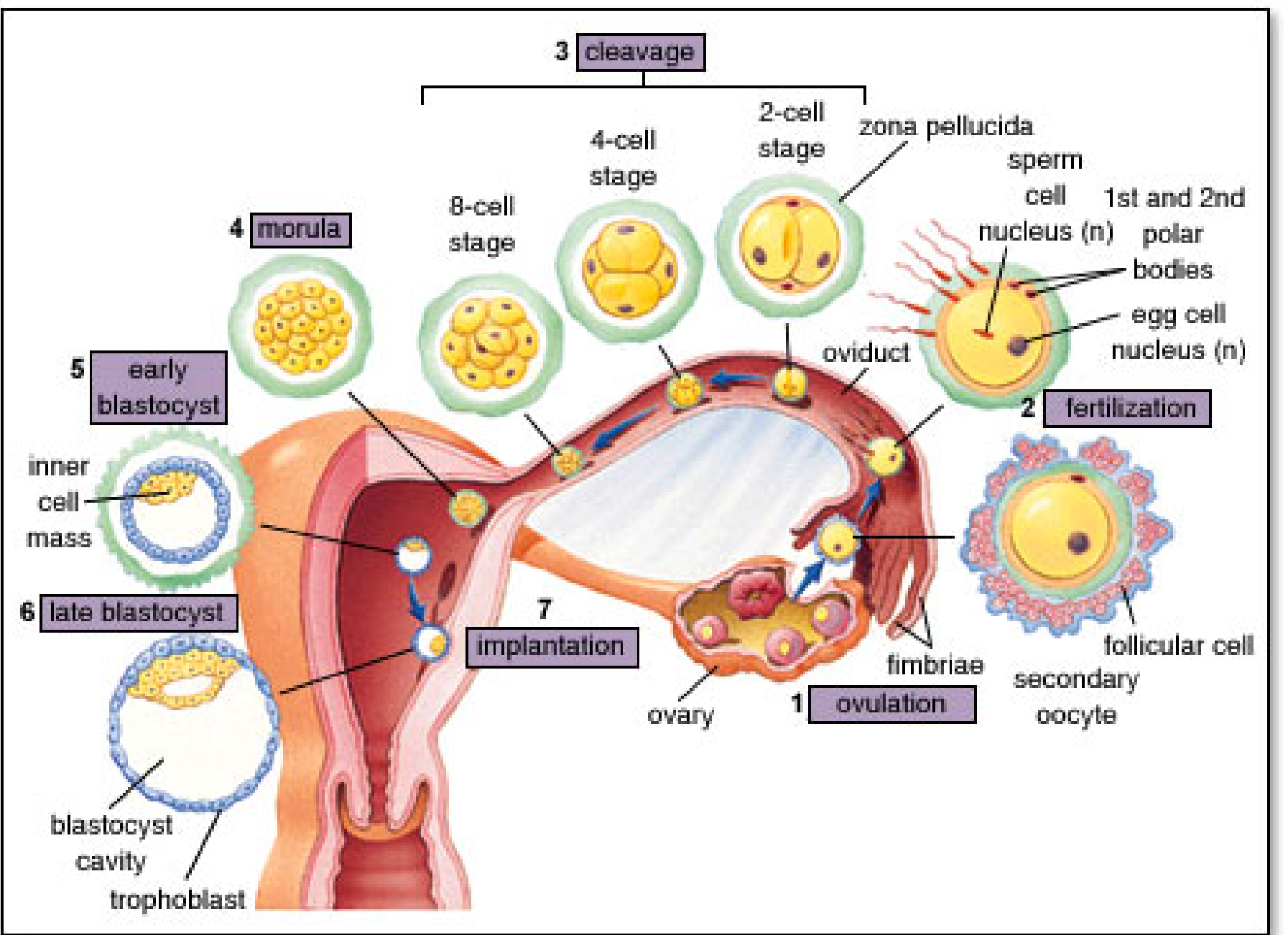


全能性幹細胞
(胚胎初期)

