2014.Q3

創世紀季刊

創世紀生技有限公司

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刊 2014Q301

細胞轉染概述

細胞轉染（Transfection）是指核酸（包括 DNA、mRNA、siRNA、miRNA 等）以物理或化學等非病毒感染方式送入活細胞內的方法。細胞轉染的最終目的，是希望送入細胞的核酸能產生預期的功能，進行大量外源性基因表現或是抑制內源性基因表現。

早在 1973 年 F. L. Graham 與 A. J. van der Eb 就建立了使用磷酸鈣（calcium phosphate）共同沈降法進行 DNA 細胞轉染，這個方法是利用帶正電的鈣離子結合帶負電的 DNA 磷酸骨架形成沈澱物形式的複合物，而這個複合物能夠透過胞吞作用（endocytosis）被攝入細胞內。雖然磷酸鈣細胞轉染法是相當節省成本的方式，但是對於一些很難轉染的細胞是完全沒有效力，而且這個方式需要消耗大量的 DNA，而且對於 pH 變化相當敏感，相對於其他方法再現率低，因此目前很少人使用磷酸鈣法進行細胞轉染，而改用其他更有效率的細胞轉染方法，包括脂質體或是帶正電聚合物。

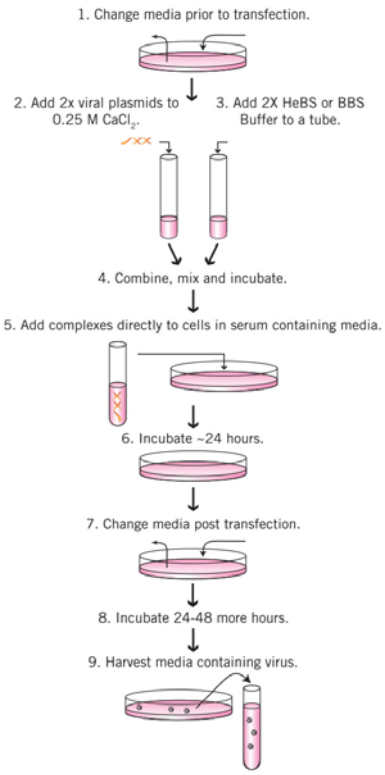


Fig.1 最傳統的 Calcium-Phosphate transfection 流程

脂質體（Liposome）是類似細胞細胞膜結構的脂質微粒，可以把 DNA 包覆在裡面。脂質體形成的方式有很多種，有些必須要使用過濾膜使脂質通過後形成特定大小的雙層膜脂質體，有些脂質體可以在與核酸的間隙中包覆正電荷就不需要經過濾膜擠壓成型。脂質體的結構是由疏水性與親水性分別構成疏水性與親水性區域，而這樣的特性會形成類似細胞膜的構造產生，為了能讓脂質體與細胞膜接觸，脂質體上必須呈現帶正電的形式。脂質體的直徑可由較小的 20~200nm 至較大的 200nm~1um，當然也可能形成直徑>1um 的巨型脂質體，而巨型脂質體內也可做成多層膜的形式。

儘管陽離子脂質體已被證實是相當有效的細胞轉染方式，但是相對的許多研究人員也發現脂質體轉染對於細胞會產生相當大的毒性。目前有相當多的研究分別由細胞型態、粒線體活性、DNA 合成與細胞增殖的角度證實脂質體為媒介的轉染方式對於細胞是具有細胞毒性的，而這些細胞毒性即使在顯微鏡下無法觀察，還是會影響到後續轉染的基因表現，因此要如何盡可能減少轉染所造成的細胞毒性是後續要解決的課題。

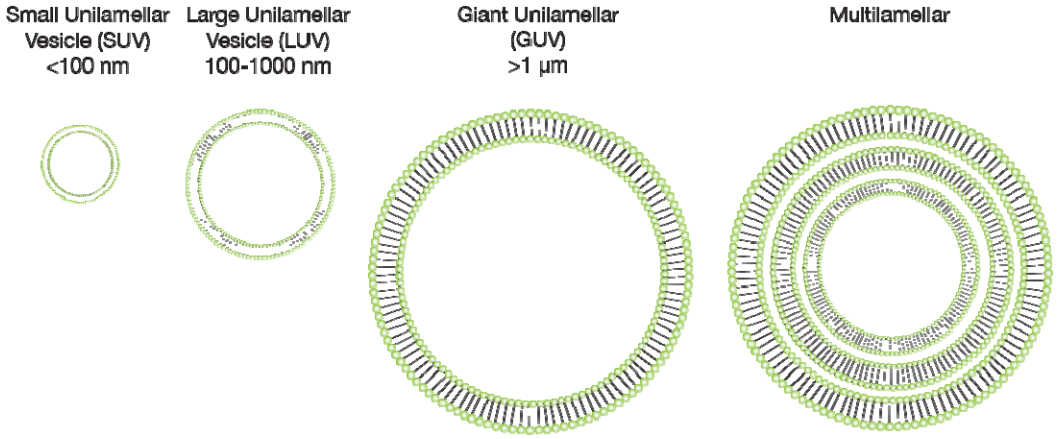


Fig.2 各種不種大小與形式的脂質體，包括有<100nm 的 SUV、介於 100-1000nm 的 LUV 與>1 μ m 的 GUV。當然也可以形成多層膜結構的脂質體。

陽離子聚合物（Cationic Polymers）是另一個可以進行細胞轉染的選擇，同樣是可以與帶負電的核酸形成帶正電的複合物，並因為其電性接觸帶負電的細胞膜表面，透過胞吞作用攝入細胞內。相對於脂質體來說，使用陽離子聚合物進行細胞轉染能夠產生較小的細胞毒性。另外，以陽離子聚合物製作的轉染試劑在大部分情況下都能夠在含有血清及抗生素的環境下進行細胞轉染，對於實驗者來說減少更換培養基的步驟，能夠大幅減少實驗所需要耗費的時間。

核酸經過細胞內吞作用進入細胞後，透過核內體（endosome）保護核酸不被分解，並移動到細胞質（for RNA）或是細胞核（for DNA）後釋放核酸。一般釋放核酸的機制是使用化學的方式，可能是使用氯奎寧（Chloroquine）或是陽離子聚合物本身特性，使得核內體產生"質子海綿效應"（Proton Sponge Effect），使得大量的氫離子進入核內體中，造成核內體膜內外滲透壓不平衡使得核內體破裂並釋出核酸。根據核內體釋放核酸的位置，就可以決定這個轉染試劑適合用來送 DNA 或是 RNA。

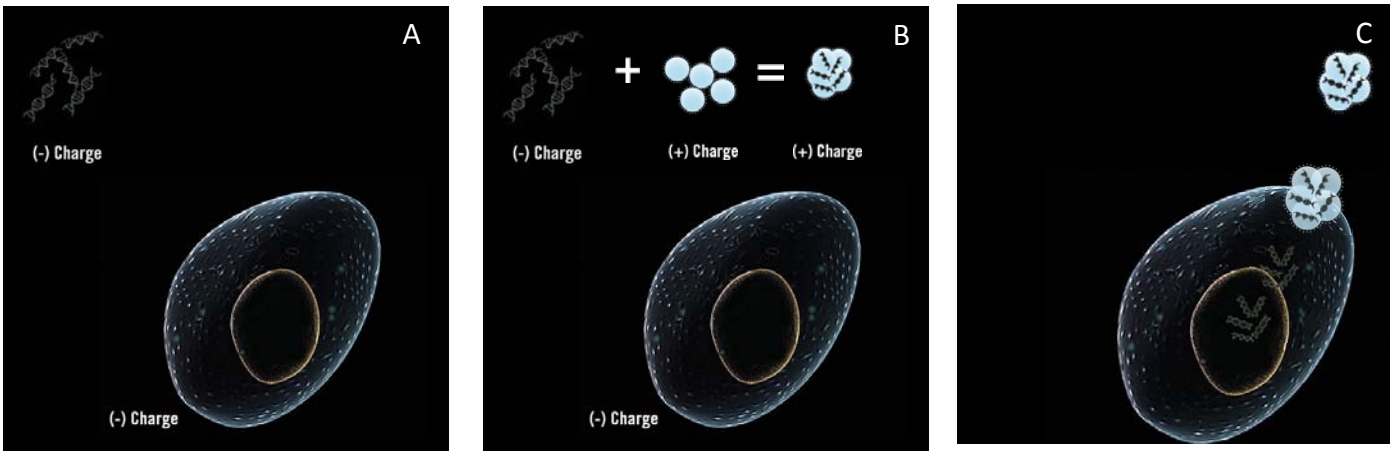


Fig.3 使用陽離子聚合物進行細胞轉染的過程。由於核酸本身是帶負電荷，而細胞膜外圍也是帶負電荷，因此核酸必須先與帶正電荷的陽離子聚合物形成帶正電荷的複合物，再通過細胞內吞作用進入細胞內。

電穿孔法（Electroporation）是另一種常見的細胞轉染方式，與轉染試劑不同的地方是使用物理的方式進行轉染。電穿孔法是用透過短時間的電流，來創造一個能讓細胞膜表面瞬間產生孔洞的電場，並使得核酸穿過細胞膜進入細胞。電場可以透過儀器設定電流，或是調整溶液中成分進行調整，不同的細胞也需要透過不同的電場而達成最佳的核酸通透效果。電穿孔法剛開始用於 DNA 轉染使用，現在也廣泛用於 RNA 轉染（包括 mRNA、miRNA、siRNA）；同樣使用電場進行的實驗包括了藥物傳輸、細胞融合（Electrofusioin）、或膜蛋白嵌入（Electroinsertion）等。

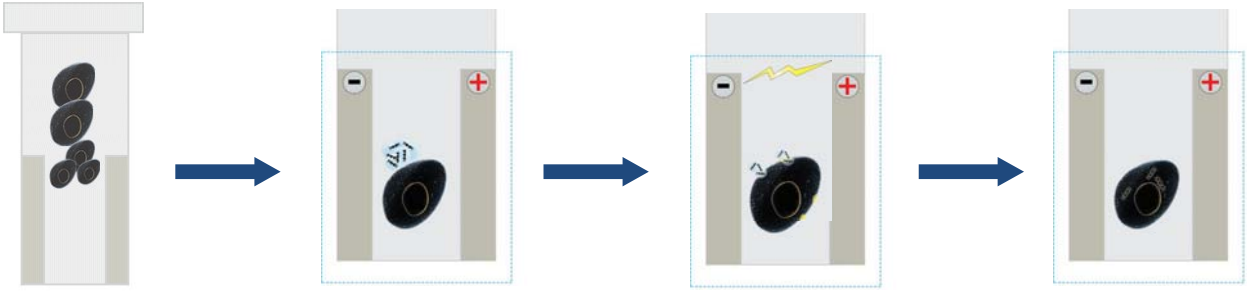


Fig.4 電穿孔法細胞轉染流程。在容器內放入細胞及核酸，透過兩側的電擊板提供電場，此時細胞膜瞬間形成孔洞，使得核酸能穿過細胞膜進去細胞內。

使用電穿孔法將核酸送入細胞內，會根據不同的細胞種類或容器內電擊板距離調整電壓、電流波形（exponential decay 或 square wave）、通電時間，以達到最佳的傳遞效率，並盡可能減少瞬間電流造成的細胞死亡。一般來說，雖然電穿孔法會造成較多的細胞死亡，但是由於電穿孔法可以適用於細胞以外的生物體（包括細菌與真菌），而且其平均轉染效率高於化學細胞轉染，因此對於一些不容易以化學法進行細胞轉染的案例（包括 Primary cell、Neural cell、Macrophage 等），都會建議使用電穿孔法達到較高的細胞轉染效率，並靠著調整細胞數、電壓、通電時間等實驗條件，取得細胞轉染效率與細胞存活率之間的平衡。

其他的細胞轉染方法

針對細胞轉染實驗來說，如何提高轉染效率以及符合多種不同細胞使用一直是最重要的課題，因此目前依然有許多單位在研究新的細胞轉染方法。

在化學細胞轉染方式的改良上，目前有一種方式同樣是使用試劑與核酸包裹成複合物形式，但是這個核酸複合物上帶有磁性物質，因此在磁場的作用下複合物能夠更容易接近細胞，提高核酸透過胞吞作用進入細胞的機率，也能夠提高細胞轉染效率。

3D 細胞培養是越來越多人使用的細胞培養方式，透過模擬組織內細胞間質的結構（例如使用 Scaffolds 或是 Hydrogel），3D 細胞培養比起傳統 2D 細胞培養更精準的模擬細胞在生物體內的型態與功能，3D 細胞轉染試劑能夠在 3D 環境下進行細胞轉染送入特定基因，用來研究細胞分化、組織生成、癌細胞轉移及侵蝕，甚至是作為新藥篩選使用。

