

# 人工生殖科技之現況及未來

臺灣大學附設醫院婦產部

陳思原醫師

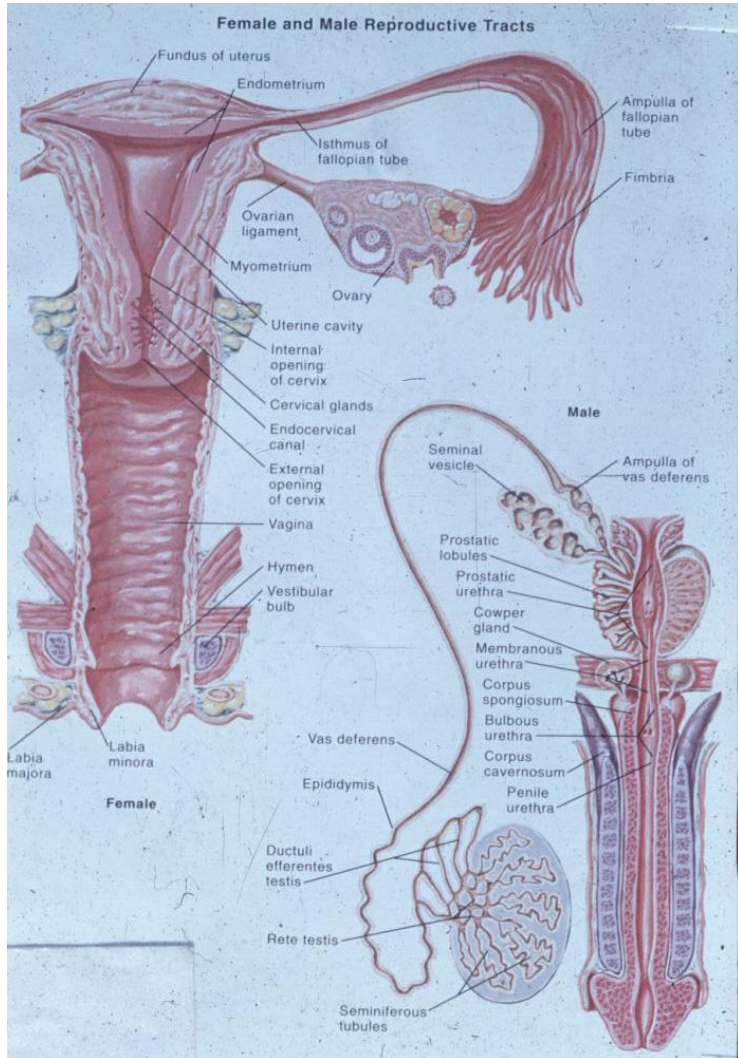
9:40-10:10 am, 2013, 11, 10

台灣醫學會

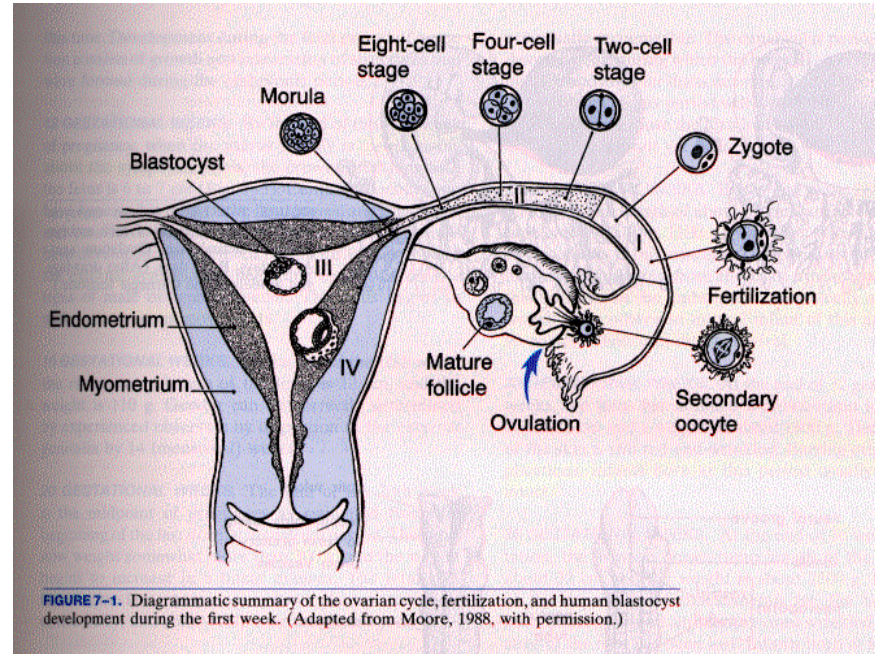
台北國際會議中心

# 自然受精與著床

## 生殖生理解剖

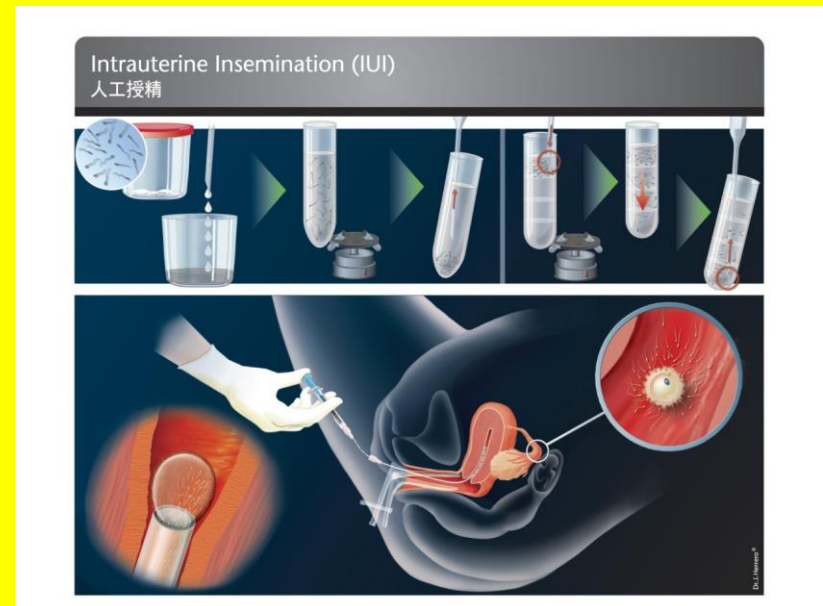
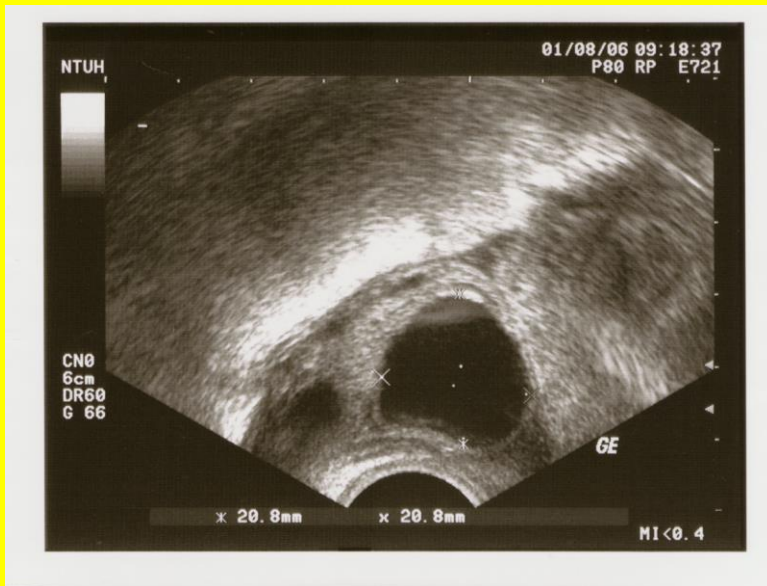


## 卵子與精子遭遇受精及胚胎細胞分裂



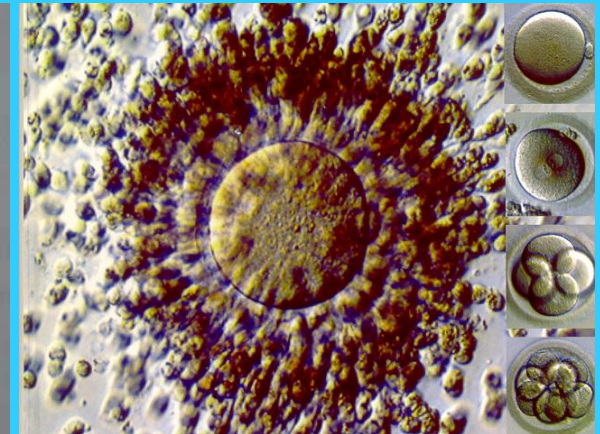
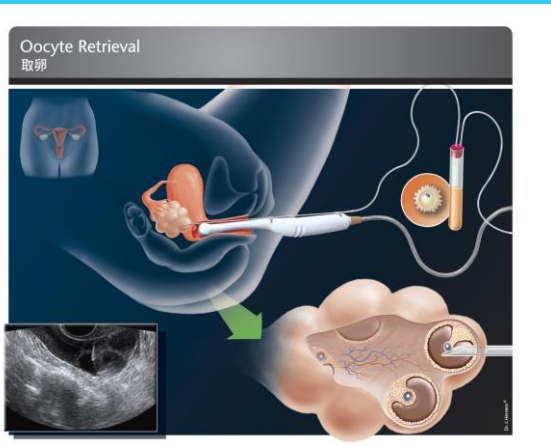
# 1 人工授精

- 不明原因不孕症、性行為困難可做人工授精。
- 先將精子洗滌篩選，選擇活動力較好之精蟲，在排卵日，應用導管直接送入子宮內（intrauterine insemination, IUI）。
- 可用自然周期排卵或微刺激排卵，例如口服排卵藥、或隔天注射促性腺素。
- 成功率約10-15%。