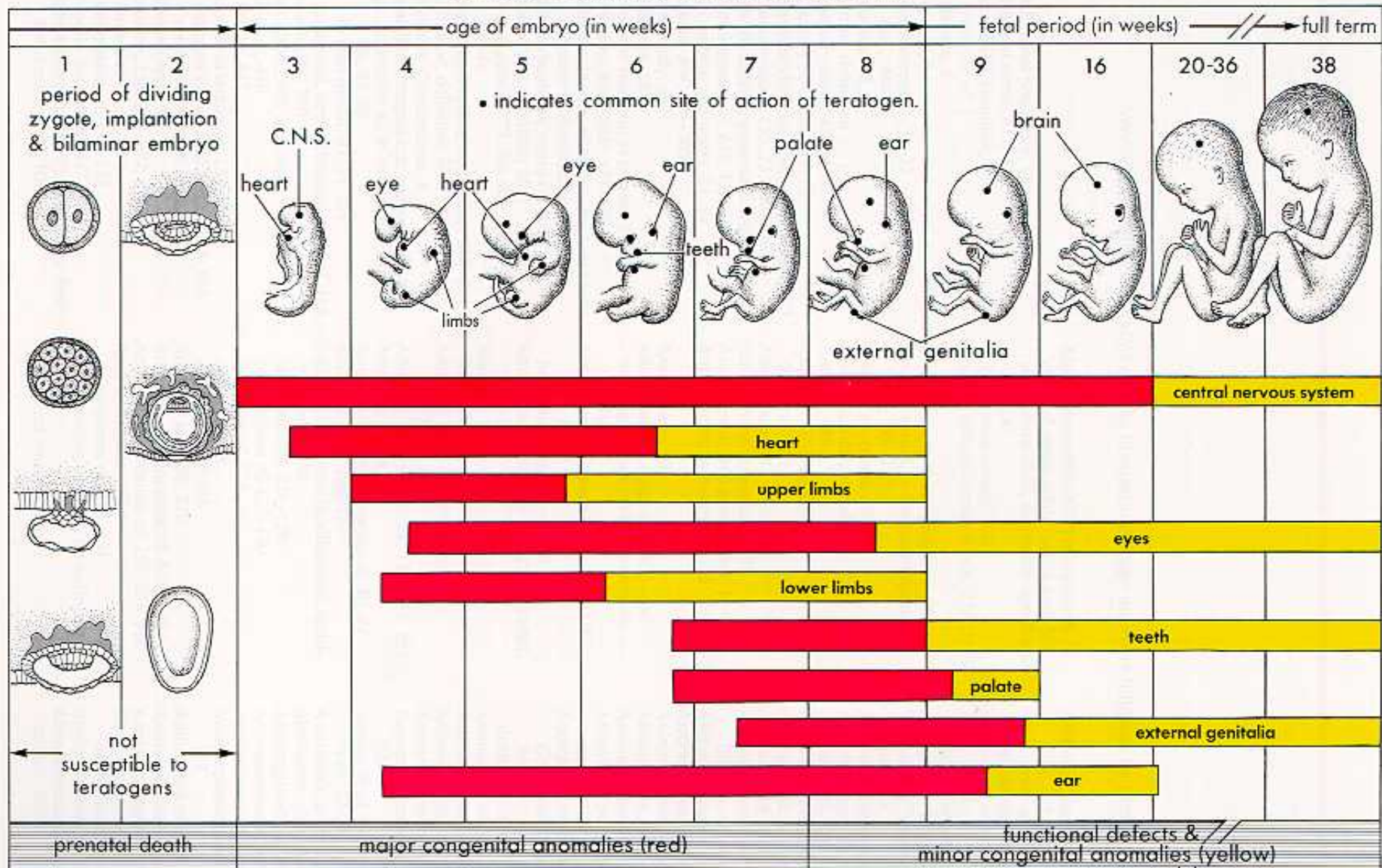
複能性幹細胞

多能性幹細胞

單能性幹細胞

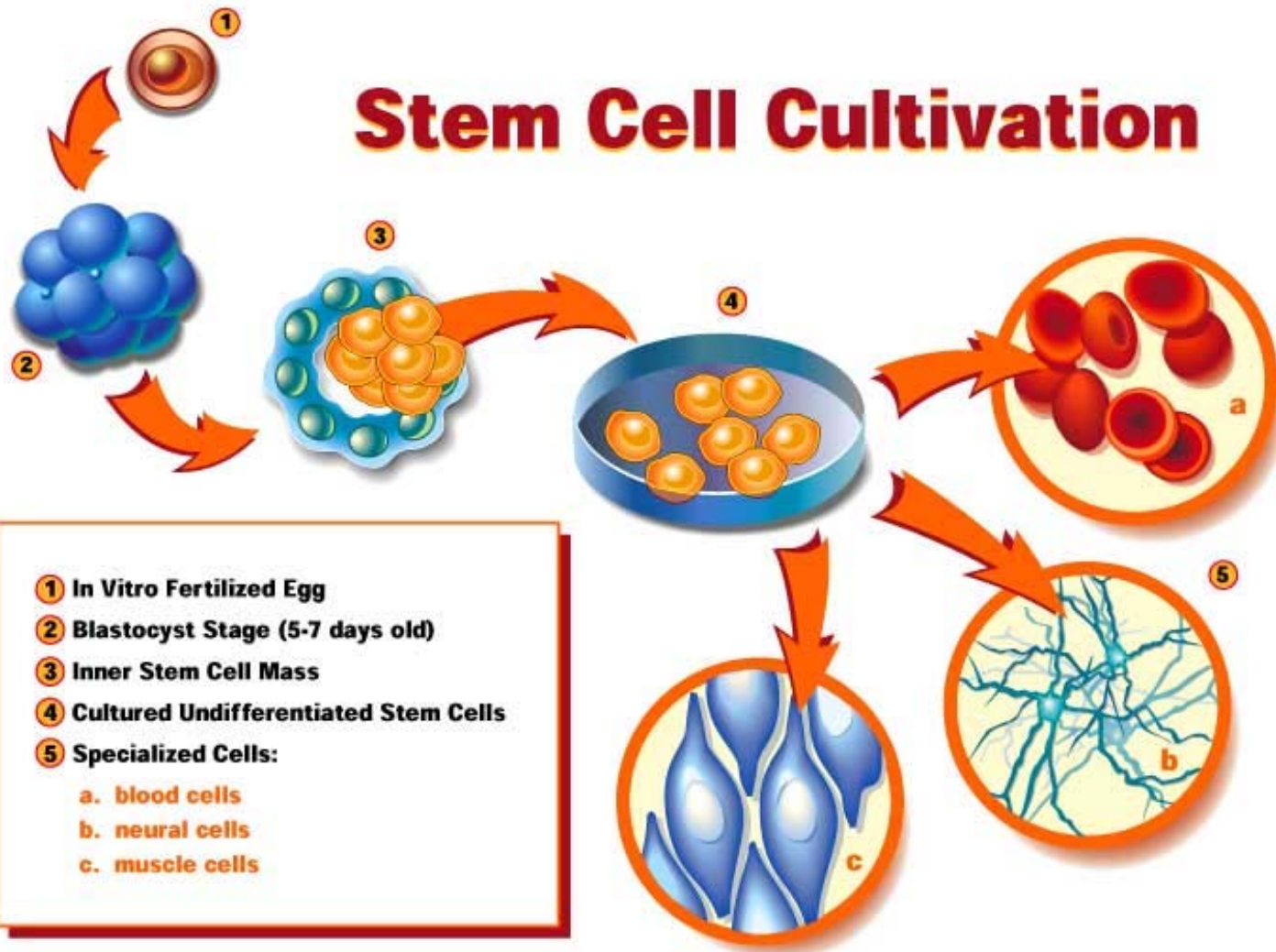


CRITICAL PERIODS IN HUMAN DEVELOPMENT*



* Red indicates highly sensitive periods when teratogens may induce major anomalies.

Stem Cell Cultivation



Stem Cell Cultivation

- ① In Vitro Fertilized Egg
- ② Blastocyst Stage (5-7 days old)
- ③ Inner Stem Cell Mass
- ④ Cultured Undifferentiated Stem Cells
- ⑤ Specialized Cells:
 - a. blood cells
 - b. neural cells
 - c. muscle cells

複製人類胚胎引發爭議

SPACEDAILY YOUR PORTAL TO SPACE

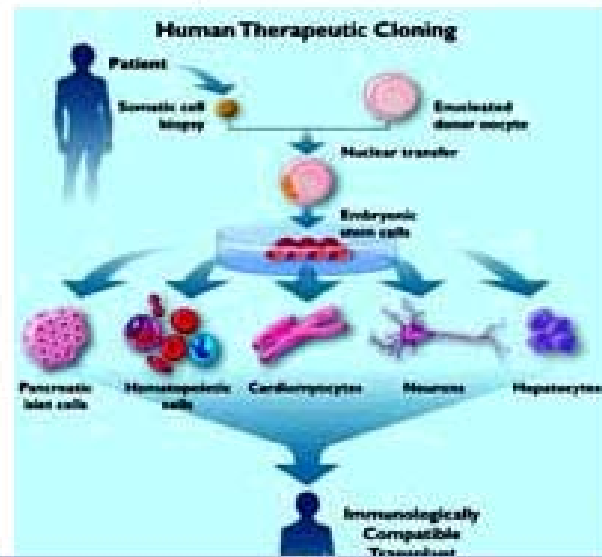
CLONE SPACE

US Academy Wants Ban On Human Cloning But Hails Therapeutic Use

by Maxim Kniazkov

Washington (AFP) Jan 19, 2002

A blue-ribbon panel sponsored by the US National Academy of Sciences called Friday for a strict ban on human cloning but -- in stark disagreement with the Bush administration -- backed creation of new stem cell lines for



History of Human Embryonic Stem Cell Research

- In 1998, John Gearhart (Johns Hopkins University) derived human embryonic germ cells from cells in fetal gonadal tissue in culture.

Aborted fetus

First Success of Human Embryo Cloning

- In 2001, the first cloned human embryo created by US researchers died at the 4-6 cell stage — **too early to obtain embryonic stem cells.**