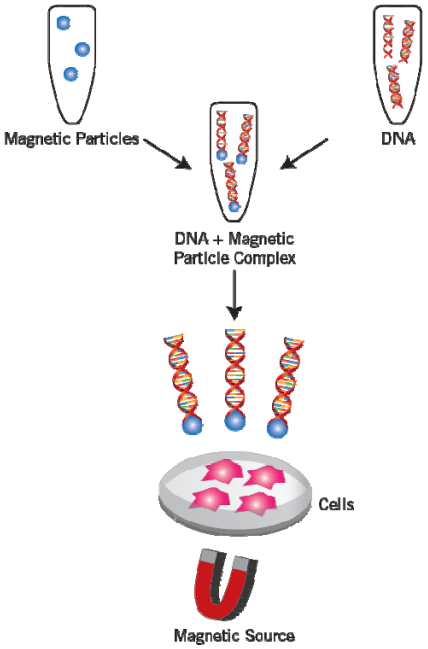
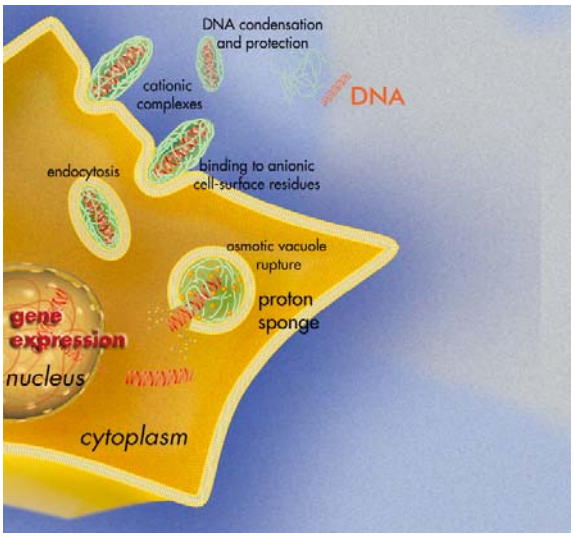
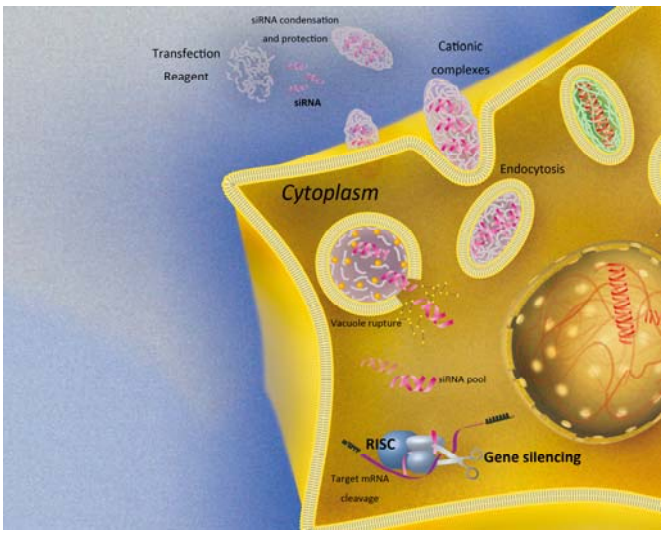


Fig.5 以磁性核酸複合物進行細胞轉染





jetPRIME®

- 可以進行 DNA transfection、siRNA transfection、DNA/siRNA co-transfection
- 適用於多種細胞的轉染試劑
- Plasmid DNA 與試劑用量皆遠低於他牌
- 低毒性，不會影響細胞生理與實驗結果
- 陽離子聚合物成分，可以在含有血清與抗生素的培養基環境下進行細胞轉染

Table. 1 jetPRIME 適用的部分細胞轉染效率

Cell types	Cell lines	Description	Transfection efficiency
Epithelial	B16-F10	Murine melanoma	70-80%
	BNL-CI2	Murine normal embryonic	50-60%
	CaCO2	Human colon carcinoma epithelial	20%
	CHO-K1	Chinese hamster ovary	70%
	HCT-116	Human colon carcinoma	70%
	HeLa	Human cervix epitheloid carcinoma	70-90%
	HepG2	Human hepatocarcinoma	50-70%
	Huh-7	Human hepatocarcinoma	30-50%
	MCF-7	Human breast adenocarcinoma	50%
	MCF-10A	Human breast adenocarcinoma	40-50%
	MDCK	Canine kidney epithelial	20%
	PC-3	Human prostate carcinoma	70%
	Vero	African green monkey kidney	50%
Fibroblast	COS-7	African green monkey kidney	60-80%
	HEK-293	Human embryonic kidney fibroblast	80-90%
	MRC-5	Human lung fibroblast	50%
	NIH-3T3	Murine embryonic fibroblast	50-70%
Myeloblast	Raw 264.7	Murine monocyte/macrophage	40-50%
Myoblast	C2C12	Murine myoblast	70-90%
Neuronal	SH-SY5Y	Human neuroblastoma	70-80%
Primary Hepatocytes		Human primary hepatocyte cell	20-30%
Primary Melanocytes		Human primary melanocyte cell	40-50%

更多細胞轉染資料，請掃描右方 QR code 由 Polyplus Cell Transfection Database 中查詢

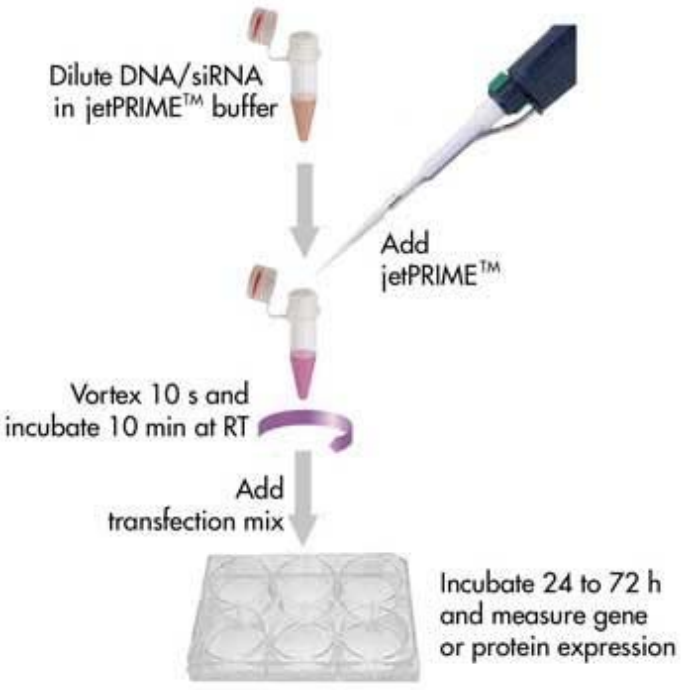


Fig.1 jetPRIME 簡易操作流程。

DNA 或 siRNA 以 jetPRIME buffer 稀釋後，加入 jetPRIME reagent，震盪混合 10 秒後靜置於室溫 10 分鐘待核酸與 jetPRIME reagent 形成 complex。Complex 可以直接加入含有血清與抗生素的 complete medium 中進行細胞轉染，並在轉染後 24 至 72 小時間觀察細胞轉染的結果。

Table. 2 jetPRIME 與他牌轉染世紀所需要使用的試劑與 DNA 用量。

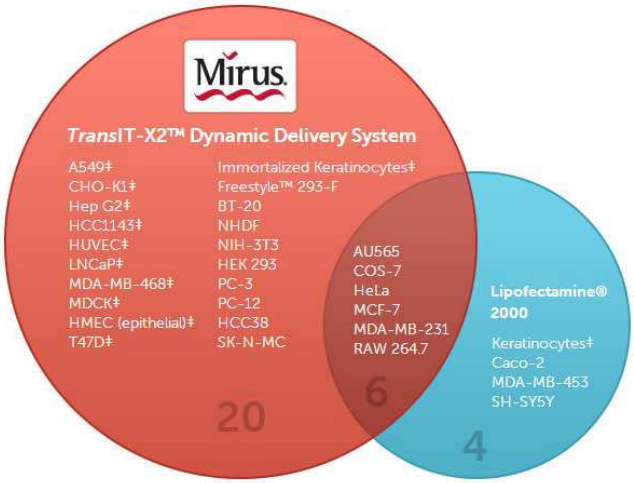
廠牌	技術	轉染物質	6well 實驗		
			DNA	reagent	confluent
jetPRIME	cationic polymer	DNA/ RNA	2 µg	4 µl	60 to 80%
L2K	lipid	DNA/ RNA	2.5 µg	5-12 µl	70 to 90%
TurboFect	cationic polymer	DNA	4 µg	6 µl	70 to 90%

jetPRIME 訂購資訊

產品編號	jetPRIME Reagent 容量	jetPRIME Buffer 容量
114-07	0.75mL	60mL
114-15	1.5 mL	2x 60mL
114-75	5x 1.5mL	10x 60mL
114-15	5x 1.5mL	120mL (5x conc.)

*Trans*IT-X2® Dynamic Delivery System

- 多效型：可轉染 DNA & siRNA & co-transfection
- 新配方：新型陽離子聚合物成分，非 liposomal technology
- 低細胞毒性，一般細胞 & primary cell 皆適用
- 不含任何動物來源成分



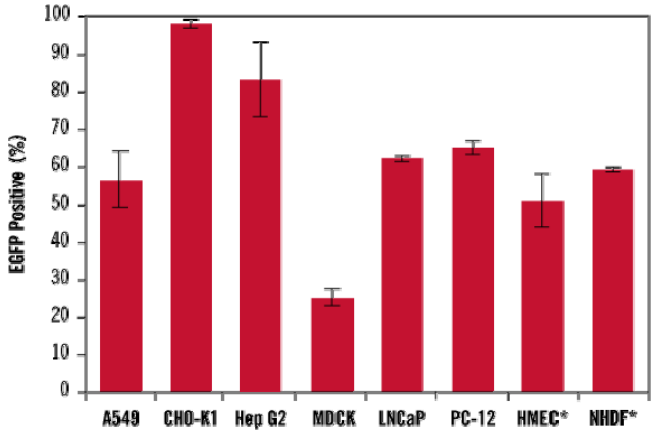


Fig.2 *Trans*IT-X2 使用 GFP plasmid 在不同細胞中所得到的細胞轉染效率。其中 HMEC 與 NHDF 是 Primary cell。

TransIT-X2 訂購資訊

產品編號	容量
MIR 6003	0.3mL
MIR 6004	0.75mL
MIR 6000	1.5mL
MIR 6005	5x 1.5mL
MIR 6006	10x 1.5mL

Fig.1 TransIT-X2 與他牌分別使用 30 種細胞進行細胞轉染後的轉染效率比較。

在這個實驗中使用的是 Luciferase 做為 reporter gene，在細胞轉染後 24 小時進行 Luciferase activity assay。由 Luciferase activity assay 中可以發現，TransIT-X2 在這 30 種細胞中所得到的數據中，有 20 株細胞的 Luciferase activity 高於他牌。

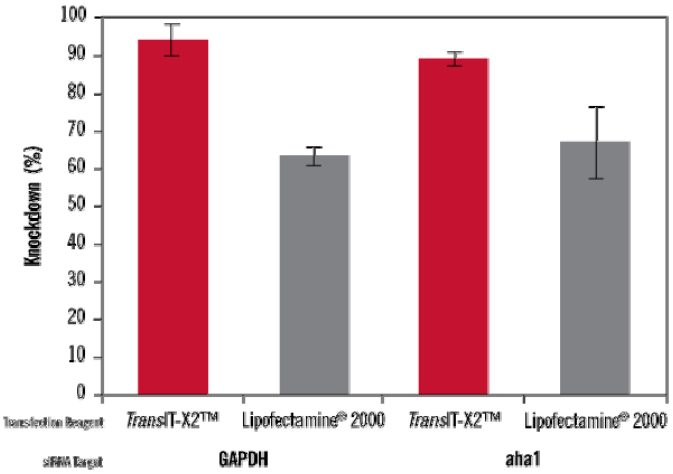


Fig.3 *Trans*IT-X2 與他牌以 siRNA 進行細胞轉染後抑制細胞表現的效率。

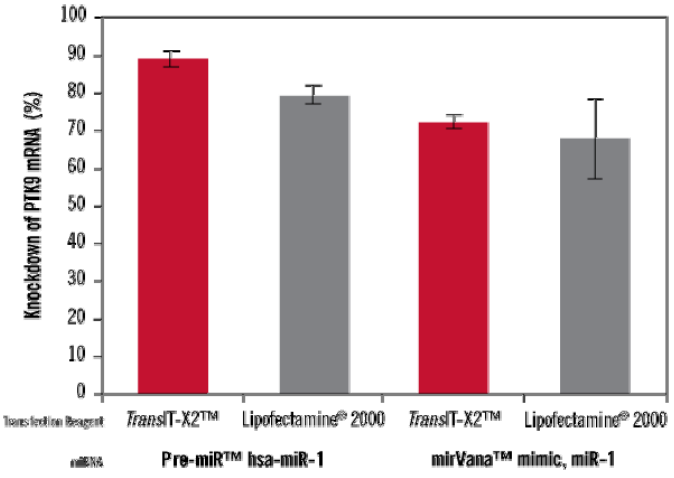


Fig.3 *Trans*IT-X2 與他牌以 miRNA 進行細胞轉染後抑制細胞表現的效率。

jetPEI®

- 可以使用傳統的細胞轉染程序，更可以使用 reverse transfection 與 batch transfection 程序進行 HTP 細胞轉染
- 用於 DNA 轉染，適用於多種細胞的轉染試劑
- 低毒性，不會影響細胞生理與實驗結果
- 陽離子聚合物成分，可以在含有血清與抗生素的培養基環境下進行細胞轉染