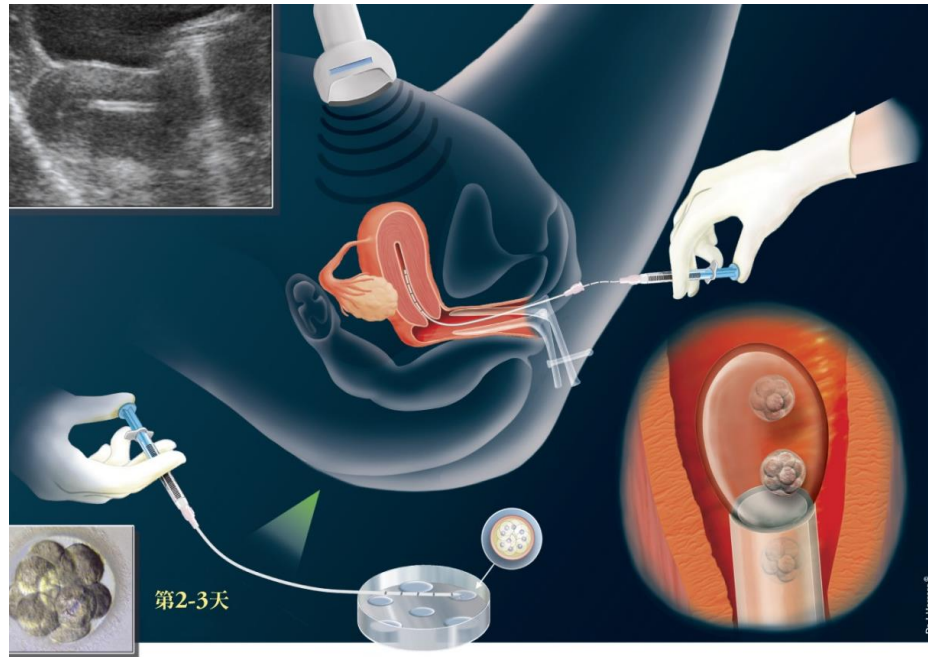
## 2 取卵手術及體外受精與胚胎植入

- 如果輸卵不通時可通過陰道取卵手術。
- 體外受精( in-vitro fertilization, IVF )(試管嬰兒)。



受精率 70%

Transvaginal oocyte retrieval



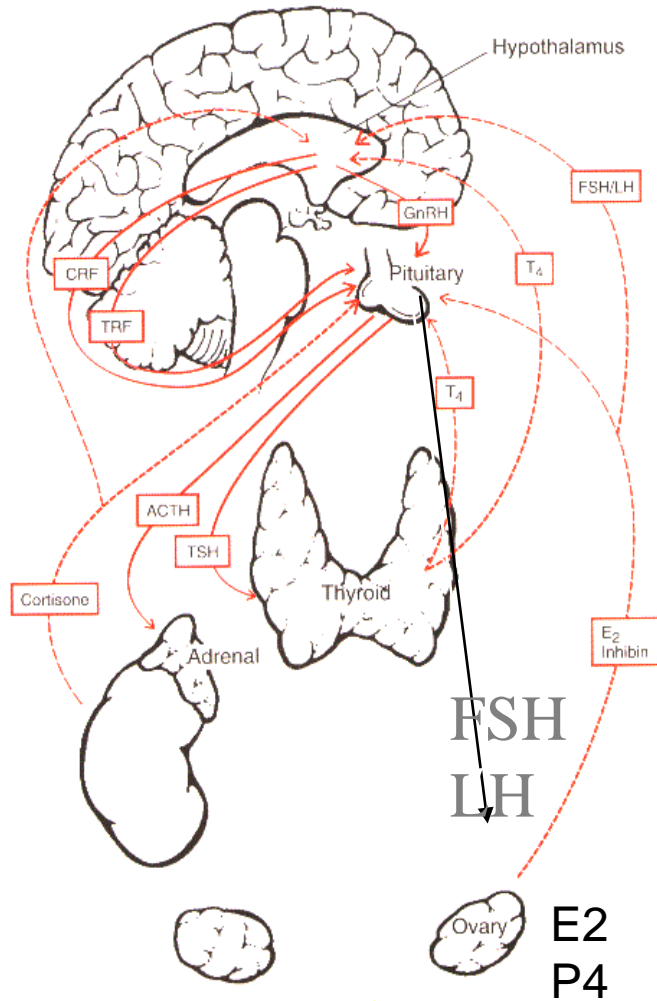
胚胎植入( embryo transfer , ET )

由陰道經過子宮頸植入子宮內

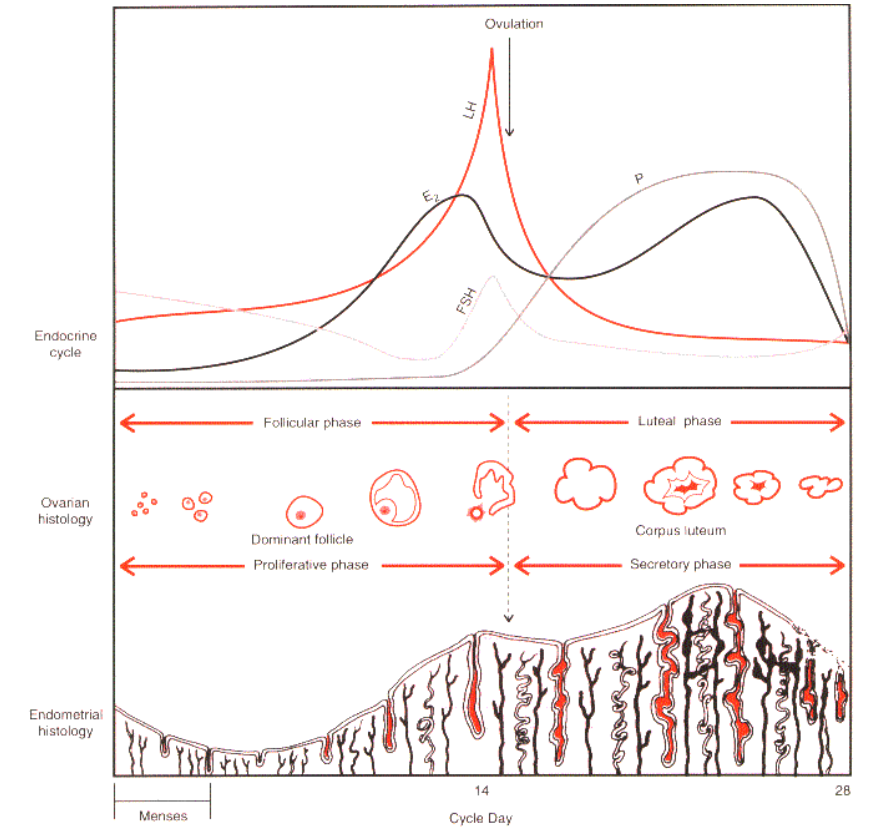
懷孕率： < 35 years, 50%  
36-40 years, 30%  
41-42 years, 15%  
> 43 years, 5%

# 生殖內分泌

## 下視丘-腦下垂體-卵巢內分泌軸 促性腺激素-性腺激素-子宮內膜



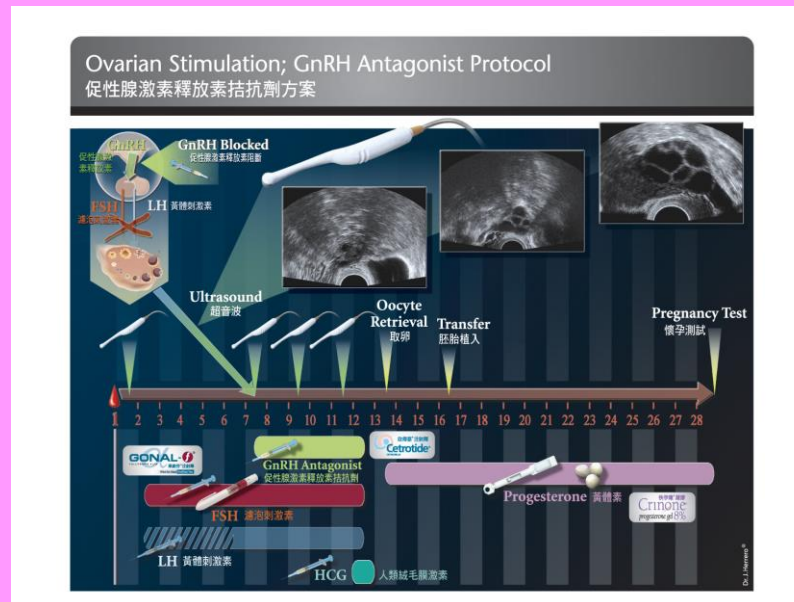
GnRH: gonadotropin-releasing hormone  
促性腺素釋放激素  
Gn: gonadotropin  
促性腺素



FSH: follicle-stimulating hormone 濾泡刺激素  
LH: luteinizing hormone 黃體刺激素  
E<sub>2</sub>: estradiol 雌激素  
P<sub>4</sub>: progesterone 黃體素

### 3 排卵刺激之進步

- 刺激排卵可增加卵子數，提高懷孕率。
- 口服排卵藥(Clomiphene)。
- 人類停經後促性腺素(Human menopausal gonadotrophin, hMG)，從停經婦女尿液提煉。
- 基因工程合成FSH及LH，試管內製造。
- GnRH衍生物，可抑制 LH surge，而不會提早排掉。
- 人類絨毛促性腺激素(human chorionic gonadotropin, hCG)模擬LH surge或 GnRH 誘發LH surge。
- 長效型FSH可維持7天。

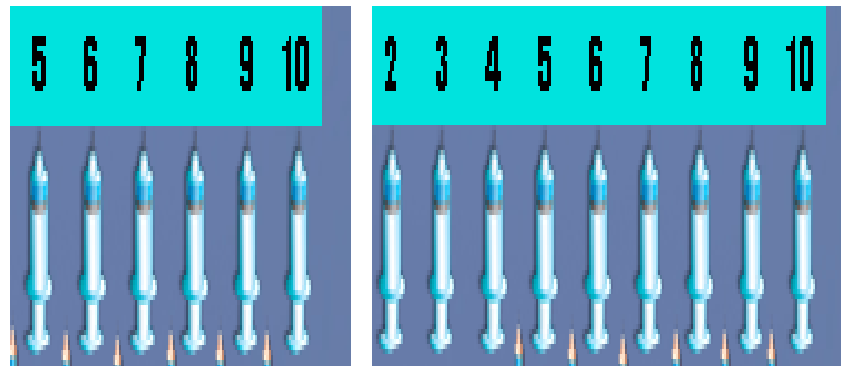


# Prospective comparison of short and long GnRH agonist protocols using recombinant gonadotrophins for IVF/ICSI treatments