The image is a screenshot of a CNN.com news article. At the top left, the CNN logo is followed by ".com" and "SCI-TECH" in large green letters. Below this is a search bar with "SEARCH" and "GO" buttons. A vertical navigation menu on the left lists various categories: MAIN PAGE, EUROPE, WORLD, WEATHER, BUSINESS, BIZ TRAVELLER, SCI-TECH (highlighted in red), ENTERTAINMENT, SPECIAL REPORTS, SPORT at SI.com, SERVICES, E-MAIL SERVICES, CNN MOBILE, CNN AVANT GO, DESKTOP TICKER, ABOUT US, and AD INFO. The main article title is "Human embryo created through cloning" in bold black text. Below the title is the date and time: "November 26, 2001 Posted: 12:33 PM EST (1733 GMT)". To the left of the text is a photograph of a microscope with a circular inset showing a magnified view of several yellowish, spherical cells. The article text begins with "WASHINGTON (CNN) -- Scientists at a technology company said Sunday they have created human embryos through cloning, drawing criticism from President Bush and lawmakers and raising new ethical questions." The text continues: "Advanced Cell Technology Inc. of Worcester, Massachusetts, said the experiment was aimed not at creating a human being but at mining the embryo for stem cells used to treat disease." At the bottom of the article, there are two icons: a floppy disk for "SAVE THIS" and an envelope for "EMAIL THIS".