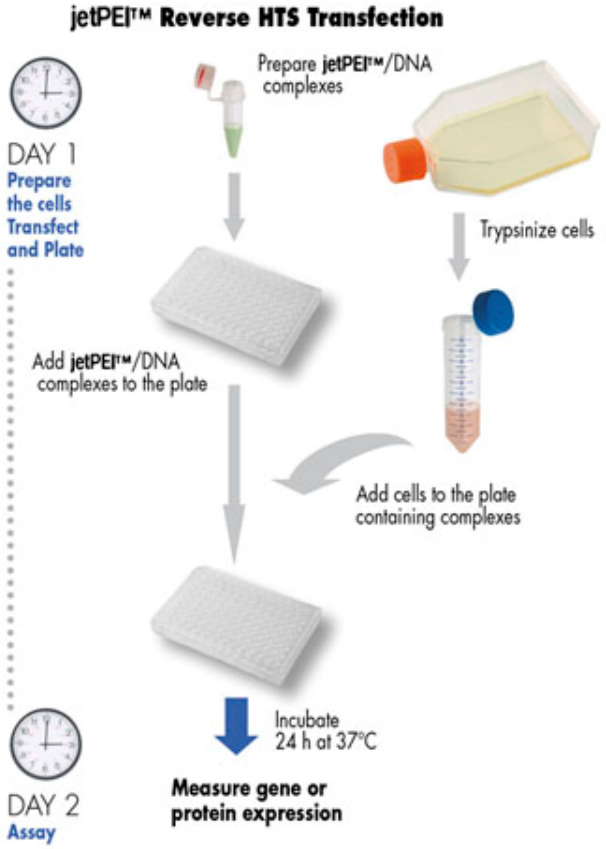


Fig.1 以 jetPEI 使用 Reverse Protocol 進行細胞轉染。jetPEI/DNA complex 形成後先行放入 well 中（必須使用 >24well plate），然後再放入細胞，此時細胞進行貼附培養盤的過程中同時進行細胞轉染，因此同樣在 24 小時以後就能夠觀察轉染效果，比起傳統的細胞轉染方法可以省去一天的實驗時間。

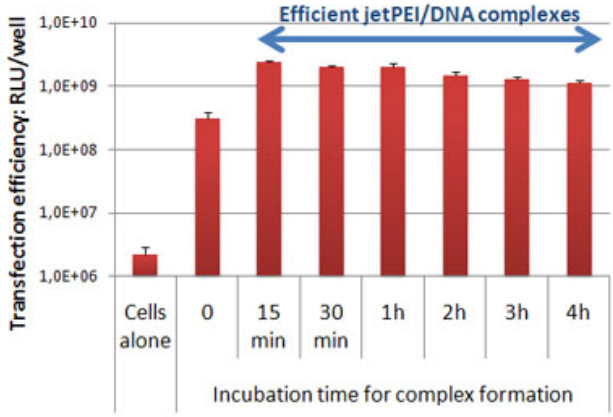


Fig.2 不同的 jetPEI/DNA complex 形成時間所造成的細胞轉染效率差異極小。

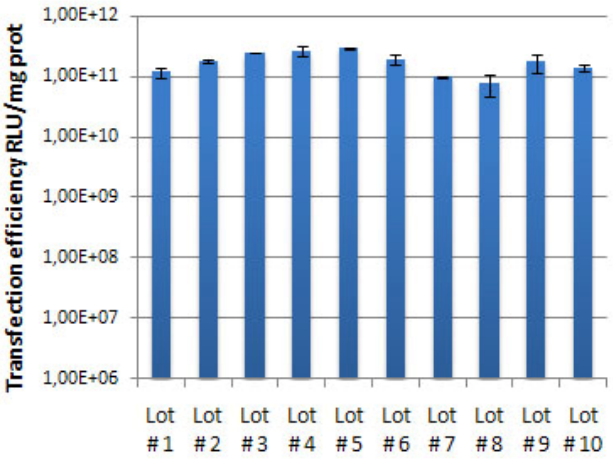


Fig.3 使用不同批次的 jetPEI 分別進行 DNA 細胞轉染，都能夠得到高度一致性的細胞轉染效果。

jetPEI 訂購資訊

產品編號	jetPEI Reagent 容量	150mM NaCl 容量
101-01N	0.1mL	5mL
101-10N	1 mL	50mL
101-40N	4x 1mL	4x 50mL
101B-010N	10 mL	2x 250mL

*Trans*IT®-2020 Transfection Reagent

- 廣效性 DNA 細胞轉染試劑，適用於多種細胞
- 相對於其他細胞轉染試劑，更適用於 primary cell 與 stem cell
- 不含任何動物來源成分

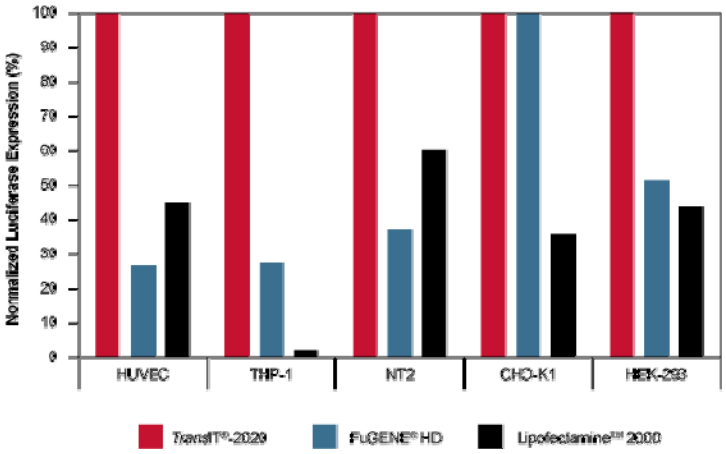


Fig. 1 *Trans*IT-2020 在不同細胞轉染後的的 Luciferase activity 皆優於他牌的效果。

*Trans*IT-2020 訂購資訊

產品編號	容量
MIR 5404	0.4mL
MIR 5400	1mL
MIR 5405	5x 1mL
MIR 5406	10x 1mL

*Trans*IT®-LT1 Transfection Reagent

- Mirus 長壽經典產品
- 廣效性 DNA 細胞轉染試劑，適用於多種細胞
- 低毒性，可在含有血清與抗生素的培養基中進行細胞轉染
- 除了適用於一般細胞轉染外，也適用於病毒生產使用

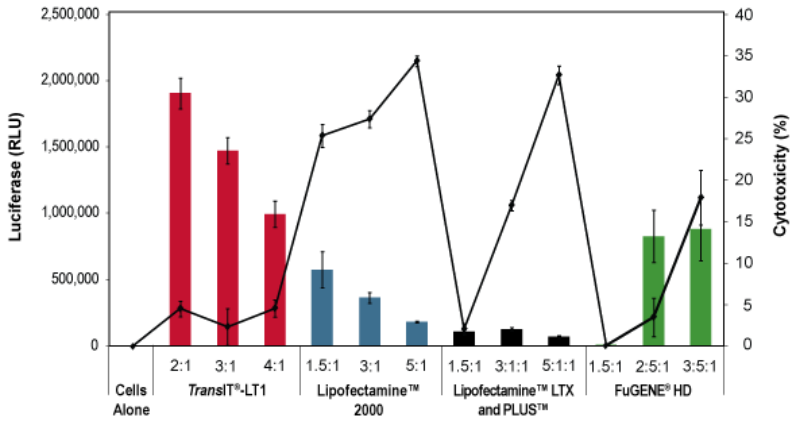


Fig.1 HepG2 細胞分別以 *Trans*IT-LT1 及他牌轉染試劑，以不同的 DNA/reagent 比例進行 DNA 細胞轉染。

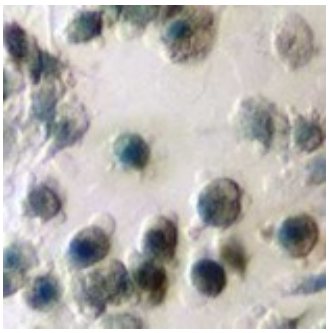
由上圖可以看到，*TransIT*-LT1 除了能夠獲得最高的 Luciferase activity 外，所觀察到的細胞毒性也是所有試劑中最低的。

*Trans*IT-LT1 訂購資訊

產品編號	容量
MIR 2304	0.4mL
MIR 2300	1mL
MIR 2305	5x 1mL
MIR 2306	10x 1mL

jetPEI®-Macrophage

- Marcophage 專用 DNA 細胞轉染試劑
- 低毒性，不會影響細胞生理與實驗結果
- 陽離子聚合物成分，可以在含有血清與抗生素的培養基環境下進行細胞轉染



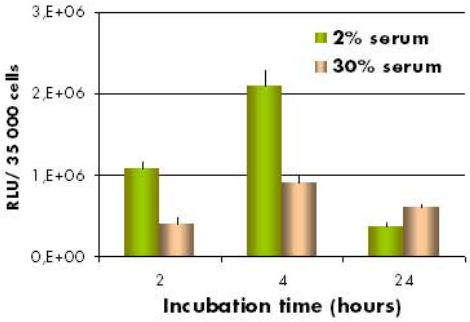
左圖是 jetPEI-Macrophage 將 Beta-Gal 基因送入 GM-CSF cell 經過 7 天候所觀察的基因表現情況。

jetPEI-Macrophage 訂購資訊

產品編號	jetPEI-Marcophage Reagent 容量	150mM NaCl 容量
103-01N	0.1mL	5mL
103-05N	0.5 mL	50mL

jetPEI®-HUVEC

- HUVEC 專用 DNA 細胞轉染試劑
- 低毒性，不會影響細胞生理與實驗結果
- 轉染效率高達 50%，接近 Electroporation 的轉染效果



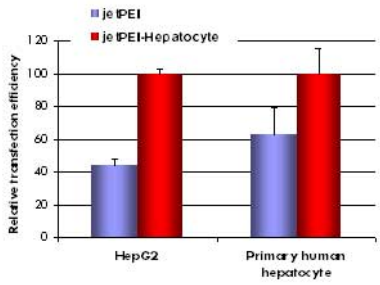
pCMV-Luc 分別在低血清(2%)與高血清(30%)環境下轉染至 HUVEC cell，轉染時間分別為 2 小時、4 小時與 24 小時；轉染結束後 24 小時進行 Luciferase activity assay。

jetPEI-HUVEC 訂購資訊

產品編號	jetPEI-HUVEC Reagent 容量	150mM NaCl 容量
108-01N	0.1mL	5mL
108-05N	0.5 mL	50mL

jetPEI®-Hepatocyte

- 肝癌細胞專用 DNA 細胞轉染試劑，也可用於 Primary Hepatocyte
- 低毒性，不會影響細胞生理與實驗結果



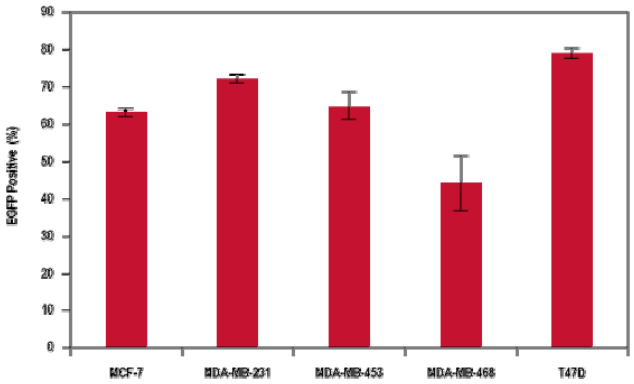
jetPEI-Hepatocyte 與 jetPEI 分別在 HepG2 與 Primary Human Hepatocyte cell 內的轉染效率比較。在左圖所顯示的是轉染效率的相對比例。

jetPEI-Hepatocyte 訂購資訊

產品編號	jetPEI-Hepatocyte Reagent 容量	150mM NaCl 容量
102-01N	0.1mL	5mL
102-05N	0.5 mL	50mL

*Trans*IT®-BrCa Transfection Reagent

- 乳癌細胞專用 DNA 細胞轉染試劑
- 相對於其他細胞轉染試劑，在乳癌細胞的轉染效率更高



TransIT-BrCa 分別在 MCF-7、MDA-MB-231、MDA-MB-453、MDA-MB-468 與 T47D 這些細胞所得到的細胞轉染效率。

*Trans*IT-BrCa 訂購資訊

產品編號	容量
MIR 5504	0.4mL
MIR 5500	1mL
MIR 5505	5x 1mL
MIR 5506	10x 1mL

*Trans*IT®-Neural Transfection Reagent

- 神經細胞專用 DNA 細胞轉染試劑
- 在神經細胞的轉染效率最高達 75%

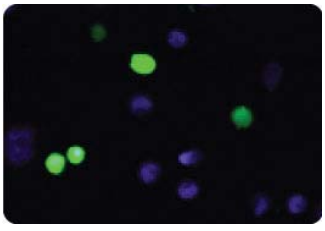
細胞株	使用 pEGFP 的轉染效率
C6	20%
Daoy	25%
DB-TRG-05MG	25%
DI-TNC1	40-50%
Neuro-2a	75%
PC-12	20-30%
SK-N-MC	60-70%
SVG p12	30%

*Trans*IT-Neural 訂購資訊

產品編號	容量
MIR 2144	0.4mL
MIR 2140	1mL
MIR 2145	5x 1mL
MIR 2146	10x 1mL

*Trans*IT®-Jurkat Transfection Reagent

- 專為 Jurkat 細胞設計的 DNA 細胞轉染試劑
- 也可用於 K562、RAW264.7、THP-1 等不容易進行細胞轉染的細胞



pEGF plasmid 以 TransIT-Jurkat 對 Jurkat 細胞進行細胞轉染後 24 小時所觀察的細胞表現。

*Trans*IT-Neural 訂購資訊

產品編號	容量
MIR 2124	0.4mL
MIR 2120	1mL
MIR 2125	5x 1mL
MIR 2126	10x 1mL

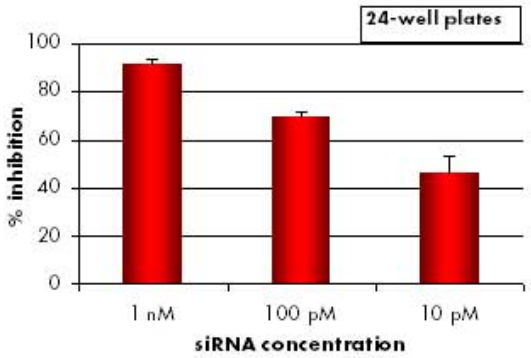
INTERFERin®

- siRNA 專用細胞轉染試劑
- 適用於多種細胞
- siRNA 最低濃度可達 1nM，且基因表現抑制效果依然高達 90%
- 低毒性，不會影響細胞生理與實驗結果