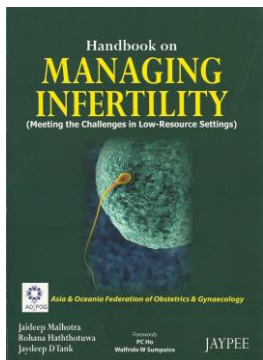
Chi-Hong Ho<sup>1</sup>, Shee-Uan Chen<sup>2,4</sup>, Fu-Shiang Peng<sup>3</sup>, Chih-Yuan Chang<sup>2</sup>, Yih-Ron Lien<sup>2</sup>, Yu-Shih Yang<sup>2</sup>

*Vol 16, No 5, 2008 632-639 Reproductive BioMedicine Online*

	短療程 GnRHa	長療程 GnRHa	P 值
打FSH的次數	7	9	< 0.05
費用	較低	較高	< 0.05
懷孕率	49%	40%	> 0.05







## 受邀寫書

除了傳統全劑量刺激外，微刺激可減少費用，及卵巢過度刺激症。

	微刺激	傳統全劑量刺激
費用	較低	較高
打針之不舒服	較少	較多
取卵數	較少	較多
卵巢過度刺激症	較少	較多
冷凍胚胎	較少	較多
懷孕成功率	較低或相當	較高或相當

Chapter: Milder stimulation  
Chen SU and Yang YS, 2011

## 4 冷凍胚胎

- 體外受精獲得多個胚胎，植入的胚胎以一至二為原則。
- 剩餘的胚胎冷凍起來，以後如需再植入就不必從頭開始了。
- 用冷凍保護劑高張溶液脫水再降溫，避免冰晶形成之傷害。
- 解凍存活率達90%以上
- 目前冷凍胚胎的懷孕率已和新鮮胚胎相當。



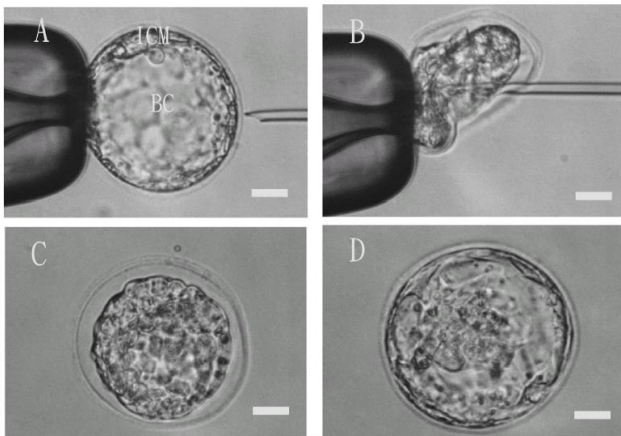
慢速冷凍

我們的動物實驗研究發現,大的囊胚做冷凍前,先縮減其囊胚液,有助於脫水及存活。

## Microsuction of blastocoelic fluid before vitrification increased survival and pregnancy of mouse expanded blastocysts, but pretreatment with the cytoskeletal stabilizer did not increase blastocyst survival

*Shee-Uan Chen, M.D., Tsung-Hsien Lee, M.D., Yih-Ron Lien, M.D., Yi-Yi Tsai, M.S.,  
Li-Jung Chang, M.S., and Yu-Shih Yang, M.D., Ph.D.*

Department of Obstetrics and Gynecology, National Taiwan University Hospital and College of Medicine, Taipei, Taiwan



存活率	無人工 縮減囊胚液	人工 縮減囊胚液	P 值
囊胚	80%	92%	<0.05
大囊胚	59%	89%	<0.01

Fertil Steril 2005

# 臨床應用囊胚期胚胎冷凍達成高懷孕率 (54%)

Human Reproduction Vol.20, No.1 pp. 122–128, 2005

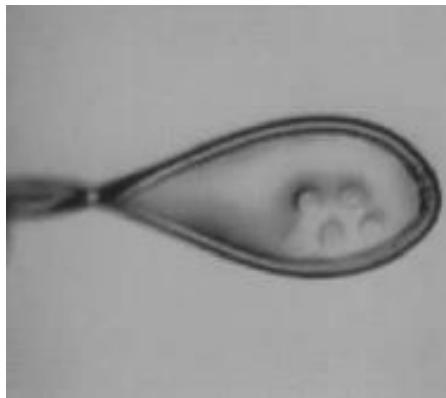
doi:10.1093/humrep/deh540

Advance Access publication October 7, 2004

## Successful pregnancy following blastocyst cryopreservation using super-cooling ultra-rapid vitrification

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Chun-Chia Huang<sup>1,2,3,\*</sup>, Tsung-Hsien Lee<sup>4,\*</sup>, Shee-Uan Chen<sup>4</sup>, Hsiu-Hui Chen<sup>1</sup>,  
Tzu-Chun Cheng<sup>1,2</sup>, Chung-Hsien Liu<sup>5</sup>, Yu-Shih Yang<sup>4</sup> and Maw-Sheng Lee<sup>1,5,6,7</sup>

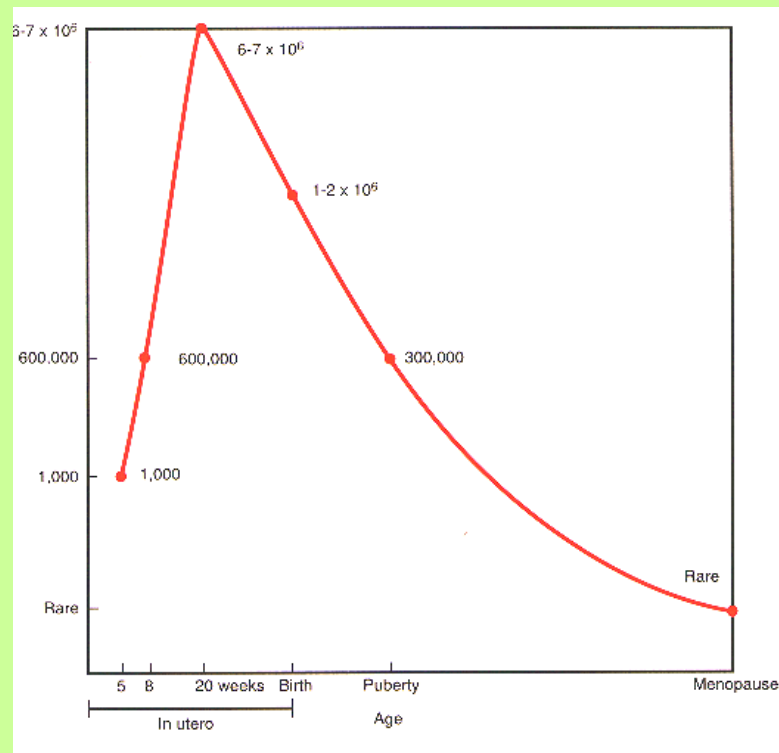


玻璃化冷凍

## 5 卵子捐贈

- 婦女年紀大時，卵子數目會減少，品質下降，染色體異常增加。
- 子宮受年齡的影響較小，應用卵子捐贈，可以讓沒有卵巢功能者、或較差者，成功懷孕。
- 即使是停經，使用雌激素及黃體素來調整子宮內膜，讓胚胎正常著床生長。
- 成功率高，因為使用年輕婦女的卵子。

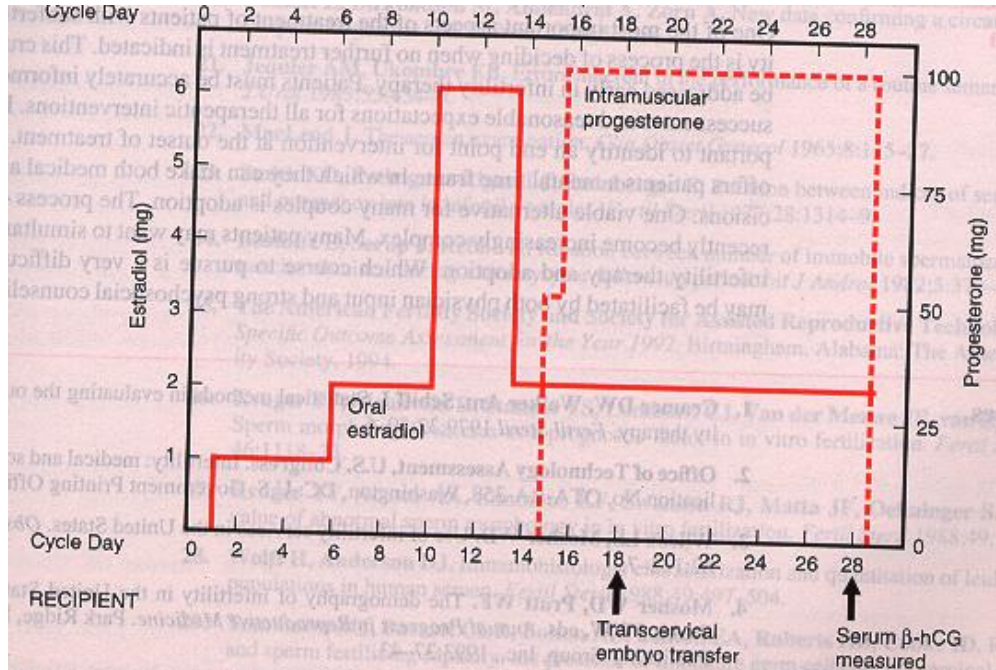
卵子數



女性年紀

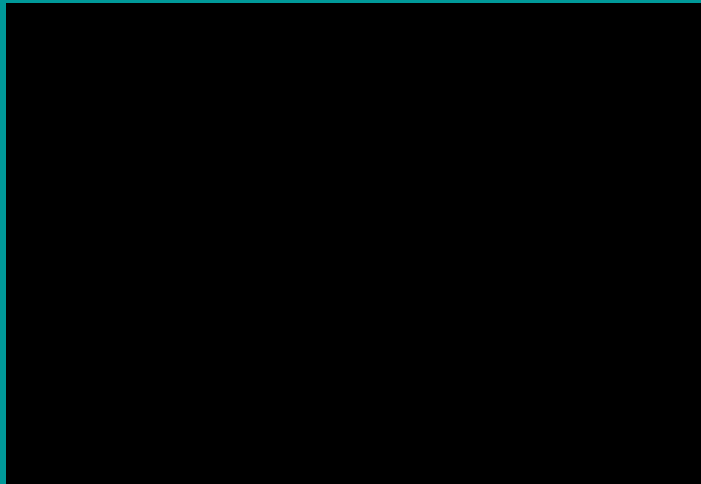
荷爾蒙補充，  
先雌激素，  
後加上黃體素。

讓子宮環境適合胚胎著床



## 6 精子顯微注射

- 如果精子數目太少，活動力太差，仍然是沒辦法達成體外受精的目的。
- 發展精子顯微注射 (intracytoplasmic sperm injection, ICSI)，直接將精子注入卵子細胞質內，有效的解決嚴重的男性精蟲問題。
- 正常受精率可達70%以上。