First Success of Human Embryonic Stem Cell

■ On February 12, 2004, South Korean scientists, Dr. Woo Suk Hwang and Dr. Shin Young Moon of Seoul National University, reported the successful creation of **30 cloned human embryos developed** to the **blastocyst stage** and then destroyed by stem cell extraction, **yielding one embryonic stem cell line.**



The screenshot shows the CNN International website interface. At the top, the CNN logo is followed by "INTERNATIONAL.com". Below this is a yellow banner with "BREAKING NEWS" and a headline about a tropical storm. A search bar is visible with "The Web" and "CNN.com" options. A navigation menu on the left lists various categories like Home Page, Asia, Europe, U.S., World, etc. The main content area is titled "HEALTH" and features a headline "Scientists 'cloned human embryos'" with a sub-headline "Stems cells extracted to be used for medical research". The article text states that South Korean researchers reported they have created human embryos through cloning and extracted embryonic stem cells. A microscopic photo of eight cloned embryos is included, with a caption stating it was released by Seoul National University. The article is dated Friday, February 13, 2004.

CNN INTERNATIONAL.com

> **BREAKING NEWS** Gustav weakens to tropical storm over Louisiana [Wa](#)
[CNN.com](#).

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HEALTH

Scientists 'cloned human embryos'

Stems cells extracted to be used for medical research

Friday, February 13, 2004 Posted: 0250 GMT (10:50 AM HKT)

SEOUL, South Korea (CNN) -- South Korean researchers reported Thursday they have created human embryos through cloning and extracted embryonic stem cells, the universal cells that scientists expect will result in breakthroughs in medical research.



A microscopic photo released by Seoul National University shows eight of the cloned embryos.

Hanyang University professor Hwang Yoon-Young said, "Our research team has successfully culled stem cells from

How Many Human Embryonic Stem Cell Lines are There?

- The actual number of human embryonic stem cell lines is a matter of some debate.
- To date, **more than 100** human embryonic stem cell lines have been derived worldwide.
- However, most of those lines are not adequately characterized yet.
- Only 22 cell lines are eligible for federal funding in the USA.