Table.1 使用 INTERFERin 成功使用低濃度 siRNA 抑制基因表現的案例

Adherent cell lines (1 nM siRNA)		
A549	Luciferase	> 90%
HeLa	GAPDH / Lamin A/C	
CaSki	GAPDH / Lamin A/C	
MCF7	GAPDH / Lamin A/C	
NIH-3T3	Vimentin	
RAW	Eg5	
SiHa	GAPDH / Lamin A/C	
HepG2	GAPDH	60-70%
Primary cells (1 nM siRNA)		
MEF Murine embryonic fibroblasts	GAPDH	> 90%
Primary human fibroblasts	GAPDH / Lamin A/C	
Primary human hepatocytes	GAPDH	
Suspension cell lines (5 nM siRNA)		
K562	GAPDH	> 80%
THP-1	GAPDH	

Selected successfully transfected cell lines and silencing efficiencies obtained with INTERFERin™



A549-GL3Luc 細胞使用 INTERFERin 轉染低濃度 siRNA 所造成的抑制效果。

INTERFERin 訂購資訊

產品編號	INTERFERin Reagent 容量
409-01	0.1 mL
409-10	1 mL
409-50	5x 1mL

*Trans*IT®-TKO Transfection Reagent
*Trans*IT®-siQUEST Transfection Reagent

Table.1 TransIT-TKO 在各種細胞中轉染 siRNA 抑制基因表現的效率

Cell Line (Source)	Endogenous Transcript	Knockdown Efficiency
BNL CL.2 (mouse liver)	MAPK1	80%
	MAPK3	83%
HeLa (human cervix)	Lamin A/C	80%
	GAPDH	80%
Hepa1c1c7 (mouse liver)	MAPK1	80%
	MAPK3	75%
	MEK1	75%
	PTEN	80%
HepG2 (human liver)	MAPK1	80%
NIH 3T3-L1	MAPK1	70%
	MAPK3	70%
Secondary Human Astrocytes	Lamin A/C	80%
Primary Mouse Hepatocytes	ABC A1	70%
	Lamin A/C	81%

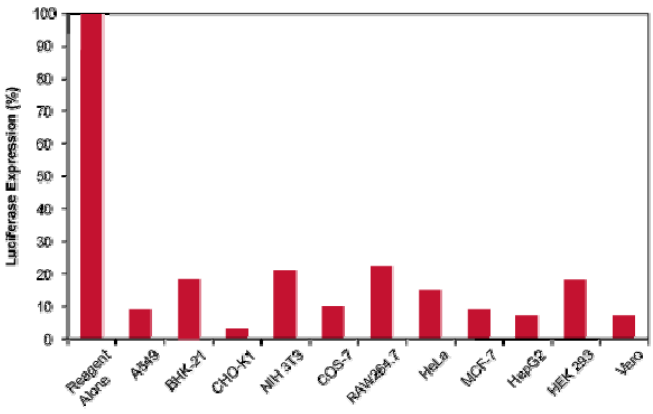


Fig.1 TransIT-siQUEST 在各種細胞轉染 siRNA 的抑制效率。

*Trans*IT-TKO 訂購資訊

產品編號	容量
MIR 2154	0.4mL
MIR 2150	1mL
MIR 2155	5x 1mL
MIR 2156	10x 1mL

*Trans*IT-siQUEST 訂購資訊

產品編號	容量
MIR 2114	0.4mL
MIR 2110	1mL
MIR 2115	5x 1mL
MIR 2116	10x 1mL

*Trans*IT®-Insect Transfection Reagent

- 昆蟲細胞專用 DNA 細胞轉染試劑
- 適用於常見的昆蟲細胞株，包括 Sf9、High Five、S2 等
- 最佳的桿狀病毒（Baculovirus）轉染系統，可用於重組蛋白質生產
- 無 liposome，也沒有任何動物成分
- 相較於他牌，試劑的使用量更少

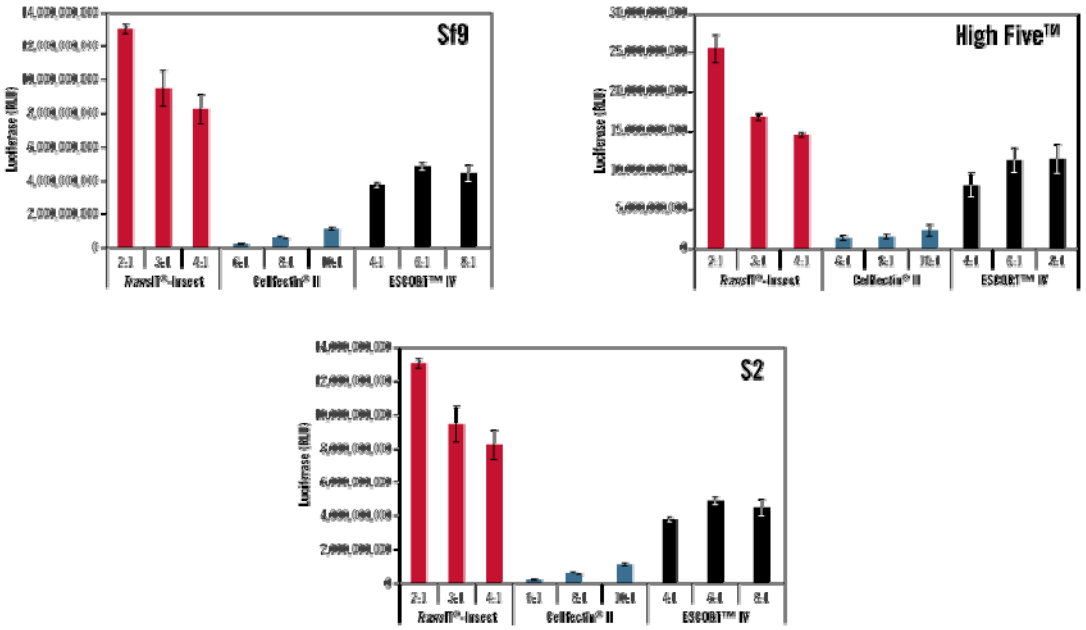


Fig. 1 使用 0. 1ug DNA 分別以 TransIT-Insect 與他牌試劑同時在 96 well plate 內對於 Sf9、High Five、S2 進行細胞轉染，轉染時使用了不同比例的試劑進行實驗，並在轉染後 48 小時進行 Luciferase activity assay。

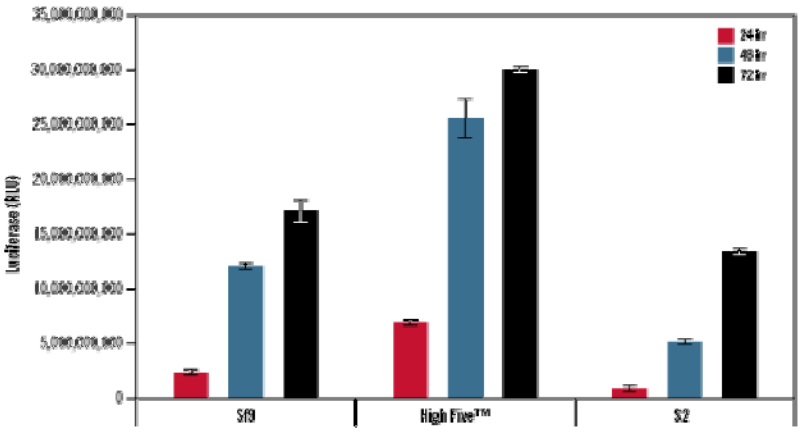


Fig.2 Sf9、High Five、S2 分別以 TransIT-Insect 進行細胞轉染，並分別在 24 小時、48 小時、72 小時以 Luciferase activity assay 評估蛋白質產量。

*Trans*IT-Insect 訂購資訊

產品編號	容量
MIR 6104	0.4mL
MIR 6100	1mL
MIR 6105	5x 1mL
MIR 6106	10x 1mL

FectoPRO™

- Bioproduction 專用轉染試劑
- 適用於在無血清、全合成培養基環境下對 HEK-293 cell 或 CHO cell 進行細胞轉染
- 使用的試劑與 DNA 用量皆低於他牌同類型試劑
- 蛋白質產量遠高於他牌同類型產品，最適於進行蛋白質或抗體生產使用
- 細胞在轉染後 6 天依然有高存活率

Table.1 FectoPRO 與他牌所建議使用的試劑與 DNA 量

Reagent	DNA amount µg/ml cell culture	Reagent volume µl/ml cell culture
FectoPRO™ + FectoPRO™ Booster	**0.4 - 0.6**	**0.6 – 0.9**
FreeStyle™ MAX Reagent	1.25	1.25

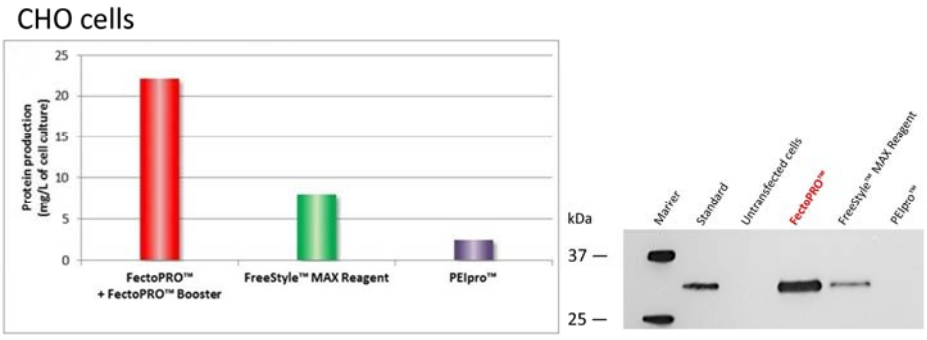


Fig.1 FreeStyle CHO-S 以 FreeStyle CHO Expression Medium 培養，並使用 FectoPRO（0.4ug/mL DNA）與他牌（1.25ug/mL DNA）進行細胞轉染，在轉染後 72 小時使用 Protein G 純化 IgG3-Fc (34KDa)的結果。

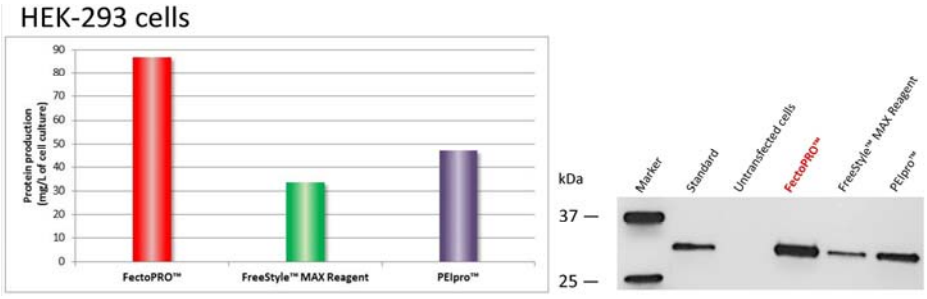


Fig.2 HEK-293F 以 FreeStyle 293 Expression Medium 培養，並使用 FectoPRO (0.8ug/mL DNA)與他牌（1.25ug/mL DNA）進行細胞轉染，在轉染後 120 小時使用 Protein G 純化 IgG3-Fc (34KDa)的結果。

FectoPRO 訂購資訊

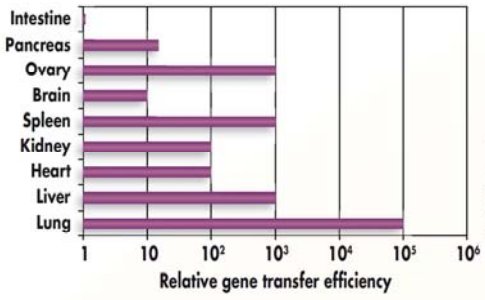
產品編號	FectoPRO Reagent 容量	FectoPRO Booster 容量
116-001	1 mL	1 mL
116-010	10 mL	10 mL
116-100	10x 10 mL	10x 10mL

in vivo-jetPEI®

- 活體專用轉染試劑
- 適用於 DNA 與 siRNA
- 可用於各種器官
- 目前已使用在臨床試驗 Phase II

Tail vein injection

Nucleic acid: 50 µg
***in vivo*-jetPEI™:** 5-8 µl
N/P ratio: 5-8
Injection volume: 200-400 µl, 5% glucose
Method: The mouse is placed in a restainer and 70% ethanol is applied on the tail in order to slightly swell the vein. Complexes in solution are injected into the tail vein over 10 sec, using a ½ inch 26 gauge needle and a 1 ml syringe.