我們發展出切精子尾巴末端,有助於活化物質釋放,並避免傷到精子中心體。

Human Reproduction vol.11 no.12 pp.2640-2644, 1996

## Intracytoplasmic sperm injection (ICSI) for severe semen abnormalities: dissecting the tail of spermatozoa at the tip

Shee-Uan Chen, Hong-Nerng Ho, Hsin-Fu Chen,  
Su-Cheng Huang, Tzu-Yao Lee and Yu-Shih Yang<sup>1</sup>

Department of Obstetrics and Gynecology, College of Medicine  
and the Hospital, National Taiwan University, Taipei, Taiwan

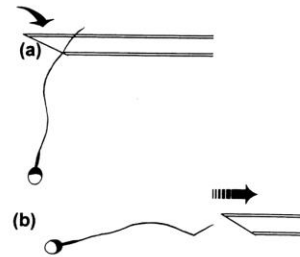


Figure 1. Dissecting the tail at the tip. (a) The tip of the tail is pressed with the injection micropipette by operating the three-dimensional joystick. (b) The micropipette is quickly withdrawn by operating the horizon-directional wheel. During this action, the spermatozoon turns from the original perpendicular direction to the horizontal direction.

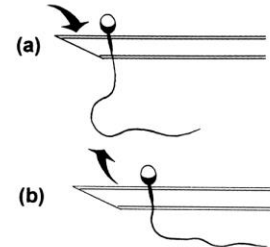


Figure 2. Compressing the mid-piece. (a) The joystick is used to operate the injection micropipette downward to impose pressure on the mid-piece. (b) The pressure is then released by operating the micropipette upward.

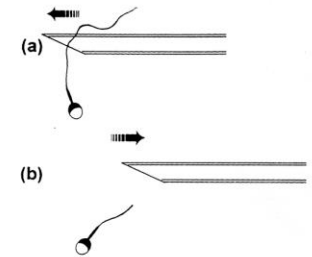
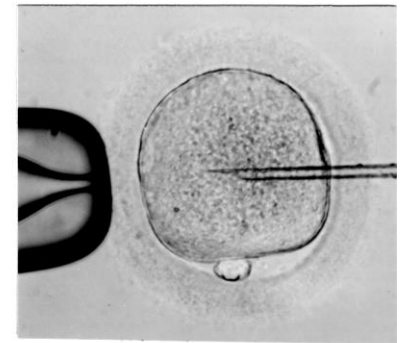


Figure 3. Cutting the tail at the mid-portion. (a) The tip of the injection micropipette is sliced across the mid-portion of the tail by operating the joystick. The spermatozoon is pushed forward against the bottom of the dish by a quick and strong force. (b) The micropipette is then quickly withdrawn using the same joystick.





男性癌症患者於化學或放射線治療前,先冷凍保存精子,疾病治癒後,可解凍精子,做人工受孕懷孕。

Human Reproduction vol.11 no.12 pp.2645-2647, 1996

#### CASE REPORT

### Pregnancy achieved by intracytoplasmic sperm injection using cryopreserved semen from a man with testicular cancer

Shee-Uan Chen, Hong-Neng Ho, Hsin-Fu Chen, Su-Cheng Huang, Tzu-Yao Lee and Yu-Shih Yang<sup>1</sup>

College of Medicine and the Hospital, National Taiwan University, Taipei, Taiwan

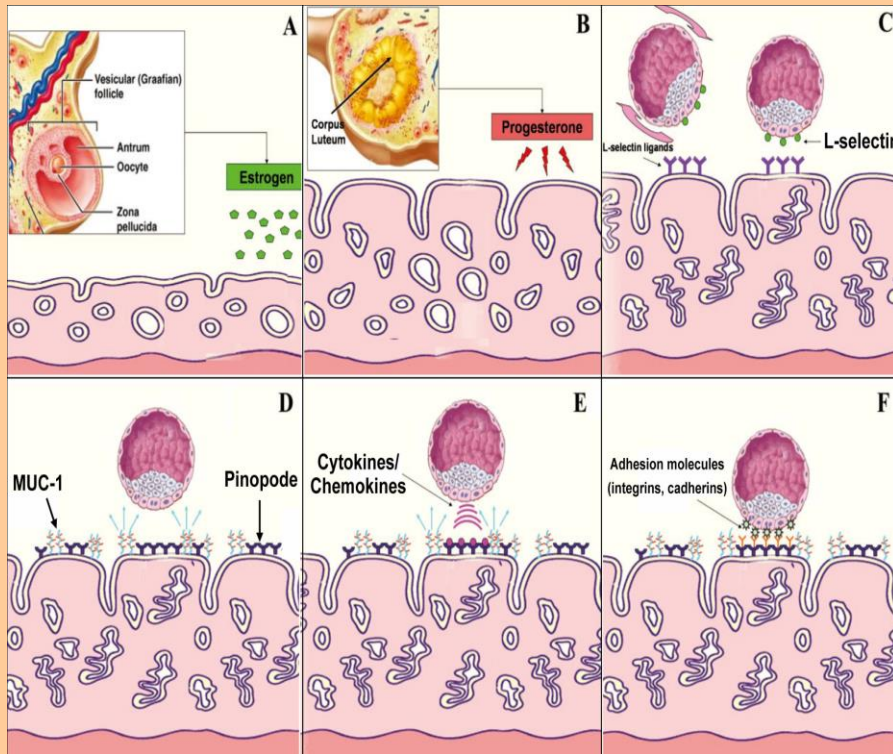
introduced technique of intracytoplasmic sperm injection (ICSI) has proved to be highly effective in cases of severe oligoasthenoteratozoospermia (Van Steirteghem *et al.*, 1993). It may now be possible to help cancer patients with poor sperm number. Here we report the first case report of



# 7 協助孵化

- 在試管嬰兒治療中胚胎不容易著床時，藉由協助孵化（assisted hatching）可能有幫助。
- 於透明層打洞或削薄，以幫助胚胎著床懷孕。
- 協助孵化對於反覆著床失敗可能有好處。
- 近年來使用雷射技術協助孵化，變得更簡單。

胚胎著床於子宮內膜



# 我們臨床應用發現協助胚胎孵化對於反覆著床失敗的病人可增加懷孕率。

FERTILITY AND STERILITY®  
Copyright © 1997 American Society for Reproductive Medicine  
Published by Elsevier Science Inc.

Vol. 67, No. 5, May 1997  
Printed on acid-free paper in U. S. A.

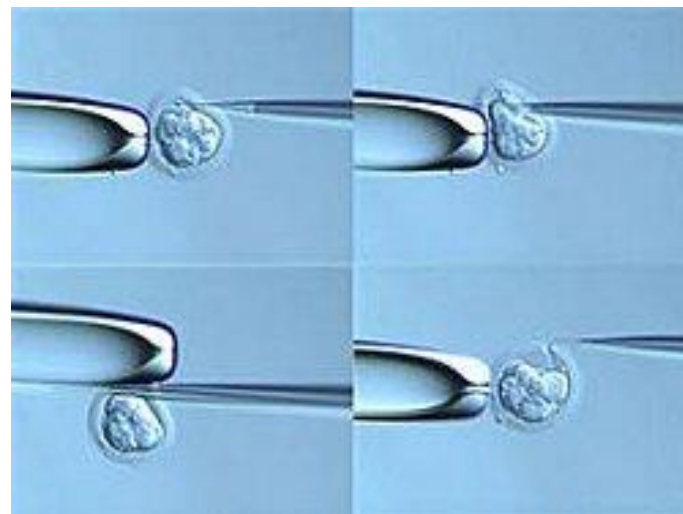
## Assisted hatching increases the implantation and pregnancy rate of in vitro fertilization (IVF)-embryo transfer (ET), but not that of IVF-tubal ET in patients with repeated IVF failures

Kuang-Han Chao, M.D.    Ming-Yih Wu, M.D.  
Shee-Uan Chen, M.D.    Yu-Shih Yang, M.D., Ph.D.  
Hsin-Fu Chen, M.D.    Hong-Nerng Ho, M.D.\*

*Department of Obstetrics and Gynecology, College of Medicine and the Hospital, National Taiwan University, Taipei, Taiwan.*



顯微操作儀



透明層部分切割

## 8 卵子與卵巢組織冷凍

- 為化學治療可能失去卵巢機能的病人，或目前仍不適合懷孕的婦女提供保存卵子的機會。
- 卵子冷凍(需要約半個月的打針排卵刺激時間)。
- 卵巢組織冷凍可保存較大量之早期卵子，及顆粒細胞將來分泌荷爾蒙之功能(卵巢組織冷凍不需要一段時間之使用排卵針，較不需延遲疾病之治療，且適用於青春期前之少女)。