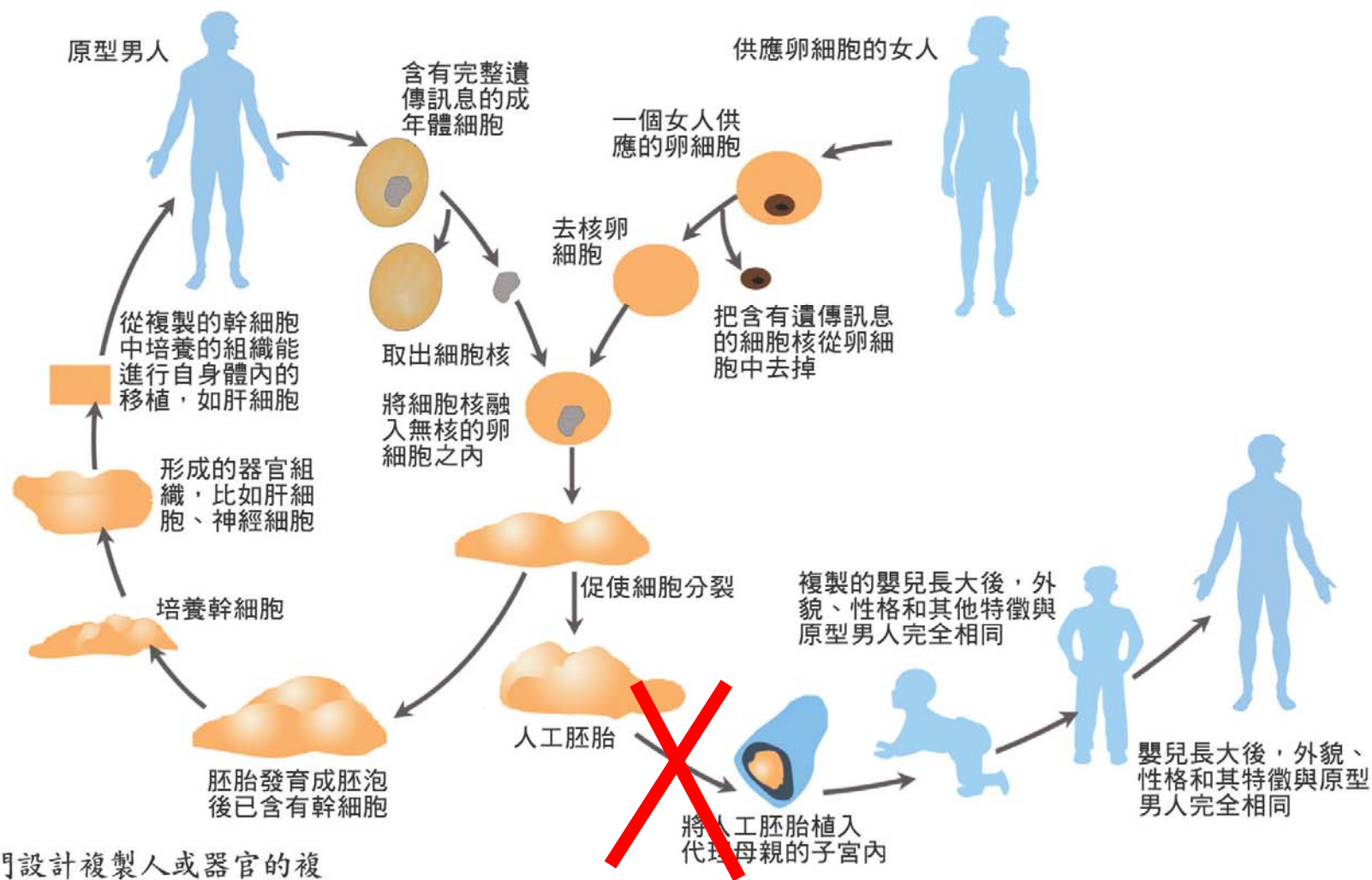
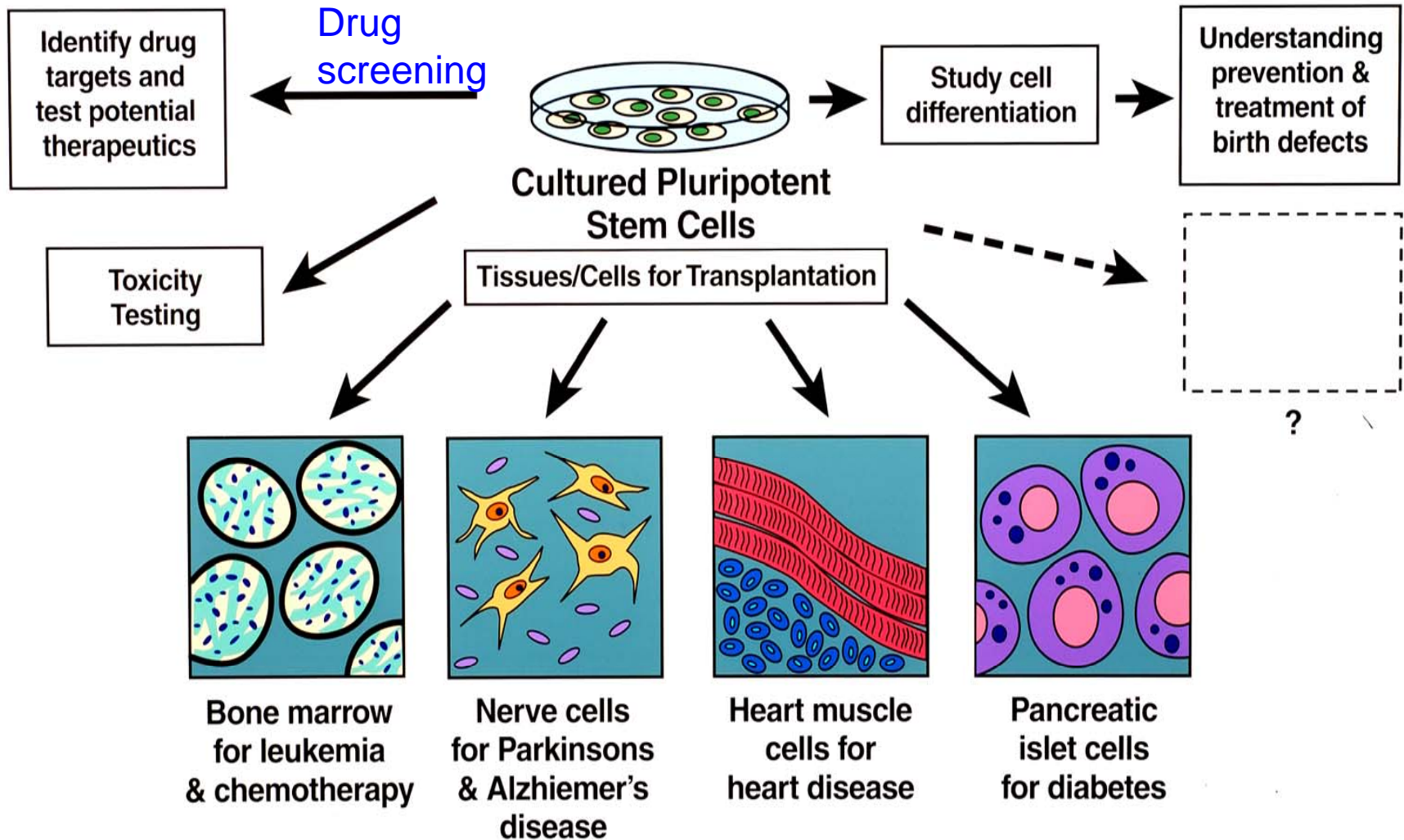