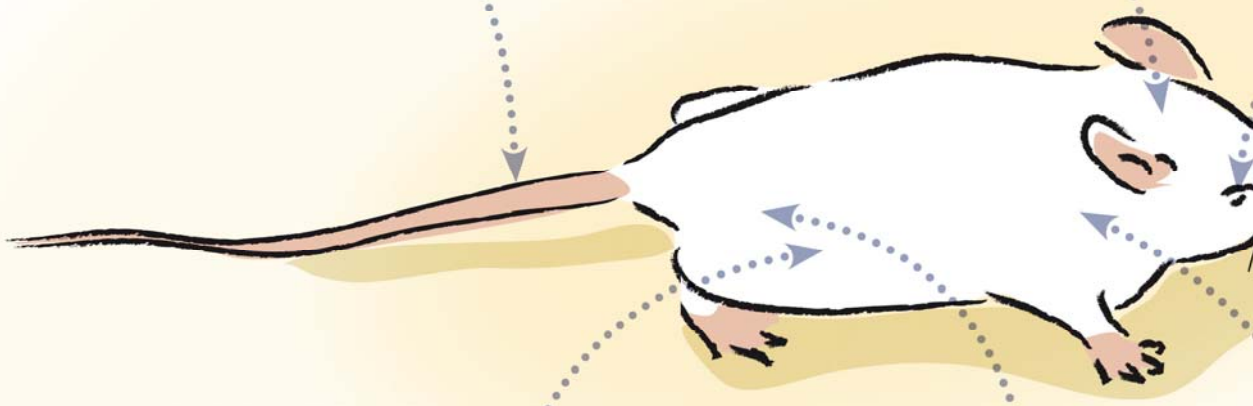
Tissue distribution of luciferase transgene expression 24 h following tail vein injection.

Intracerebral injection (stereotaxic

siRNA: 0.1 µg/µl using **jetSI™ 10 mM** (se
Injection volume: 1-4 µl
Method: Single injection into either lateral ventricle or stereot

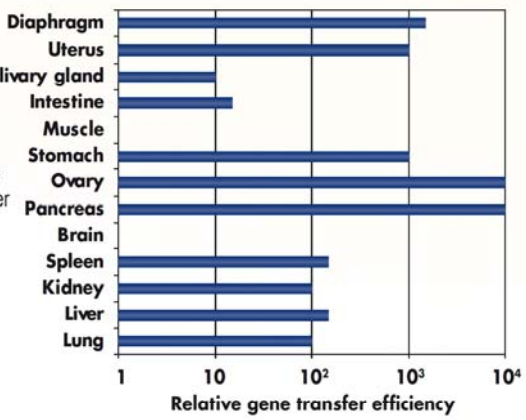
DNA: 1 µg (for 8-12 week-old mice)
***in vivo*-jetPEI™:** 0.12 µl
N/P ratio: 6
Injection volume: 5 µl, 5% glucose
Method: Single injection (5 µl) into either lateral ventricle (0.2 mm posterior to the bregma line, 1.1 mm lateral, and 2.2 mm deep from the pial surface) to pentobarbital anesthetized mice (65 mg/kg).

Example of transfected cells expressing the β-galactosidase and found in the anterior subventricular zone (1 week after intraventricular injection of pCMV-LacZ). Courtesy B. Demeneix



Intraperitoneal injection

Nucleic acid: 100 µg
***in vivo*-jetPEI™:** 12-16 µl
N/P ratio: 6-8
Injection volume: 400 µl to 1 ml, 5% glucose
Method: Complexes in solution are injected into the peritoneal cavity over 10 sec, using a ½ inch 26 gauge needle and a 1 ml syringe.



Tissue distribution of luciferase transgene expression 24 h following i.p. injection.

Intratumoral injection

Nucleic acid: 10-20 µg
***in vivo*-jetPEI™:** 1.2-3.2 µl
N/P ratio: 6-8
Injection volume: 50-100 µl, 5% glucose
Method: For implanted subcutaneous tumors (size> 5 mm^3), perform multiple injections of 10-20 µl complexes at different sites of the tumor to avoid reflux.

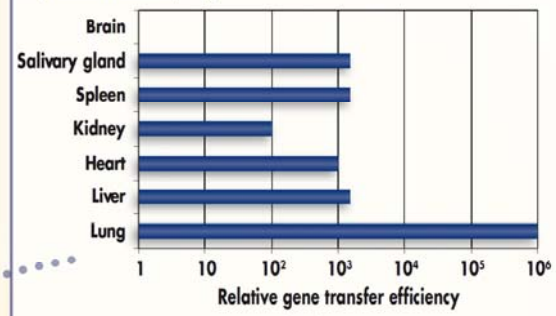
injection)

e page 51)

axical injection.

Retro-orbital injection

Nucleic acid: 40 µg
in vivo-jetPEI™: 6.4 µl
N/P ratio: 8
Injection volume: 200-400 µl, 5% glucose
Method: The tip of a 27 g hypodermic needle is introduced carefully in front of the eye. Follow the edge of the orbit down until feeling the needle tip at the base beneath the eye. Inject complexes in solution within 2 sec. If performed carefully, there will be little or no bleeding. The capillary nexus will take up the injected solution rapidly.



Tissue distribution of luciferase transgene expression 24 h following retro-orbital injection.

Nasal instillation for trachea and lung delivery

Nucleic acid: 20 µg
***in vivo*-jetPEI™:** 2.4-3.2 µl
N/P ratio: 6-8
Injection volume: 50-100 µl, 5% glucose
Method: Mice are held supine at an angle of 45° with pressure applied to the lower mandibule to immobilize the tongue and prevent swallowing. Complexes in solution are then introduced to the nasal planum using a micropipet.

Subcutaneous injection

Nucleic acid: 3-5 µg
***in vivo*-jetPEI™:** 0.3-0.7 µl
N/P ratio: 5-7
Injection volume: 10 µl, 5% glucose
Method: Mice are restained and complexes are injected subcutaneously in the region of interest.

目前使用 in vivo-jetPEI 進行臨床試驗的單位與時程

查詢 in vivo-jetPEI 轉染方法，請掃描以上 QR Code。

查詢 in vivo-jetPEI 轉染器官，請掃描以上 QR Code。

in vivo-jetPEI 訂購資訊

產品編號	in vivo-jetPEI Reagent 容量	10% Glucose 容量
201-10G	0.1 mL	10 mL
201-50G	0.5 mL	2x 10 mL

Ingenio® Electroporation Products

- 針對 Primary cells 等不容易進行細胞轉染實驗而設計的電穿孔法試劑
- 適用於是面上常見的電穿孔儀器，包括 Lonza-Amaxa®、Bio-Rad®、Harvard BTX®
- 可用於 plasmid DNA 與 siRNA 的細胞轉染
- 優秀的 C/P 值，能節省更多實驗經費

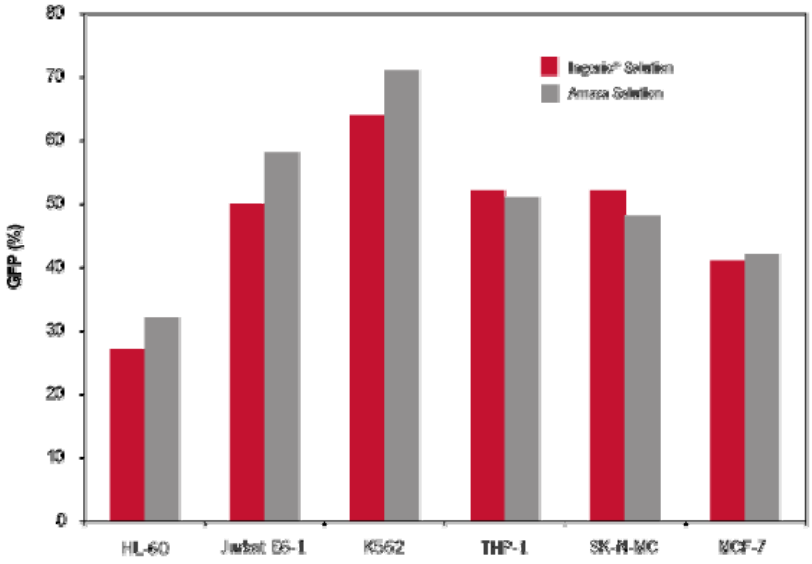


Fig.1 分別使用 Ingenio solution 與 Amaxa solution 以 Amaxa 儀器以電穿孔法進行細胞轉染所呈現的轉染效率

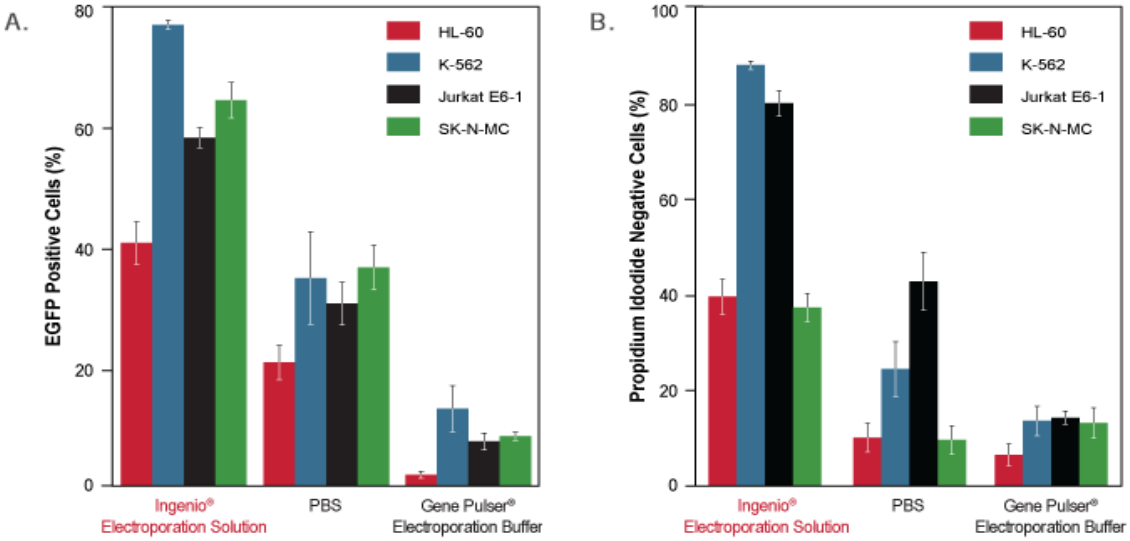


Fig.2 細胞分別以 Ingenio solution 與其他 solution 以 Bio-Rad Gene Pulser® Xcell 進行電穿孔法細胞轉染。上圖分別呈現的為(A)細胞轉染效率；(B)電穿孔後的細胞存活率。

Ingenio® Electroporation Kit for Lonza-Amaxa® Nucleofector® devices

產品編號	使用次數
MIR 50112	25 reactions
MIR 50115	50 reactions
MIR 50118	100 reaction

Ingenio® Electroporation Kit for Bio-Rad® and Harvard-BTX®

產品編號	使用次數
MIR 50113	25 reactions
MIR 50116	50 reactions
MIR 50119	100 reaction

Lifeblood Medical, Inc.
www.lifebloodmedical.com

Lifor®

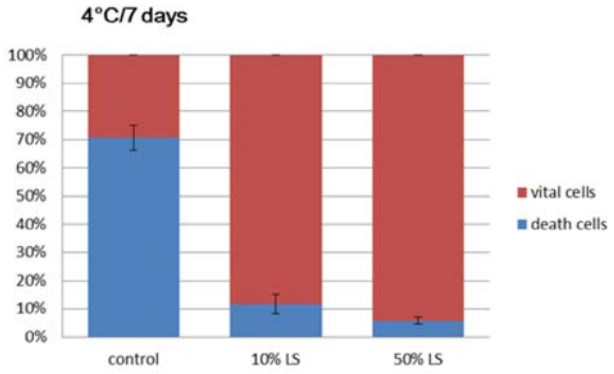
Composi on for Maintaining Organ and Cell Viability

- ► Organ Preservation and Transportation
- ► Cell Culture, FBS Replacement
- ► Tissue Preservation & Transportation

客戶見證：

最厚達 2 cm 的皮膚組織, 取下後直接浸泡 Lifor®， 置於 4°C，最長放置 2 星期，細胞維持良好活性，使 primary cell culture 效果接近新鮮處理的 sample，細胞存活率大大提升！！

Lifor® for Stem Cell Preservation



使用 10% 及 50% 的 Lifor® 保存周邊血液幹細胞，可在 4°C 下保存 7 天並維持存活率高達 88.4 % 及 94.2%。

包裝規格	貨號
100ml	AEDTNC-100
500ml	AEDTNC-500
1000ml	AEDTNC-1000

- ◆ Animal/Human Component Free
- ◆ Low Potassium
- ◆ Dextran Based
- ◆ Liposome Complex
- ◆ Nutrients
- ◆ GMP Validated Manufacturing
- ◆ Batch Consistency Lot-to-Lot
- ◆ US Patent No 7,220,538

- ● 以微脂體包覆而成的奈米粒子攜帶 O_2 及細胞所需之營養成分
- ● 提供細胞自行修復的條件
- ● 不含動物血清及蛋白,減低感染及污染的機率
- ● 不含具細胞毒性的成分,如 DMSO

Composition of Lifor®: Physiological, oxygen enriched solution, inorganic salts, amino acids, vitamins, adenosine, cholesterol, glucose, dextrane 70

如何應用？

- ◆ 實驗用途之器官儲存，室溫運送，並在移植後重現器官功能（如心臟、 肝臟、腎臟）
- ◆ 適合長時間 4°C 或 25°C 儲存, 運送活細胞檢體，方便後續細胞培養， 酵素活性測試及基因表達分析，如 mouse epididymal sperm、peripheral blood stem cells、phgranulocytes、skeletal muscle、RNA extraction。
- ◆ 提高 primary culture 細胞存活率

關於 LIFELINE

成立於 25 年來 致力於提供 Normal Human Cells Systems

Lifeline Cell Technology (Lifeline) 藉著提供嚴謹的品質測試,一慣的創新研發和對客戶及技術服務的熱情,持續領導品牌

Lifeline 專注於發展及生產供細胞培養的 **purified primary human cells** 和 **optimized reagents**

Lifeline 的科學家們鑽研在此重要領域中已超過 20 年

- **Lifeline** 的科學家們所發展的 **human cell systems 和 品管標準程序 已經在各學術, 政府單位及藥物研發實驗室廣為應用於研究人類疾病。**
- **Lifeline 團隊的科學家們和品管技術人員不斷追求 human cell systems 的進步以符合細胞培養市場中不斷增加的**
- **Lifeline** 的科學家們突破性的發展 **human stem cell 產品**

Lifeline 以引以為傲的技術及服務誠摯的為您提供細胞培養的需要!