玻璃化卵子冷凍

## 先做動物實驗, 玻璃化冷凍

**Vitrification of mouse oocytes using closed pulled straws (CPS) achieves a high survival and preserves good patterns of meiotic spindles, compared with conventional straws, open pulled straws (OPS) and grids**

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Shee-Uan Chen, Yih-Ron Lien, Ya-Yun Cheng, Hsin-Fu Chen, Hong-Nerng Ho and Yu-Shih Yang<sup>1</sup>

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卵子解凍後, 螢光免疫染色,  
馬上檢查100%是不正常,  
培養3小時, 紡錘體90%以上回復正常。



封面報導

# 卵子冷凍臨床應用

**Observational clinical follow-up of oocyte cryopreservation using a slow-freezing method with 1,2-propanediol plus 0.3 M sucrose followed by ICSI**

Shee-Uan Chen, Yih-Ron Lien, Hsin-Fu Chen, Li-Jung Chang, Yi-Yi Tsai and Yu-Shih Yang<sup>1</sup>

Human Reproduction Vol.20, No.7 pp. 1975–1980, 2005

冷凍卵子使用提高蔗糖濃度(0.1 to 0.3M)的慢速冷凍,有助於脫水。

評估因子	卵子冷凍	早期胚胎 冷凍	P 值
存活率	75%	79%	> 0.05
懷孕成功率	33%	32%	> 0.05



效果與胚胎冷凍相當

(被引用次數: 83)

# 歐洲義大利學者 Porcu教授邀請我們前往做專題演講

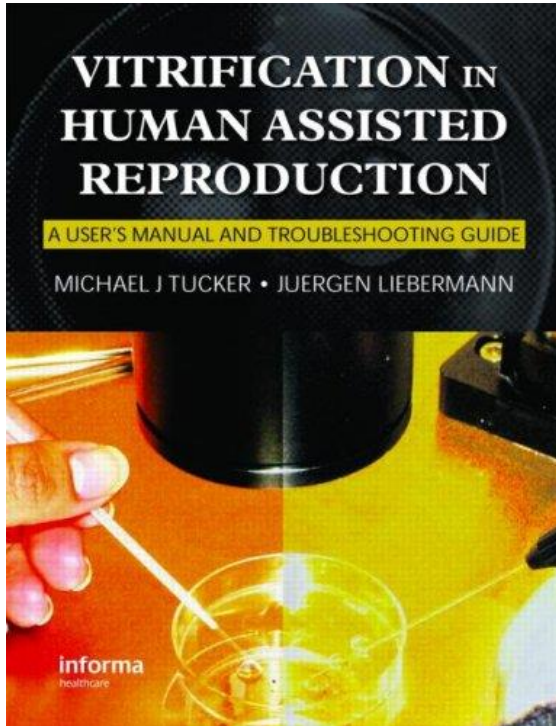
**FIRST WORLD CONGRESS ON HUMAN OOCYTE CRYOPRESERVATION**  
Bologna June 5-7 2005

<b>&gt; SUNDAY 5 JUNE 2005</b>	
15.00	Opening remarks E. Porcu, S. Venturoli, <i>Italy</i>
15.30	Oocyte cryobiology M. Toner, <i>USA</i>
16.00	Structural changes in frozen oocytes O. Anastasiou, J. Mandelbaum, <i>France</i>
16.30	Sugars in freezing oocytes A. Eroglu, <i>USA</i>
17.00	Break
17.30	Sodium free medium in freezing oocytes C. Quintans, <i>Argentina</i>
18.00	Preliminary results of the sodium free-PROH-high dose sucrose protocol L. Notarangelo, <i>Italy</i>
18.30	Oocyte vitrification J. Lieberman, <i>USA</i>
19.00	Discussion
<b>&gt; MONDAY 6 JUNE 2005</b>	
9.00	Immature vs mature egg freezing T.L. Toth, <i>USA</i>
9.30	Evaluation of the meiotic spindle and sperm microinjection P.M. Ciotti, <i>Italy</i>
10.00	Fertilization and cleavage of thawed oocytes R. Fabbri, <i>Italy</i>
10.30	Discussion
11.00	Selected communications
13.00	Lunch
14.30	Is human oocyte cryopreservation ready for routine clinical application? E. Porcu, <i>Italy</i>
15.00	Routine ART cycle organization with egg freezing and thawing G.B. La Sala, <i>Italy</i>
15.30	Oocyte storage for donation E. Polak de Fried, <i>Argentina</i>
16.00	Break
16.30	Storage of oocytes vs pronuclear oocytes S.U. Chen, <i>Taiwan</i>
17.00	Storage of oocytes vs embryos D. Cline, <i>USA</i>
17.30	Are embryos from thawed oocytes freezable? P. Levi Setti, <i>Italy</i>
18.00	Round Table: Can human egg freezing cope with the Italian legal restriction in ART? E. Porcu, G.B. La Sala, P. Levi Setti, A. Revelli, <i>Italy</i>
18.40	Discussion
<b>&gt; TUESDAY 7 JUNE 2005</b>	
9.00	The Cefer Institute experience S. Marina, <i>Spain</i>
9.30	The New York University experience N. Noyes, <i>USA</i>
10.00	The Latin America Experience E. Polak de Fried, <i>Argentina</i>
10.30	Discussion
11.00	Break
11.30	Selected communications
13.00	Lunch
14.30	Storage of oocytes to stop the reproductive clock? K. Johnson, <i>Canada</i>
15.00	Egg freezing in oncological patients R. De Cesare, G. Damiano, <i>Italy</i>
15.30	Outcome evaluation of human egg freezing S. Daya, <i>Canada</i>
16.00	Preliminary results of the International Registry E. Porcu, <i>Italy</i>
16.30	Discussion
17.00	Closing remarks



我們提出卵子冷凍的執行時間流程，須考慮紡錘體的恢復，解凍後培養三小時，再進行受精，受到國際學者的認同。

美國著名學者Tucker及Liebermann邀請，撰寫生殖醫學冷凍學專書之卵子冷凍章節。



## Vitrification of oocytes: various procedures

7B

*Shee-Uan Chen and Yu-Shih Yang*

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### 玻璃化卵子冷凍

- 減少冷凍液體積- 增加冷凍及解凍速率，避免冰晶形成。
- 減少冷凍保護劑濃度- 減少毒性。
- 高存活率及懷孕能力。

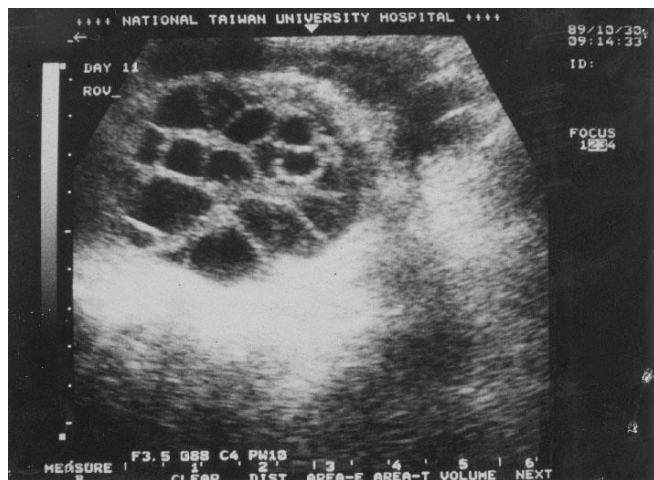
2007



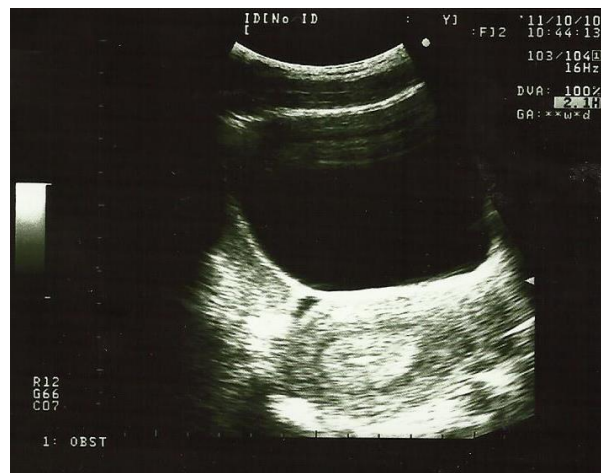
## 女性癌症患者於化療前做卵子冷凍成功懷孕

- 2006年, 25歲的女性, 罹患骨髓異常增生疾病, 來做卵子冷凍, 總共取得38個卵子做冷凍。
- 病人接著做骨髓移植, 使用了大量的化學藥劑, 而導致了提早停經。
- 病人於32歲結婚後, 2013年來本院做解凍卵子。
- 植入一個胚胎, 成功懷孕, 其他5個囊胚再冷凍起來。

2006 接受排卵刺激及冷凍



2013年接受荷爾蒙治療及胚胎植入



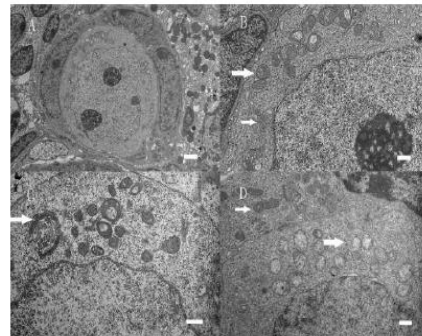
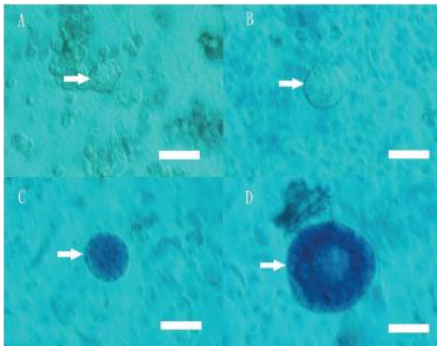
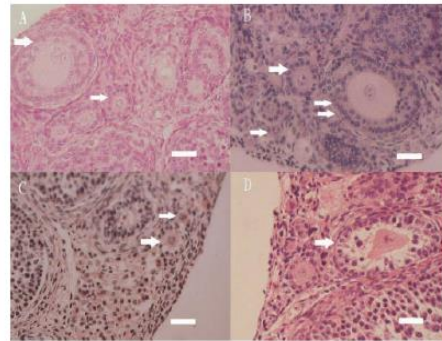
卵巢組織冷凍動物實驗,使用創新直接覆蓋快速玻璃化冷凍,卵泡存活率高 (90%),  
電子顯微鏡檢查,卵子結構正常,移植後生出正常小鼠。