圖 12-28 專門設計複製人或器官的複製技術與步驟

The Promise of Stem Cell Research



未來幹細胞或許可以用來治療以下常見疾病

Parkinson's disease (巴金森氏症)

Alzheimer's disease (老人癡呆症)

Spinal cord injury (脊髓損傷)

Stroke (中風)

Burns (燒傷)

Diabetes (糖尿病)


Liver failure (肝衰竭)

Heart disease (心臟病)

Osteoarthritis (骨關節炎)

Rheumatoid arthritis (風濕性關節炎)

End-stage kidney disease (末期腎臟病變)



*Once little more than
a futile hope, some restoration
of the injured spinal cord
is beginning to seem feasible*

Repairing the Damaged Spinal Cord



自體幹細胞 培育氣管移植 瀕危肺結核女獲救 科學家：20年內會普及

2008/11/20 蘋果日報



【蔡佳慧／綜合外電報導】幹細胞療法新突破，開啓「外科治療新紀元」！歐洲科學家替一名支氣管受損的30歲婦女，完成全球首例的自體幹細胞培育器官移植手術，成功解決免疫系統的排斥問題。科學家聲稱，未來20年內，病患移植以自體細胞培育出的心臟、肺臟等器官，可望變成普遍的療法。

現年30歲的哥倫比亞婦女卡絲蒂約（Claudia Castillo）現居西班牙，她在2004年感染結核病，今年3月時，左支氣管連接肺部一端嚴重阻塞，幾乎完全塌陷，導致她連走路都有困難，甚至恐怕得摘除左肺。不過，歐洲醫界攜手合作，以創新的幹細胞療法，從她骨髓幹細胞培育出新氣管進行移植，讓她重拾健康生活。

自體移植支氣管

一名哥倫比亞女子卡絲蒂約接受世界首例量身訂做的氣管移植手術，其方法是把她自己的幹細胞「種」在別人捐贈的器官上，以免身體發生排斥現象。

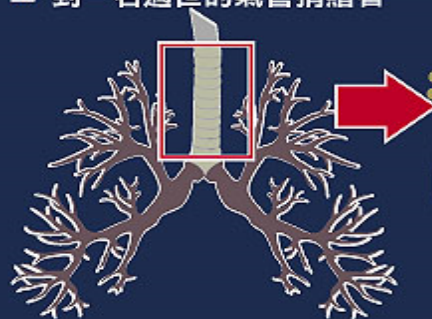
氣管萎縮

卡絲蒂約左肺的支氣管因肺結核受損萎縮



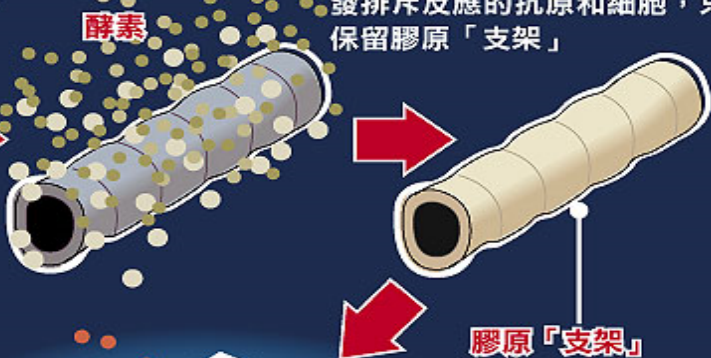
移植程序示意圖

1 西班牙巴塞隆納醫師找到一名過世的氣管捐贈者



2

以酵素把氣管「洗淨」，去除原本屬於捐贈者、可能引發排斥反應的抗原和細胞，只保留膠原「支架」



神奇幹細胞「茶包」2周治癒癱男 置入大腦起藥廠作用最快5年內上市

2008年12月04日蘋果日報

【蔡文英／綜合外電報導】長久以來，研究人員不斷尋找修補中風病患受損大腦的方法，先前研究顯示，移植人類胚胎幹細胞製造的腦細胞，有助修復老鼠大腦的損傷。德國專家前天宣布，一名中風病人在接受將裝有幹細胞的「茶包」放入大腦內的新療法兩周後，不但恢復說話能力，癱瘓的右臂也能動了。神奇的茶包幹細胞療法最快5年內上市，將嘉惠無數出血性腦中風患者。

「我覺得很幸運」，現已出院的49歲德國人貝斯特（Walter Bast）是**全球**首位接受此一革命性幹細胞療法的人，他在手術後一周如此表示。他今年10月因出血性腦中風（俗稱腦溢血）住院，短期內二度中風，語言能力受損，右手臂也不聽使喚。漢諾瓦的國際神經科學學會教授布林克（Thomas Brinker）替他進行由英國Biocompatibles International藥廠研發的「細胞珠」（CellBeads）療法。