Lifeline 屬於 International Stem Cell Corporation, (ISC) (ISCO.OB), 公開上市公司位於加州 Oceanside, Lifeline 產品製造位於 明尼蘇達州 Frederick

Shiga toxin subtypes display dramatic differences in potency. Fuller, et.al., Infect. Immun. 2011,79(3),p.1329
Lifeline cell technology: RenaLife Complete Medium for renal cytotoxicity studies

Estrogen and Cytochrome P450 1B1 Contribute to Both Early- and Late-Stage Head and Neck Carcinogenesis. Shatalova et. al., Cancer Prev. Res., 2011, 4(1) p.107
Lifeline cell technology: DermaLife K Complete Medium for culturing MEK Leuk1 cells

Mechanical signals activate vascular endothelial growth factor receptor-2 to upregulate endothelial cell proliferation during inflammation. Lui and Agrawal, J. Immunol., 2010, 185(2) p. 1215
Lifeline cell technology: VascuLifeVEGF-MV Complete Medium for VEGF Receptor-2 studies in microvascular endothelial cells

Novel high-throughput screen against Candida albicans identifies antifungal potentiators and agents effective against biofilms. La Fleur et. al., Anitmicrob. Chemother., 2011, 66(4), p. 820
Lifeline cell technology: Adult Fibroblasts for cytotoxicity studies

Classical NF-kappaB activation negatively regulates noncanonical NF-kappaB-dependent CXCL12 expression. Madge and May, J. Biol. Chem., 2010, 285(49) p.38069
Lifeline cell technology: VascuLife VEGF-MV Complete Medium for studying the activation of endothelial cells

Transmembrane potential of GlyCl-expressing instructor cells induces a neoplastic-like conversion of melanocytes via a serotonergic pathway. Blackiston, et.al., Disease Models Mechan., 2011, 4(1) p.67
Lifeline cell technology: Melanocytes and DermaLife M Complete Medium for transmembrane depolarization studies

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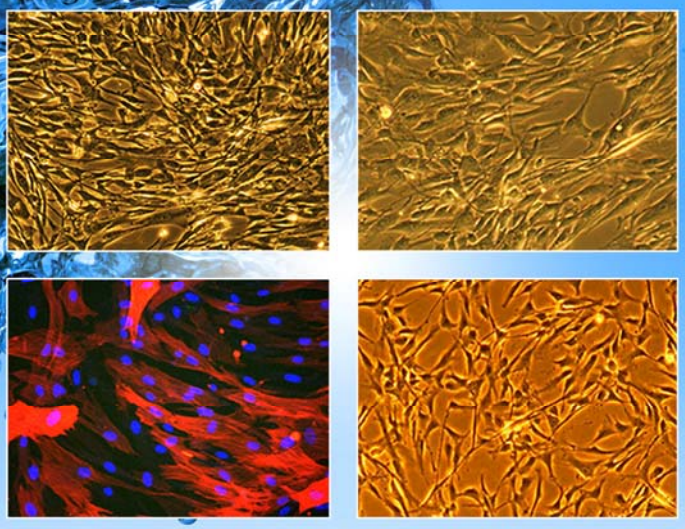
www.Lifelinecelltech.com

LIFELINE
CELL TECHNOLOGY

THE HIGHEST QUALITY human cells and media
designed to **PERFECT** your **RESEARCH RESULTS**

"Brought to you by the people who first designed
consistency and reliability in Human Cell Systems"



LIFELINE 能提供您甚麼?

提供具代表性的產品, 作為人類疾病的模型

穩定的細胞及 optimized media 系統使您在目前火紅的研究領域更上層樓

標準化· **再**現性高· **品**質保證

高規格 QC 保證細胞的特性及 Lot-to-lot consistency

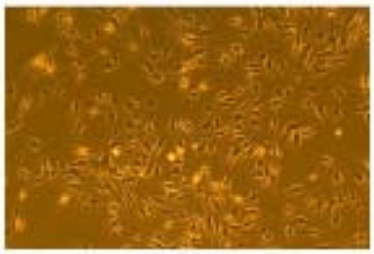
專注於簡化顧客端的操作

為您免除分離組織細胞的困難繁雜, 提供您品質穩定的細胞及 mediua, 同時以標準程序建立完備的捐贈者資料及證明文件檔案

專業技術支援

提供快速的溝通窗口, 使您方便的自 LCT 產品研發科學家得到專業的技術支援, 解決您的疑難雜症

Cells • Media • Service



Airway Cell Systems	Item#
Norma l Human Lung Smooth Muscle Cells (HLMSC)	FC-0046
Normal Human Bronchial/Tracheal Smooth Muscle Ce lls (HBTSMC)	FC-0059
Norma l Human Bronchial/Tracheal Epithelia l Cells ， Primary	FC-0035
Normal Human Lobar Bronchial Epithelial Cells	FC-0054
BronchiaLife ™ B/T Medium Complete Kit	LL-0023
Normal Human Small Airway Epithelial Cells ， Primary	FC-0016
Bronchia Life SAE Medium Complete K it	LL-0037
Badder Cell Systems	
Norma l Human Bladder Epithelial Cells - Ape x (HBIEC-A)	FC-0040
Normal Human Bladder Epithelial Cells - Dome (HBIEC- D)	FC-0079
UroLife™ A Culture Medium Complete Kit	LL-0063
UroLife™ D Complete Culture Medium	LM-0042
Normal Human Bladder Fibroblasts	FC-0050
Normal Human Bladder Smooth Muscle Cells	FC-0043
Corneal Cell Systems	
Normal Human Corneal Epithelial Cells	FC-0029
OcuLifeγ™ Medium Complete Kit	LL-0032
Endothelial Cell Systems	
Norma l Human pulmonary Artery Endothelial Cells (HPAEC)	FC 0055
Norma l Human Aortic Endothelial Cells (HAoEC)	FC 0014
Norma l Human Coronary Artery Endothelial Cells (HCAEC)	FC 0032
Normal Human Umbilical Vein Endothelial Cells (HUVEC)	FC-0003
Normal Human Umbilical Vein Endothelial Cells, 10-Donor Pool	FC-0044
Normal Human iliac Artery Endothelial Cells	FC-0028
Vascu Life® EnGS Medium Complete Kit	LL-0002
Vascu Life VEGF Medium Complete Kit	LL-000 3
Normal Human Dermal Microvascular Endothelia l Cells, Neonatal	FC-0042
Vascu Life EnGS-Mv Medium Complete Kit	LL-0004
Vascu Life VEGF - Mv Medium Complete Kit	LL-0005
Fibroblast Systems/Stem Cell Products	
Norma l Human Dermal Fibroblasts ,Neonatal,Primary (HDFn)	FC-0001
Normal Human Derma l Fibroblasts, Adult, Primary (HDFa)	FC-0024
Norma l Human Lung Fibroblasts (HLF)	FC-0049
Normal Human Derma l Fibrob lasts, Neonatal, Xenofree (HDFn-XF)	FC-0037
FibroLife ® Xeno-Free Complete Cell Culture System	LL-0048
Xeno-Free Fibroblast Starter Kit	LL-0049
FibroLife ® S2 Medium Complete Kit	LL-0011
FibroLife SerumFree Complete Kit	LL-0001
FibroLife Xeno-Free Complete Medium *(for use with Xeno-Free Fibroblas)*	LM-0013
Human Hematopoietic Cells	
Human Peripheral Blood Mononuclear Cells (HPBMC)	HC-0001
Human Monocytes-Negatively Selected	HC-0002
Human Monocyte-Derived Dendritic	HC 0003
Cells Human T Cells	HC-0004
Human B Cells	HC-0005
Human $CD34^+$ Hematopoietic Stem Cells (HSC-C $D34^+$)	HC-0006
RPMI 1640 Medium Complete Kit	LL-0054
RPMI 1640 Basal Medium	LM0025
Keratinocyte Systems	
Norma l Human Epiderma l Kerat inocytes, Neonatal, Primary (HEKn)	FC-0007
Normal Human Epidermal Keratinocytes, Adult, Primary (HEKa)	FC-0025
DermaLife® K Medium Complete Kit	LL-0007
Derma Life® K Calcium-Free Medium Complete Kit	LL-0029

Mammary Cell Systems	Item#
Normal Human Mammary Epithelial Cells (HMEC)-Male	FC-0063
Normal Human Mammary Epithelial Cells (HMEC)-Female	FC-0065
MammaryLife™ Medium Complete Kit	LL-0061
Melanocyte Systems	
Normal Human Epidermal Melanocytes, Neonatal, Primary (HEMn)	FC-0023
Normal Human Epidermal Melanocytes, Neonatal, Secondary	FC-0019
DermaLife™ Medium Complete Kit	LL-0027
Norma l Human Epidermal Melanocytes, Adult, Secondary (HEMa)	FC-0030
Derma Life™ Medium Complete Kit	LL-0039
Neural Stem Cell Systems	
Neura Life™ Neurol Basal Medium	LM-0055
NeuraLife Complete Kit (Basal Medium & J20 LifeFactor)	LM-0055
Prostate and Male Reproductive Cell Systems	
Norma l Human Prostate Epithelial Cells (HPrEC)	FC-0038
Prosta Life™ Medium Complete Kit	LL-0041
Norma l Human Seminal Vesicle Epithelia l Cells	FC-0048
Normal Human Vas Deferens Fibroblasts	FC-0052
Renal Cell Systems	
Norma l Human Renal Cortical Epithelia l Cells (HRCEC)	FC-0012
Normal Human Renal Proximal Tubule Epithelia l Cells (HRPTEC)	FC-0013
Norma l Human Renal Mixed Epithelial Cells	FC-0017
Normal Human Renal Medullary Epithelial Cells	FC-0018
Rena Life™ Medium Complete Kit	LL-0025
Smooth Muscle Cell Systems	
Norma l Human Pulmonary Artery Smooth Muscle Cells (HPASMC)	FC-0056
Norma l Human Coronary Artery Smooth Muscle Cells (HCASMC)	FC-0031
Norma l Human Aortic Smooth Muscle Cells (HAoSMC)	FC-0015
Vascu Life® SMC Medium Complete Kit	LL-0014
Human Stem Cell Systems	
Human Bone Marrow - Derived Mesenchymal Stem Cells (HMSC-BM)	FC-0057
StemLife ™ MSC-BM Medium Complete Kit	LL-0062
Human Adipose-Derived Mesenchymal Stem Cells (HMSC-Ad)	FC-0034
Human Wharton's Jelly Mesenchymal Stem Cells (HMSC-WJ)	FC-0020
StemLife MSC Medium Complete Kit	LL-0034
Human Pre-Adipocytes (HMSC- Pre-d)	FC-0062
StemLife PA Medium Complete Kit	LL-0058
Adipo Life™ DfKt™-1Adipogenesis Medium Complete Kit	LL-0050
Adipo Life DfKt-2 Adipogenesis Medium Complete Kit	LL-0059
ChondroLife ™ Complete Chondrogenesis Medium	LM-0022
OsteoLife™ Complete Osteogenesis Medium	LM-0023
Alizarin Red Stain (for Osteoblasts)	CM-0058
Alizarin Blue Staining Kit (for Chondrocytes)	LL-0051
Oil Red O Staining Kit (for Adipocytes)	LL-0052
Uterine Cell Systems	
Norma l Human Uterine Fibroblasts	FC-0076
Normal Human Uterine Smooth Muscle Cells	FC-0075
Reagents and Cryopreservation Solutions	
TrypK it ™ Subculture Reagents	LL-0013
Frosta Life ™ Cryopreservation Solution	LM-0015
Frosta Life X F Xeno-Free Cryopreservation Solution	LM-0019

Human Mesenchymal Stem Cells (HMSC)

- **Adult (HMSC-Ad)**
- **Bone Marrow (HMSC-BM)**
- **Pre-adipocyte (HMSC-Pre-Adipocyte)**
- **Wharton's Jelly (HMSC-WJ)**

Lifeline 提供不同組織來源的 Mesenchymal Stem Cells.