Human Reproduction Vol.21, No.11 pp. 2794–2800, 2006  
Advance Access publication September 18, 2006.

doi:10.1093/humrep/del210

## Novel direct cover vitrification for cryopreservation of ovarian tissues increases follicle viability and pregnancy capability in mice

Shee-Uan Chen<sup>1</sup>, Chung-Liang Chien<sup>2</sup>, Ming-Yih Wu<sup>1</sup>, Tzu-Hsin Chen<sup>1</sup>, Shu-Mei Lai<sup>2</sup>,  
Chung-Wu Lin<sup>3</sup> and Yu-Shih Yang<sup>1,4</sup>



## 9 卵巢過度刺激症之預防

- 卵巢過度刺激症 (ovarian hyperstimulation syndrome) 是排卵刺激的可能併發症(發生率約 1-5%)。
- 研究發現和hCG及卵巢分泌的血管內皮細胞生長因子(VEGF)有關，分泌太多時會增加血管內皮細胞的通透性 (陳欽德 楊友仕 et al., Fertility and Sterility; Human Reproduction, 1999; 2000)。
- 血管內的水分滲出血管外，造成腹水、胸水、血液濃度上升。
- 對生理病理機制有深入瞭解，有助於預防及治療。
- 包括微刺激方案，減低hCG劑量或使用GnRH誘發卵子成熟，和冷凍胚胎，已大大減少其發生。



腹水

我們研究發現卵巢分泌的物質，如血管內皮細胞生長因子(VEGF)等，會使得血管內皮細胞間隙變大，水分及白蛋白會滲出血管外。

Human Reproduction, Vol.25, No.3 pp. 757–767, 2010

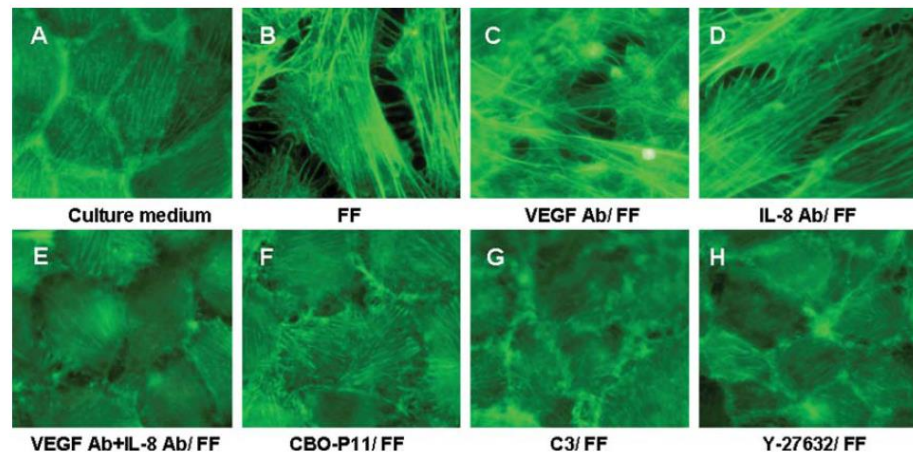
Advanced Access publication on December 13, 2009 doi:10.1093/humrep/dep432

human  
reproduction

ORIGINAL ARTICLE *Reproductive biology*

## Signal mechanisms of vascular endothelial growth factor and interleukin-8 in ovarian hyperstimulation syndrome: dopamine targets their common pathways

Shee-Uan Chen<sup>1</sup>, Chia-Hung Chou<sup>1</sup>, Chung-Wu Lin<sup>2</sup>, Hsinyu Lee<sup>3</sup>, Jiahn-Chun Wu<sup>4</sup>, Hsin-Fen Lu<sup>5</sup>, Chin-Der Chen<sup>1</sup>, and Yu-Shih Yang<sup>1,6</sup>



## 10 胚胎切片著床前遺傳疾病診斷及篩檢

- 著床前遺傳疾病診斷 (pre-implantation genetic diagnosis, PGD) 為傳統的產前遺傳疾病診斷的更進一步之診斷方式。
- 傳統羊膜穿刺檢查，必須在懷孕16-20週才可以做。一旦發現有遺傳疾病時，則必需面對流產手術，孕婦及家屬身心上皆面臨很大的壓力與創傷。
- PGD篩檢胚胎是否正常，選擇正常者植入女性體內，可避免這些傷害。



分裂期胚胎切片

我們先用動物實驗做胚胎切片，等熟悉後再臨床應用。

## A Simplified Technique for Embryo Biopsy: Use of the Same Micropipette for Zona Drilling and Blastomere Aspiration

SHEE-UAN CHEN,<sup>1</sup> HONG-NERNG HO,<sup>1</sup> HSIN-FU CHEN,<sup>1</sup> KUANG-HAN CHAO,<sup>1</sup>  
SU-CHENG HUANG,<sup>1</sup> TZU-YAO LEE,<sup>1</sup> and YU-SHIH YANG<sup>1,2</sup>

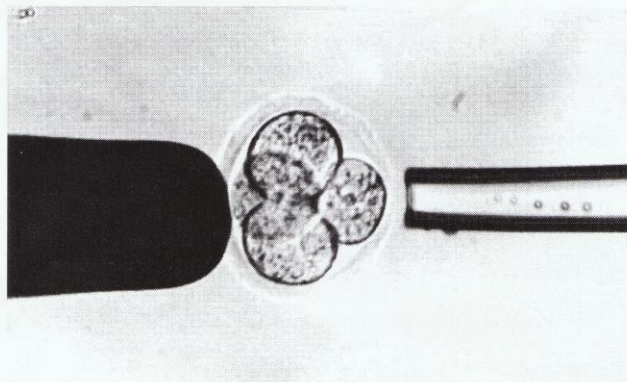


Fig. 1A. The embryo was held, and the blastomere targeted for biopsy was located at the 3 o'clock position. The zona pellucida was drilled by expelling acidified Tyrode's solution from the drilling/biopsy micropipette to make a hole with a diameter equal to that of the micropipette.

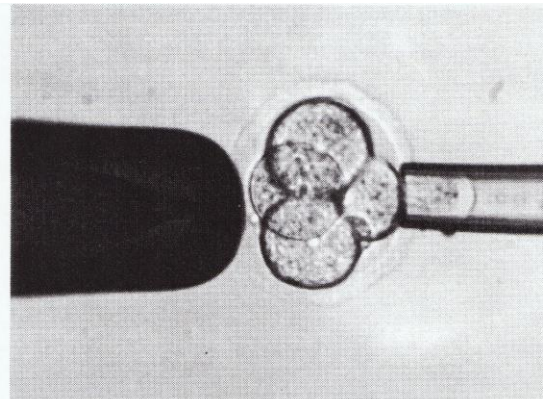


Fig. 1B. After the zona was drilled, the acid mixed with medium was sucked back into the micropipette immediately, and the blastomere was then touched and aspirated gently by the same micropipette.

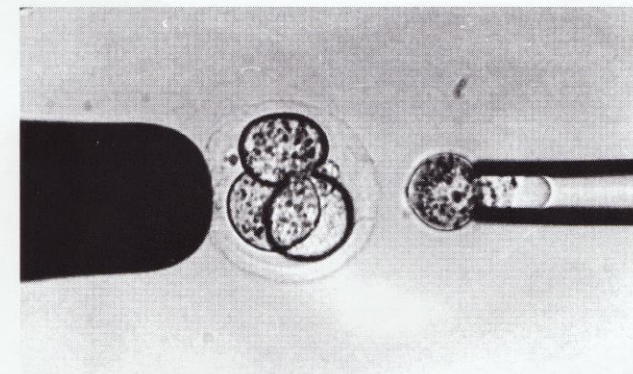
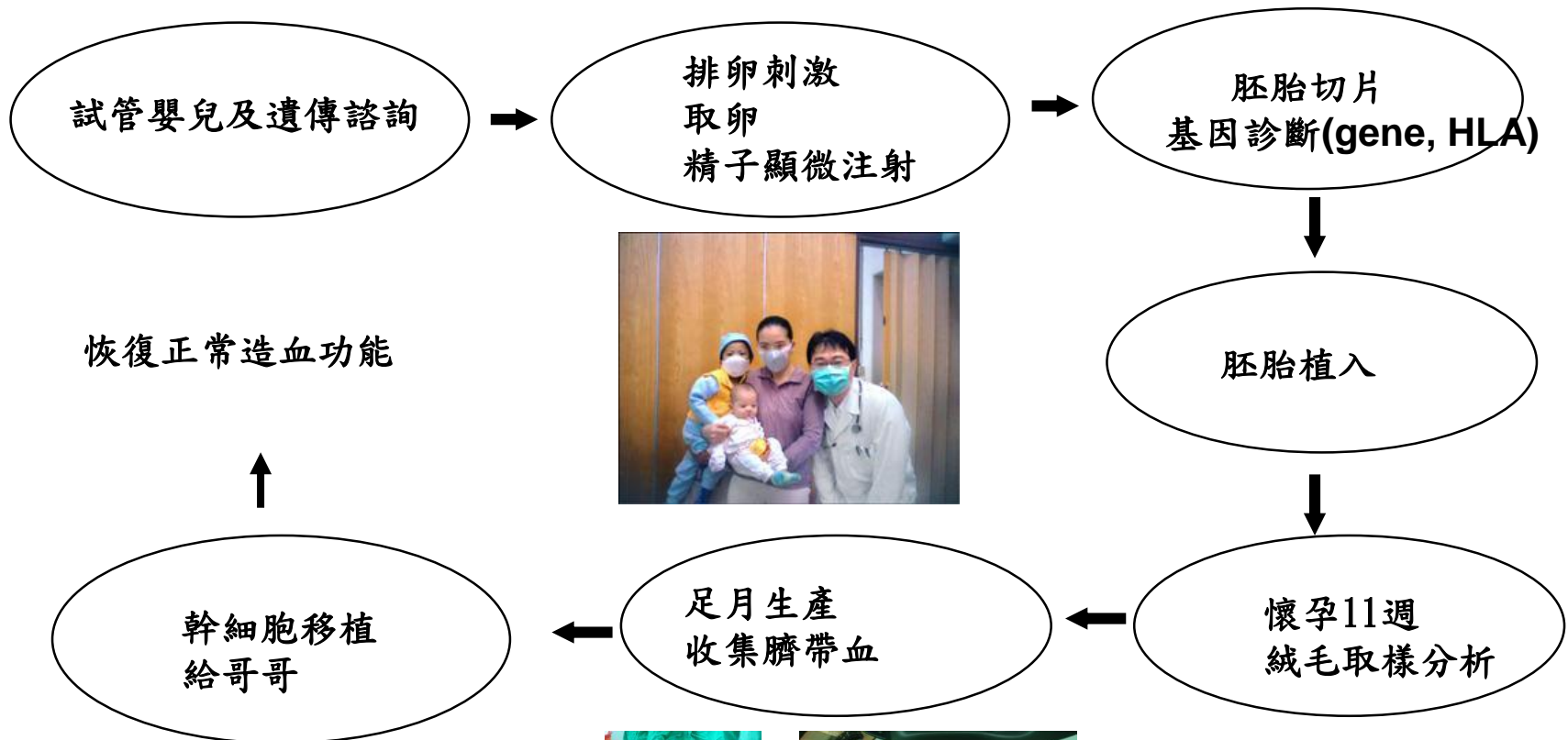