癱瘓右手恢復知覺

布林克將1個2公分x2公分聚丙烯製「茶包」，放進貝斯特大腦內血管受損處，茶包內有500顆藻酸鹽製的膠囊，每顆小膠囊內含100萬個取自**健康**成人捐贈者骨髓的間葉幹細胞（mesenchymal stem cell），間葉幹細胞能形成脂肪和肌肉。

這些間葉幹細胞經過基因改造，能產生具有抗細胞死亡功能的蛋白質GLP-1（專利藥品名為CM1），能使因中風受損的細胞再現生機，其作用有如「大腦內的藥廠」。將幹細胞置於膠囊內，是為避免身體免疫系統將它們視為外來組織，遭到破壞。

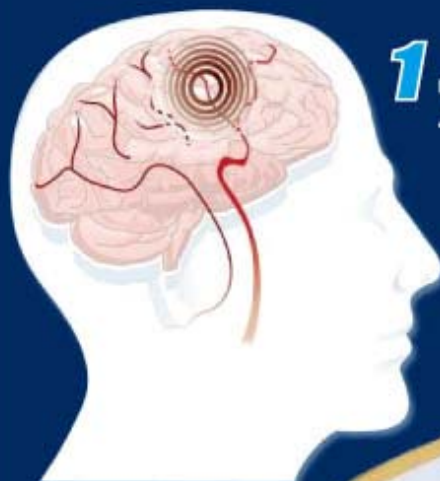
14天後，醫生將茶包取出，以防移植的細胞對患者造成可能的長期副作用。如今手術過了6周，貝斯特不但能再開口說話，右手也恢復活動。

目前仍處臨床階段

布林克說：「我們在如此少數的患者身上看到這麼好的復元之路，這是令人鼓舞的開始。最重要的是，我們發現這種治療無副作用。」臨床測試第一階段，共20名患者接受實驗。

製造商Biocompatibles的史崔福博士指，茶包療法可儲存於醫院冷藏室，以備患者不時之需。現階段實驗目的僅在確定其**安全性**，要上市還得通過效用和道德上種種障礙。該公司執行長賽門接受路透電話訪問時強調，目前還稱不上有正式結果，但這名患者的復元情況良好。但因該患者還動了中風患者通常會接受的大腦減壓手術，還無法確定是哪種手術起作用。

出血性腦中風佔所有中風的15%？20%，是最難治療的一種，死亡率與發病率最高，只有44%患者能活過發病之後的30天。

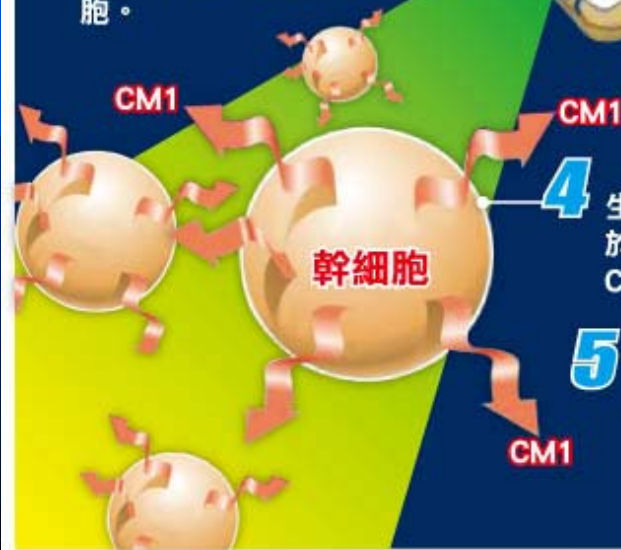
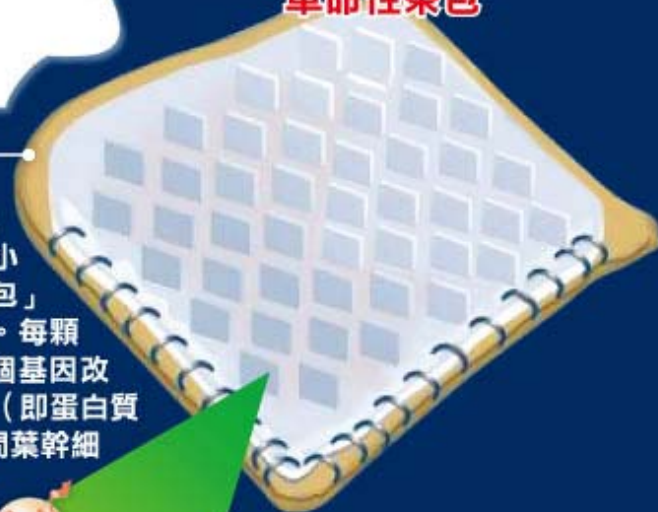


1 因大腦內脆弱的血管破裂而中風的患者，語言能力受損且一隻手臂癱瘓。

2 外科醫生割下患者一小部分頭骨，將破裂的血管結紮好，並清除腦中的血。

革命性茶包

3 醫生將一個4平方公分大小、裝了500顆小膠囊的網眼「茶包」塞進患者大腦內。每顆膠囊內含100萬個基因改造，能製造CM1（即蛋白質GLP-1）藥物的間葉幹細胞。



4 這些幹細胞會大量生產可保護腦細胞免於死亡、恢復生氣的CM1。

5 約兩周後，醫生取出「茶包」，患者恢復說話能力，手臂也能再活動。

Fetal stem cells cause tumor in a teenage boy

By [Coco Ballantyne](#) in [60-Second Science Blog](#)

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Stumble!