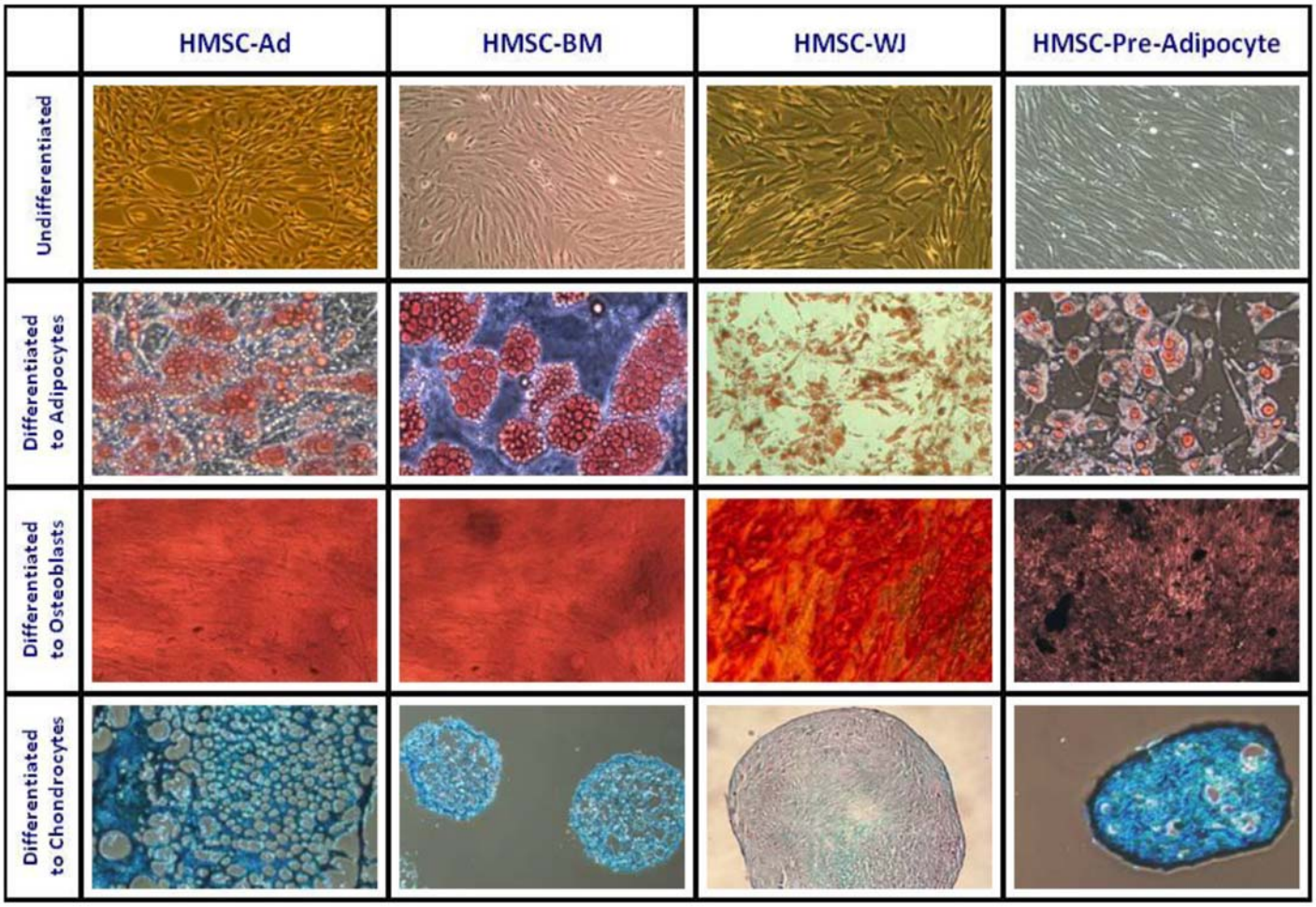
- ▶ HMSC-Ad 分離自成人抽脂術來的抽出物(lipoaspirate)
- ▶ HMSC-BM 分離自骨髓抽出物 (Bone Marrow aspirate)
- ▶ HMSC-WJ 分離自臍帶 Wharton's Jelly
- ▶ HMSC-Pre-Adipocyte 分離自 成熟脂肪細胞 (mature adipocytes)

Lifeline 的 HMSC are 經過 flow cytometry 分析以確保各種關於 mesenchymal stem cells markers 的表現皆符合 mesenchymal stem cells 的特性.

positive for CD29, CD44, CD73, CD90, CD105, and CD166
negative for CD14, CD31, CD34, and CD45

Lifeline 的 HMSC 提供理想的模型供 multipotent stem cell biology and differentiation processes 相關研究. 這些細胞可以分化為典型的 mesenchymal lineages; 像是 adipogenic, chondrogenic, and osteogenic.

Lifeline 已發展出最佳化放大培養 HMSC 的產品, 並確保細胞維持在 undifferentiated state,以及各種優化培養套組用以誘發 Adipogenesis, Chondrogenesis, and Osteogenesis. 另外亦提供方便的染色套組辨識分化後的各種細胞。



Product Ordering Information

Mesenchymal Stem Cells

Part Number	Cell Type
FC-0020	HMSC-WJ – Derived from the Wharton's Jelly of the umbilical cord
FC-0034	HMSC-Ad – Derived from adipose tissue
FC-0057	HMSC-BM – Derived from bone marrow
FC-0062	HMSC-Pre-Adipocyte – Derived from mature adipocytes that have been dedifferentiated

Expansion Media

Part Number	Components	For Use With Cell Part Number(s)
LL-0034	StemLife™ MSC Complete Kit	FC-0020 FC-0034 FC-0062
LL-0062	StemLife MSC-BM Complete Kit	FC-0057
LL-0058	StemLife PA Complete Kit	FC-0062

Differentiation Media

Part Number	Components	For Use With Cell Part Number(s)
LL-0050	AdipoLife™ DfKt™-1 (LM-0021 AdipoLife Basal Medium + LS-1074 DifFactor™ 1 + LS-1075 DifFactor 2)	FC-0034 FC-0062
LL-0059	AdipoLife DfKt-2 (LM-0021 AdipoLife Basal Medium + LS-1083 DifFactor 3)	FC-0020 FC-0057
LM-0022	OsteoLife™ Complete Osteogenesis Medium	FC-0020 FC-0034 FC-0057 FC-0062
LM-0023	ChondroLife™ Complete Chondrogenesis Medium	

Additional Products

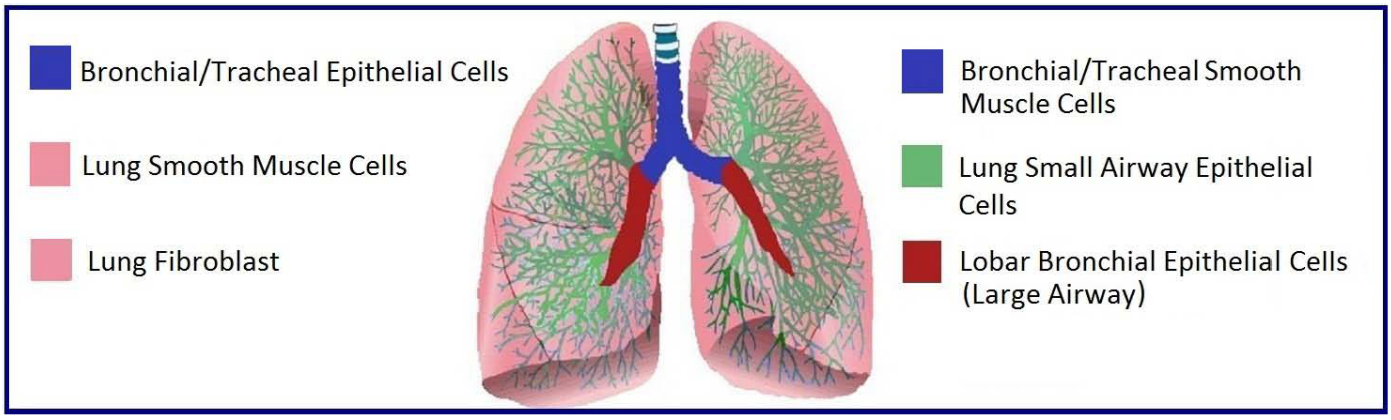
Part Number	Components	Part Number	Components
CM-0058	2% Alizarin Red Stain	CM-0063	Fibronectin
LL-0051	Alcian Blue Staining Kit	LL-0013	TrypKit™ Subculture Reagent Kit
LL-0052	Oil Red O Staining Kit	LM-0015	FrostaLife™ Cryopreservation Solution
LS-1011 LS-1085	PSA, 1 mL and 5 mL Penicillin 10,000 Units/mL Streptomycin 10,000 µg/mL Amphotericin B 25 µg/mL	LS-1008 LS-1086	GA, 1 mL and 5 mL Gentamicin 10 mg/mL Amphotericin B 250 µg/mL

Normal Human Lung Cell Systems and Media

- **Bronchial/Tracheal Epithelial Cells**
- **Lung Fibroblasts**
- **Bronchial/Tracheal Smooth Muscle Cells**
- **Lung Smooth Muscle Cells**
- **Lung Small Airway Epithelial Cells Lobar**
- **Bronchial Epithelial Cells (Large Airway)**

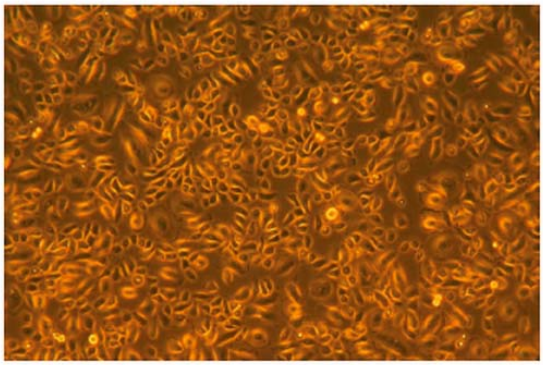
Lifeline 的 Normal Human Lung Cells, 搭配 Lifeline 的 culture medium, 提供了理想的肺部疾病培養模型例如 氣喘, COPD, 囊狀纖維化,肺癌 以及吸煙造成的肺部健康影響。

為了確保最佳的存活率及增值效率, Lifeline 的 lung cells 是在第一代或第二代的初代培養後冷凍保存。 Bronchial/Tracheal Epithelial Cells 及 Large Airway Lobar Epithelial cells 是培養在 BronchiaLife B/T Medium. Small Airway Epithelial Cells 是培養在 BronchiaLife SAE Medium. Human Lung Smooth Muscle Cells 是培養在 VascuLife SMC Medium 而 the Lung Fibroblasts 是培養在 FibroLife® S2 Medium.



HUMAN LUNG CELLS ARE TESTED FOR:	
• Cell Count	500,000 cryopreserved cells per vial
• Proliferation	Population growth at various densities
• Cell Viability	≥ 70% viability when thawed from cryopreservation
• Morphology	Normal cell appearance for 15 population doublings
• Sterility Testing	Negative for mycoplasma Negative for bacterial and fungal growth
• Virus Testing	Negative for HIV-1, HIV-2, HBV, and HCV by PCR
• Specific Staining *(Lung Smooth Muscle Cells)*	Negative for von Willebrand Factor Positive for Smooth Muscle α-Actin after differentiation

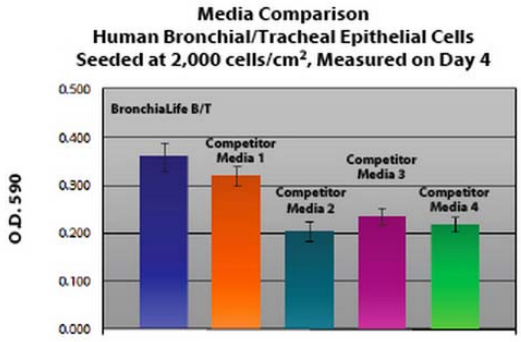
PRODUCT INFORMATION:	
Part #	**Description**
FC-0035	Normal Human Bronchial/Tracheal Epithelial Cells, Primary – 500,000 per vial
FC-0054	Lobar Bronchial Epithelial Cells (Large Airway), Secondary – 500,000 per vial
LL-0023	BronchiaLife B/T Medium Complete Kit - *For the culturing of Bronchial/Tracheal Epithelial Cells and Large Airway Lobar Epithelial Cells*
FC-0016	Lung Small Airway Epithelial Cells
LL-0037	BronchiaLife SAE Medium Complete Kit - *For the culturing of Lung Small Airway Epithelial Cells*
FC-0049	Human Lung Fibroblast, Primary – 500,000 per vial
LL-0011	FibroLife® S2 Complete Kit *for the culturing of Human Lung Fibroblasts Cells*
FC-0059	Normal Human Bronchial/Tracheal Smooth Muscle Cells, Primary – 500,000 per vial
FC-0046	Human Lung Smooth Muscle Cells, Primary – 500,000 per vial
LL-0014	VascuLife® SMC Medium Complete Kit - *For the culturing of Human Bronchial/Tracheal Muscle Cells and Human Lung Smooth Muscle Cells*

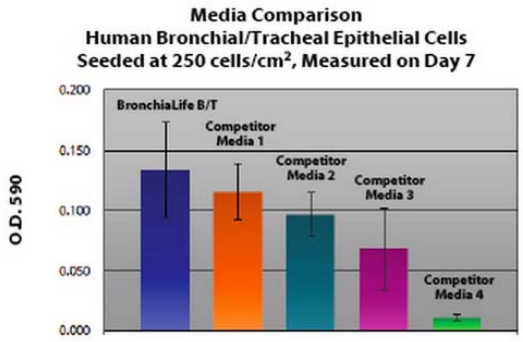


BronchiaLife™ B/T Medium grows human bronchial/tracheal epithelial cells through at least 15 population doublings at rates that meet or exceed other commercially available media while maintaining excellent cell morphology. In comparisons with other commercially available media, BronchiaLife B/T shows superior proliferation at different seeding densities.

Shown at left: Human Bronchial/Tracheal Epithelial Cells, passage 3, 4 days after inoculation with 5,000 cells/cm^2 (100X)

Shown below: proliferation at low seeding density in 24-well plates. Higher O.D. 590 represents a greater number of cells per well and therefore better proliferation.