Fig. 1C. The blastomere was slowly pulled out of the zona, then released on the margin of the droplet.

# PGD of $\beta$ -thalassaemia and HLA haplotypes using OmniPlex whole genome amplification

Shee-Uan Chen<sup>1,3</sup>, Yi-Ning Su<sup>2,3</sup>, Mei-Ya Fang<sup>2</sup>, Li-Jung Chang<sup>1</sup>, Yi-Yi Tsai<sup>1</sup>, Li-Ting Lin<sup>1</sup>, Chien-Nan Lee<sup>1,4</sup>, Yu-Shih Yang<sup>1,4</sup>

獲得正常小女孩並且拯救罹病之哥哥,亞洲第一例。



囊胚切片可以取得5-10個細胞，增加診斷率及準確性；  
冷凍胚胎，讓我們有足夠的時間做基因染色體診斷。



Human Reproduction, Vol.28, No.5 pp. 1435-1444, 2013

Advanced Access publication on March 12, 2013 doi:10.1093/humrep/det048

human  
reproduction

ORIGINAL ARTICLE *Reproductive genetics*

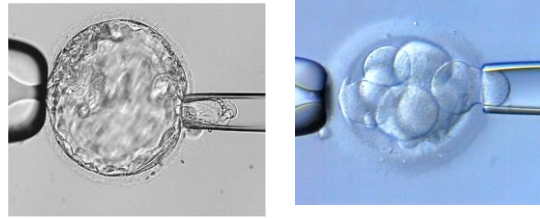
## Blastocyst biopsy and vitrification are effective for preimplantation genetic diagnosis of monogenic diseases

Li-Jung Chang<sup>1</sup>, Chu-Chun Huang<sup>1</sup>, Yi-Yi Tsai<sup>1</sup>, Chia-Cheng Hung<sup>2</sup>, Mei-Ya Fang<sup>2</sup>, Yi-Chun Lin<sup>2</sup>, Yi-Ning Su<sup>1,2</sup>, Shee-Uan Chen<sup>1,3,\*</sup>, and Yu-Shih Yang<sup>1</sup>

幫助有基因異常風險的夫婦成功生下健康寶寶，  
包括地中海貧血、血友病、肌肉萎縮症等。



囊胚切片加上玻璃化冷凍, 解凍植入,  
 診斷率、著床率、及懷孕率,  
 比八細胞期胚胎切片, 新鮮植入還要高。



評估因子	囊胚切片, 冷凍, 解凍植入	八細胞期 胚胎切片, 新鮮植入	P 值
診斷率	90%	71%	< 0.05
著床率	50%	16%	< 0.05
懷孕率	60%	33%	< 0.05

染色體平衡轉位的病人在形成配子的時候，發生不正常的同源染色體配對，容易有不正常的染色體分離，造成不正常的配子比例較高(87.5%)。

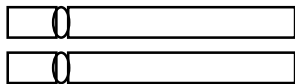
46XY, t(6;14) (q27;q32.12q32.13)

### 正常同源染色體配對

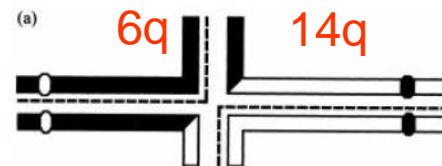
染色體 6



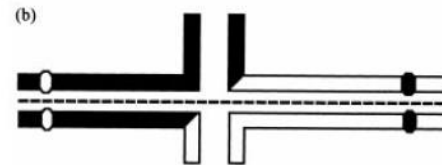
染色體 14



### 不正常同源染色體配對



Alternate



Adjacent - 1



Adjacent - 2

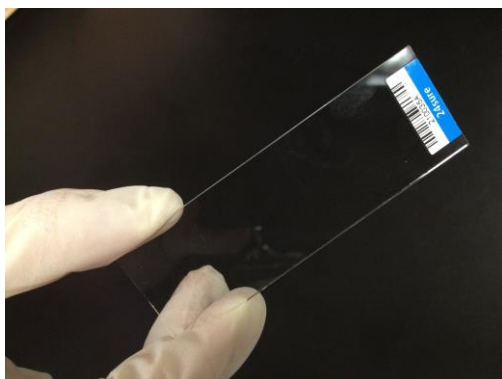


3:1

我們應用囊胚切片及染色體晶片檢查，來協助染色體平衡轉位的病人挑選正常染色體的胚胎，來避免懷有不正常的胎兒，減少流產的機會。

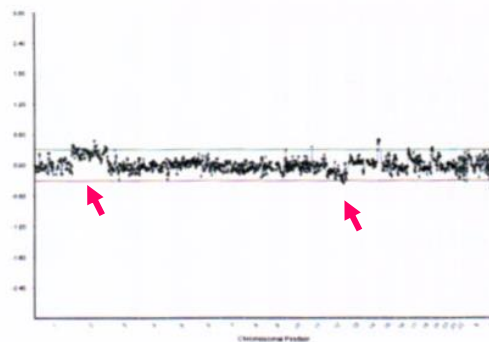
An effective strategy of preimplantation genetic diagnosis for carriers with chromosomal translocation: Using blastocyst biopsy and array comparative genomic hybridization

Chu-Chun Huang<sup>a,d</sup>, Li-Jung Chang<sup>a,d</sup>, Yi-Yi Tsai<sup>a</sup>, Chia-Cheng Hung<sup>b</sup>, Mei-Ya Fang<sup>b</sup>, Yi-Ning Su<sup>a,b,c</sup>, Hsin-Fu Chen<sup>a,\*</sup>, Shee-Uan Chen<sup>a,\*</sup>



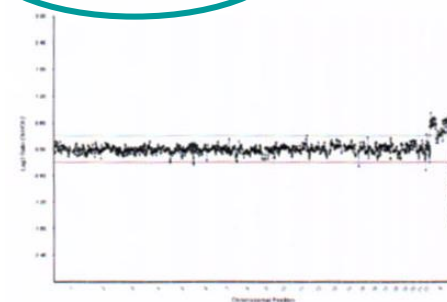
染色體晶片

Embryo-4



胚胎染色體有異常位移

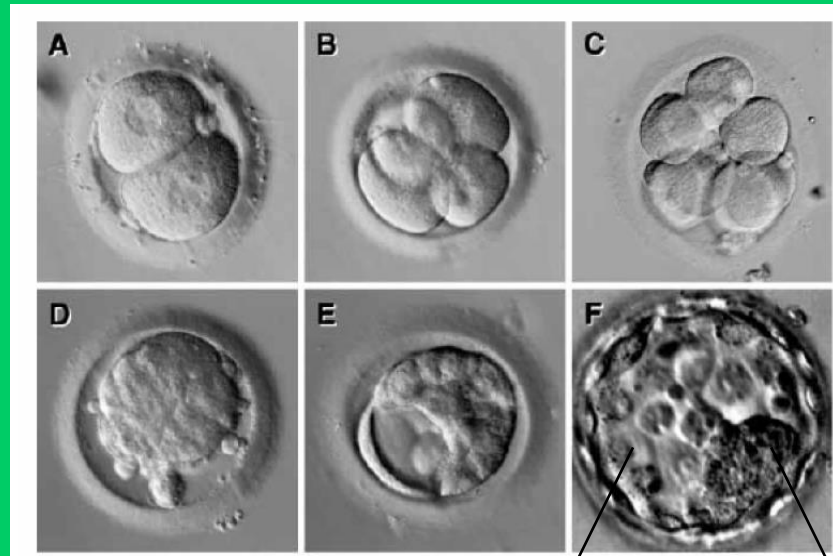
Embryo-10



胚胎23對染色體正常

## 11 單一胚胎植入

- 近年來培養液的改良，培養至囊胚期的比率增加至50%，植入囊胚可提高著床率。
- 選擇一個最好的囊胚做植入，可達高著床率，減少多胞胎懷孕早產的危險性。



胎盤細胞-胎盤  
Trophectoderm  
(placenta)

內細胞團-胎兒  
Inner cell mass  
(Fetus)

## 單一胚胎植入臨床實例

1. 36歲女性，罹患不孕症，曾經懷孕過，接受剖腹產，子宮有一疤痕的缺陷。
2. 如果懷雙胞胎，會有早產及子宮破裂的危險。
3. 因此建議單一胚胎植入，病人植入一個囊胚成功懷孕，還有2顆囊胚冷凍中。