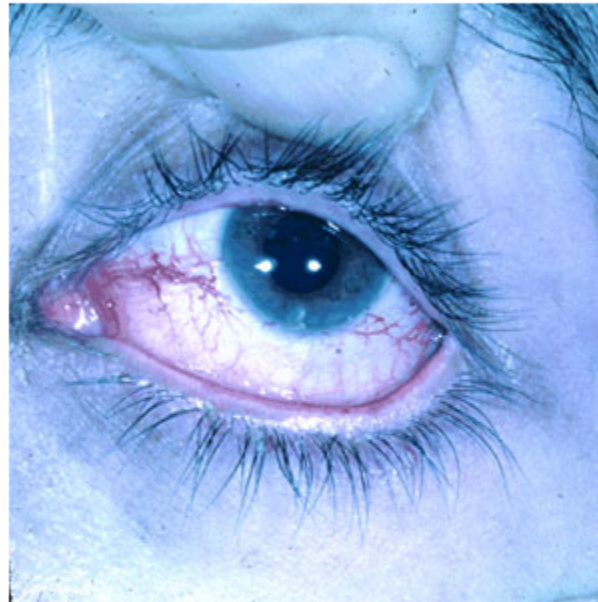


6 thumbs-up



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Safety



In May 2001, Israeli parents of a nine-year old boy with a crippling disease that left him wheelchair-bound took their child to see doctors in Moscow. In a highly experimental procedure that was presumably unavailable in their home country, those doctors injected fetal stem cells into various regions of his brain.

The boy's parents—they aren't named in a [report](#) describing the case in this week's *PLoS Medicine*—must have been desperate. The nine-year old suffered from [ataxia-telangiectasia](#), a childhood disease that causes degeneration of parts of the [brain](#) that control muscle movements and speech. The symptoms include slurred speech, poor balance, impaired immune function, and the appearance of red spider veins called telangiectasias in the eyes, ears or cheeks.

There are no treatments for the disorder and the prognosis is dim; patients usually only make it into their teens or early twenties, [according to the National Institute of Neurological Disorders and Stroke](#). While it's unclear exactly what the Russian doctors were trying to achieve (the researchers who wrote the case report were not involved in the stem cell therapy), they must have been hoping that the [injected cells](#) would restore some function in his brain, or at least slow the disease progression. The boy went back for injections in 2002 and 2004, although it's not clear from the report whether his condition improved as a result.

Then he was diagnosed with a brain tumor in 2005. That tumor, it turns out, grew out of the stem cells, obtained from at least two aborted fetuses, used in his brain.

The tumor was benign, doctors safely removed it, and it has gradually been growing back since the surgery. But this is the first-known case of a brain tumor caused by a brain stem cell therapy, according to the report—a phenomenon [scientists have predicted in the pages of *Scientific American*](#) and elsewhere. The theory is that because these stem cells are fetal cells, they are designed to proliferate and give rise to new tissue, which means they have the potential to produce tumors. The case, write the authors of this week's case study, should serve as a warning that more research is needed to gauge the safety of these novel therapies.

International Legislation

- **South Korea – refined nuclear transfer or therapeutic cloning**
- **China – supports research**
- **Singapore – stem cell research a national priority**
- **Israel – leaders stem cell disease**
- **Great Britain – leader Dolly – active support of research**
- **Japan – supports research**

國別	法律是否明文禁止複製人 (reproductive cloning)	法律是否允許以下列來源進行研究			相關主管部會	專門的全國性委員會
		幹細胞	人類胚胎	墮胎的胚胎		
丹麥	禁止	可	可	可	健康與研究部	丹麥倫理委員會
芬蘭	禁止	可	可	可	社會事務與健康部	全國健康看護諮詢委員會下的子委員會
挪威	禁止	無法律規範	不允許	正立法當中	健康與社會事務部	全國研究倫理委員會
瑞典	禁止	不允許	可	可	健康、社會事務與教育部	無全國性的機構,只有地區性的倫理委員會
英國	禁止	可	可	可	健康部門	人工受精、胚胎授權與人類基因委員會
法國	禁止	可	不允許	可	勞動與社會事務部	健康與生命科學倫理的全國性諮詢委員會
德國	禁止	無法律規範	不允許	可	聯邦健康部	無全國性的機構,只有地區性的倫理委員會
荷蘭	正立法中	正立法中	正立法中	正立法中	健康、福利與運動部	與人類事務研究有關的中央委員會
瑞士	禁止	無法律規範	無法律規範	無法律規範	聯邦司法局	全國性諮詢委員會
西班牙	禁止	可	可	可	健康部	生化倫理委員會

瑞士(2004/11/29)就一項允許對人類胚胎幹細胞進行醫學研究的法律舉行複決公投²⁴，有三分之二選民投下贊成票。