子宮有一疤痕缺陷

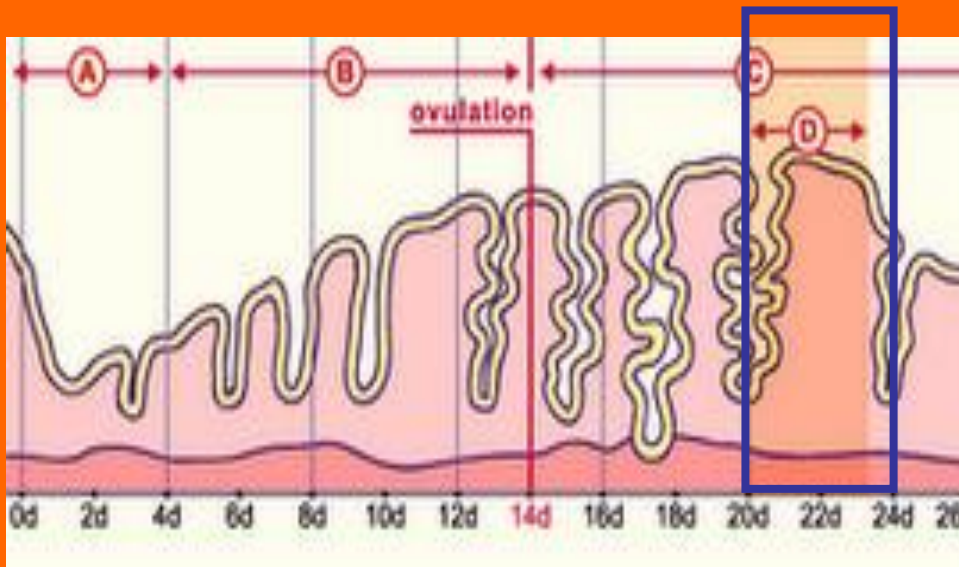


囊胚

## 12 子宮內膜與胚胎著床之機轉

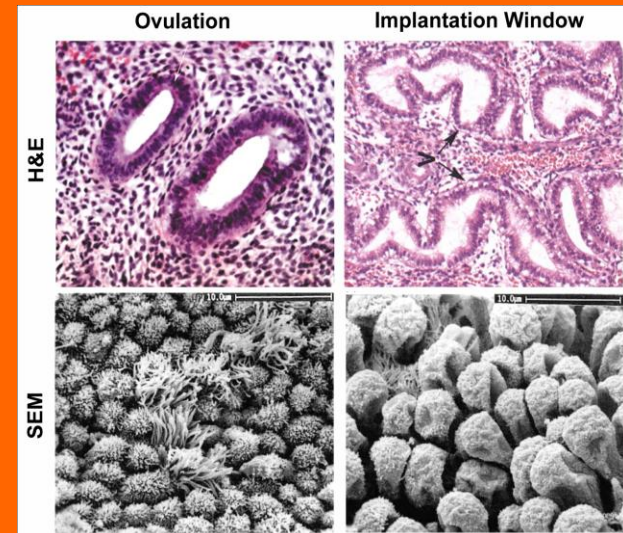
- 胚胎著床要有適當的子宮內膜環境, 要先經過一段雌激素的作用, 及接著黃體素的作用。
- 在經過排卵後或黃體素開始作用5-9天之間, 最適合著床, 稱為著床視窗(Implantation window),
- 子宮內膜型態, 生長因子及細胞動力素發生明顯的改變。

光學顯微鏡



雌激素作用    黃體素作用

排卵前子宮內膜型態



排卵後著床視窗期型態

電子顯微鏡

- 我們的研究發現在排卵刺激當中黃體素容易上升, 因此可能造成著床視窗提早產生, 也提早結束。
- 上升太高及時間較長者會影響到懷孕率。
- 因此避免黃體素的上升, 可增加懷孕率。
- 如果已上升太高, 可將胚胎冷凍起來, 下一次在比較自然的環境下來植入。

Hum. Reprod. Advance Access published May 4, 2012

Human Reproduction, Vol.0, No.0 pp. 1–10, 2012

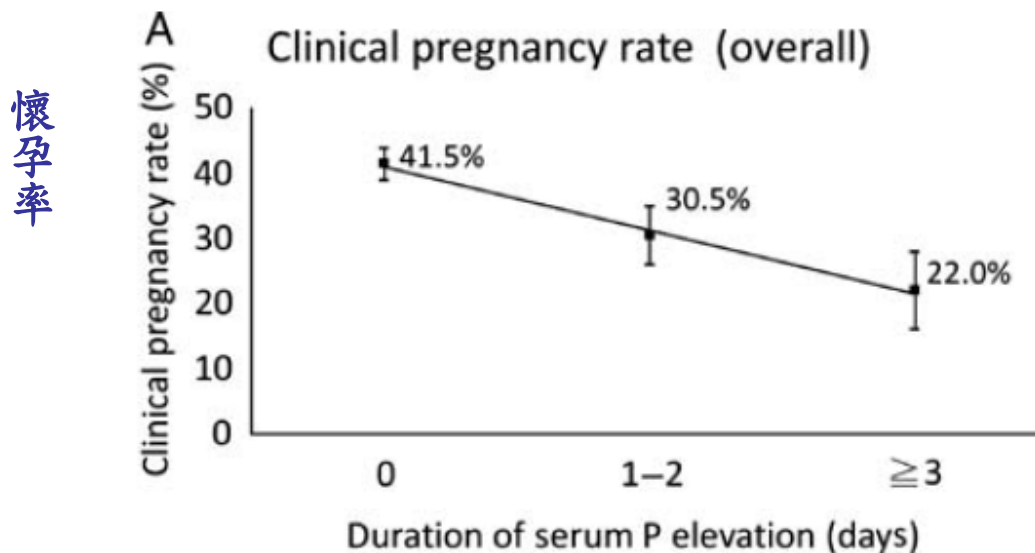
doi:10.1093/humrep/des141

human  
reproduction

ORIGINAL ARTICLE *Infertility*

## The duration of pre-ovulatory serum progesterone elevation before hCG administration affects the outcome of IVF/ICSI cycles

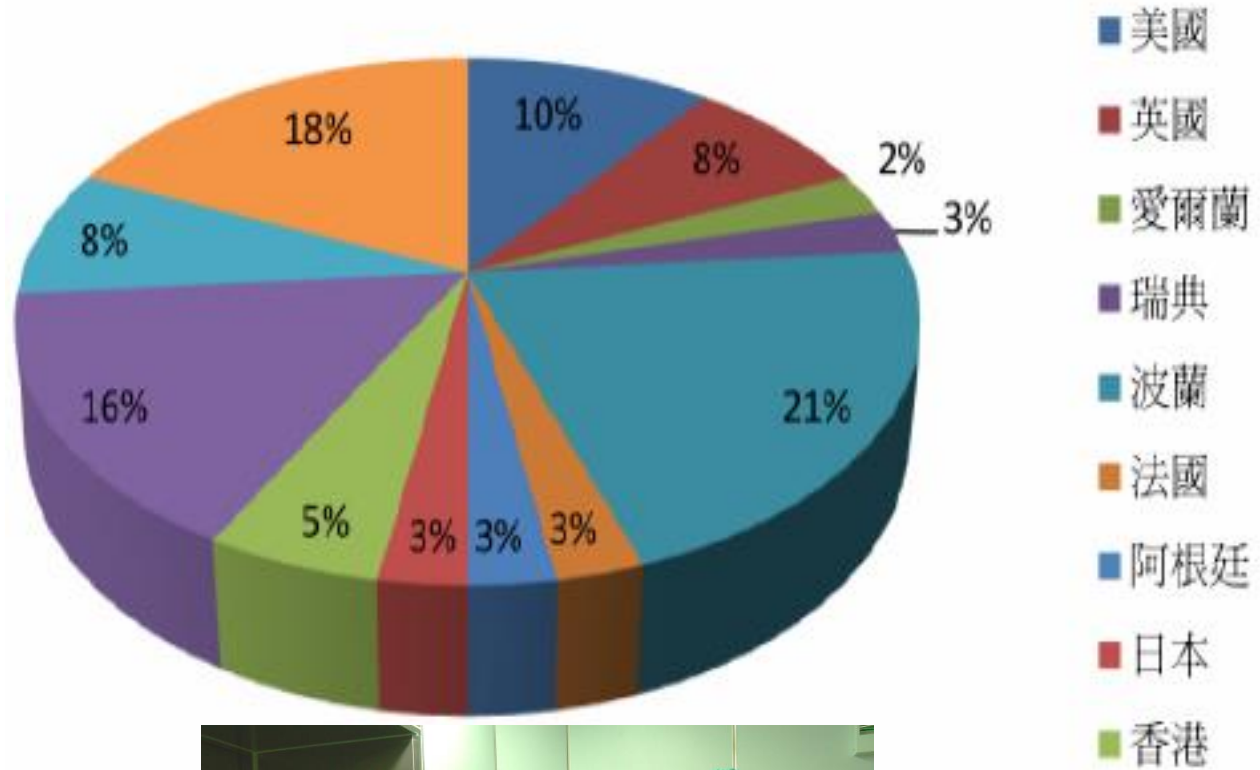
Chu-Chun Huang<sup>1</sup>, Yih-Ron Lien<sup>1</sup>, Hsin-Fu Chen<sup>1,\*</sup>, Mei-Jou Chen<sup>1</sup>, Chia-Jen Shieh<sup>1</sup>, Yi-Lin Yao<sup>1</sup>, Chin-Hao Chang<sup>2</sup>, Shee-Uan Chen<sup>1,\*</sup>, and Yu-Shih Yang<sup>1</sup>



懷孕率

黃體素上升天數

## 醫師自世界各國申請來見習或學習





## 結論

- 將來更多的多方研究，將更可提高成功率，孕育正常健康胎兒，避免併發症，及減輕病人疼痛。
- 常常會有父母親在寶寶出生後，特地寄照片或送蛋糕表示他們的喜悅及感激。
- 這就是我們最大的成就感。