在 24-well seeding 低細胞數培養 4 天或 7 天後，偵測 O. D. 590 吸光值顯示，使用 LifeLine medium, BronchiaLife™ B/T 培養 Human Bronchial/Tracheal Epithelial Cells 相於他牌培養液，有較高的細胞數, 證實在不同細胞濃度下 LifLine medium 皆能使細胞有較佳的增殖能力。

Normal Human Renal Epithelial Cells

- ► **Mixed Renal Epithelial**
- ► **Renal Cortical Epithelial**
- ► **Renal Medullary Epithelial**
- ► **Renal Proximal Tubule Epithelial**

Lifeline 的 normal Human Renal Epithelial Cells 培養在 Lifeline 的 RenaLife™ Medium, 能提供理想的 low-serum culture model 適合研究腎功能, 代謝,腎毒性及癌症研究。

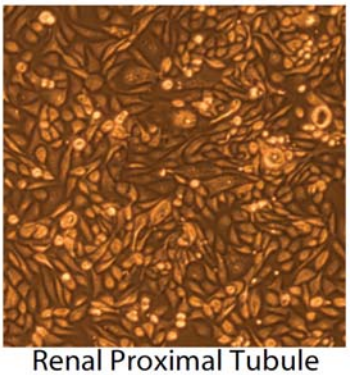
為了確保最佳的存活率及增值效率, Lifeline 的 Renal Epithelial Cells 是在第一代或第二代的初代培養後冷凍保存。Lifeline 的 Renal Epithelial Cells 的品管條件是培養 RenaLife Medium 確保最佳化培養在低血清條件下至少細胞數倍增 15 代。

CELL FEATURES:
• Mixed Renal Epithelial, Renal Cortical Epithelial, and Renal Medullary Epithelial are cryopreserved as primary cells; isolated from human kidney tissue and expanded in culture vessels once before cryopreservation.
• Renal Proximal Tubule Epithelial are cryopreserved as secondary cells; isolated from human kidney tissue and expanded in culture vessels twice before cryopreservation.
• All Renal Epithelial Cell types can be grown in a 0.5% serum medium without phenol red or antimicrobials when cultured in RenaLife Medium.
• All Renal Epithelial Cell types are extensively tested for quality and optimal performance.
• Lifeline guarantees performance and quality.

NORMAL HUMAN RENAL EPITHELIAL CELLS ARE TESTED FOR:	
• Cell Count	500,000 cryopreserved cells per vial
• Proliferation and Morphology	Normal cell appearance for 15 population doublings
• Cell Viability	Minimum 50% viability when thawed from cryopreservation
• Sterility Testing	Negative for mycoplasma Negative for bacterial and fungal growth
• Virus Testing	Negative for HIV-1, HIV-2, HBV, and HCV by PCR
• Specific Enzyme Test	Renal Proximal Tubule cells have γ-glutamyl transferase activity

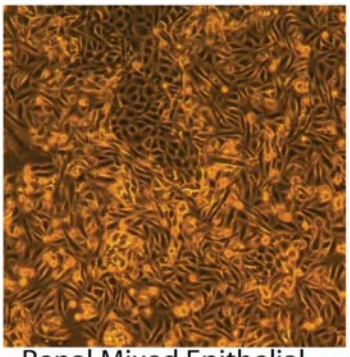
Lifeline Technical Note: There are different and often contradictory terminologies used by cell culture companies to define he passage number of cells. Lifeline's designation of 'primary cells' are cells that have been isolated from tissue, plated onto ulture vessels, expanded, harvested and cryopreserved. The term 'secondary' indicates that the cells have been isolated, lated and expanded in culture vessels twice before being harvested for cryopreservation.

PRODUCT INFORMATION:	
Part #	**Description**
FC-0017	Mixed Renal Epithelial Cells – 500,000 cells per vial
FC-0012	Renal Cortical Epithelial Cells - 500,000 cells per vial
FC-0018	Renal Medullary Epithelial Cells - 500,000 cells per vial
FC-0013	Renal Proximal Tubule Epithelial Cells - 500,000 cells per vial
LL-0025	RenaLife™ Medium Complete Kit (RenaLife Basal Medium, RenaLife LifeFactors® Kit)

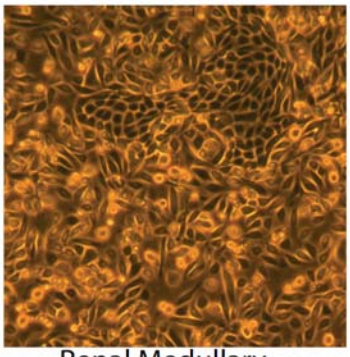


Renal Proximal Tubule

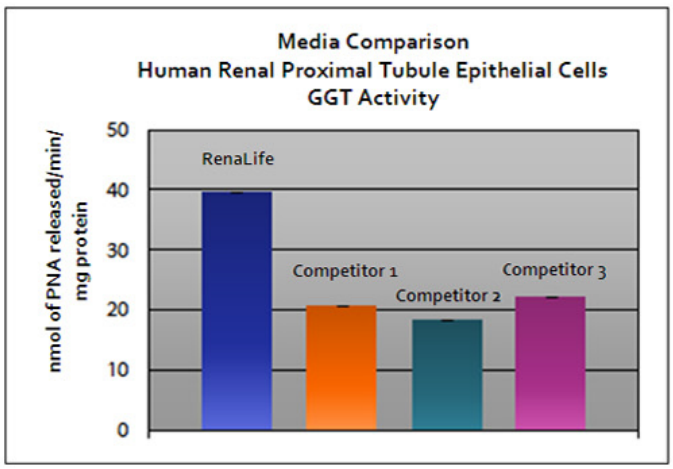
Renal Cortical



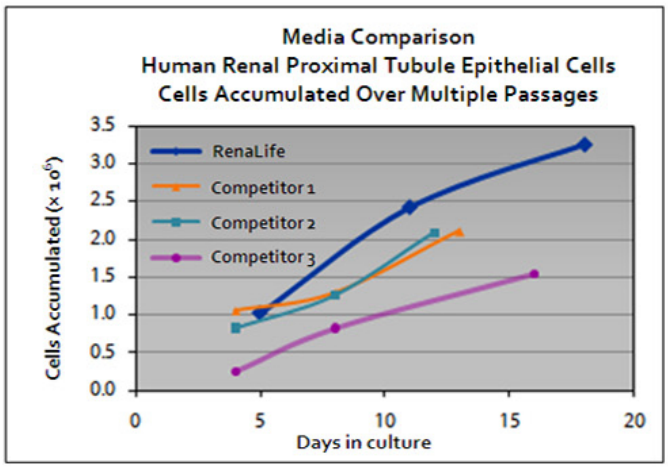
Renal Mixed Epithelial



Renal Medullary



Human Renal Proximal Tubule Epithelial Cells 以 Lifeline RenaLife Medium 培養, 相較於他牌產品, 可維持較佳的 GGT activity



Human Renal Proximal Tubule epithelial cells 以 Lifeline RenaLife Medium 培養, 相較於他牌產品, 可維持較佳的細胞增殖效率

Normal Human Endothelial Cells

- **Human Umbilical Vein Endothelial Cells (HUVEC)**
- **HUVEC 10-Donor Pool**
- **Human Aortic Endothelial Cells (HAoEC)**
- **Human Coronary Artery Endothelial Cells (HCAEC)**
- **Human Pulmonary Artery Endothelial Cells (HPAEC)**

Lifeline 的 normal human endothelial cells 培養在 VascuLife® Medium, 能提供理想的 low-serum culture mode, 用以研究在 human VEGF 存在或不存在的條件下的血管新生,動脈硬化,及血管生物學。Lifeline 的 normal human endothelial cells 是在 VascuLife EnGS Medium 中進行分離的,為的是確保體外培養時僅暴露在人類重組 VEGF 蛋白。

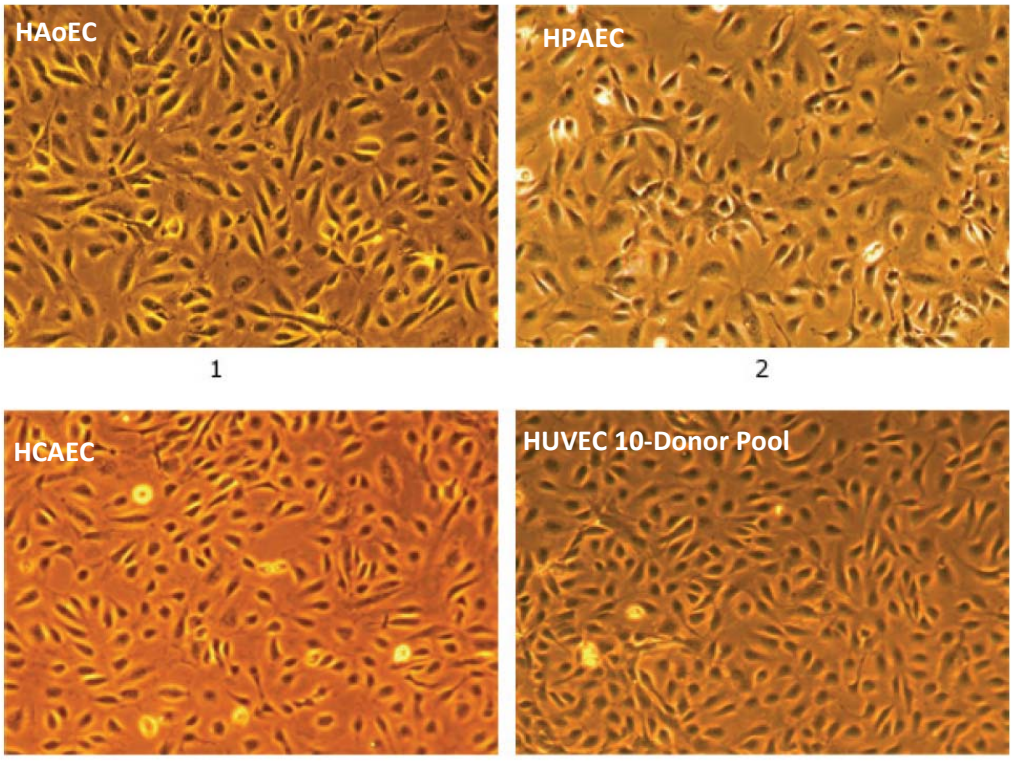
為了確保最佳的存活率及增值效率, Lifeline 的 human endothelial cells 盡可能在較早的代數冷凍保存。Lifeline 的 human endothelial cells 的品管條件是培養在 VascuLife EnGS 或 EnGS-Mv Medium 確保最佳化培養在低血清條件下至少細胞數倍增 15 代,而且倍增速度等於或大於其他含血清的培養液。

CELL FEATURES:
• HUVEC are isolated from human umbilical cords, cultured on plastic and cryopreserved as primary cells. • HAoEC and HUVEC 10-Donor Pool are isolated from human aorta or umbilical cord, cultured on plastic and cryopreserved as secondary cells. • HPAEC are isolated from human pulmonary artery, cultured on plastic and cryopreserved as secondary or tertiary cells. • HCAEC are isolated from human coronary arteries, cultured on plastic and cryopreserved as tertiary cells.
• Human endothelial cells can be grown in low serum (2%) medium without phenol red or antimicrobials when cultured in VascuLife medium.
• Culture human endothelial cells with or without VEGF.
• Lifeline's human endothelial cells are extensively tested to meet quality standards and exhibit optimal performance.
• Lifeline guarantees performance and quality.

NORMAL HUMAN ENDOTHELIAL CELLS ARE TESTED FOR:	
• Cell Count	500,000 cryopreserved cells per vial
• Proliferation and Morphology	Normal cell appearance for 15 population doublings
• Cell Viability	Minimum 50% viability when thawed from cryopreservation
• Sterility Testing	Negative for mycoplasma Negative for bacterial and fungal growth
• Virus Testing	Negative for HIV-1, HIV-2, HBV, and HCV by PCR
• Specific Staining	von Willebrand Factor positive Smooth muscle α-actin negative

PRODUCT INFORMATION:	
Part #	**Description**
FC-0003	HUVEC, Human Umbilical Endothelial Cells, Primary* – 500,000 cells per vial
FC-0044	HUVEC 10-Donor Pool, Secondary – 500,000 cells per vial
FC-0014	HAoEC, Normal Human Aortic Endothelial Cells, Secondary – 500,000 cells per vial
FC-0027	HAoEC, Normal Human Aortic Endothelial Cells, Tertiary – 500,000 cells per vial
FC-0032	HCAEC, Normal Human Coronary Artery Endothelial Cells, Tertiary – 500,000 cells per vial
FC-0055	HPAEC, Normal Human Pulmonary Artery Endothelial Cells, Secondary or Tertiary – 500,000 cells per vial
LL-0002	VascuLife® EnGS Medium Complete Kit (VascuLife Basal Medium, VascuLife EnGS LifeFactors® Kit)
LL-0003	VascuLife VEGF Medium Complete Kit (VascuLife Basal Medium, VascuLife VEGF LifeFactors Kit)
LL-0004	VascuLife EnGS-Mv Medium Complete Kit (VascuLife Basal Medium, VascuLife EnGS-Mv LifeFactors Kit)
LL-0005	VascuLife VEGF-Mv Medium Complete Kit (VascuLife Basal Medium, VascuLife VEGF-Mv LifeFactors Kit)

**Lifeline Technical Note: There are different and often contradictory terminologies used by cell culture companies to define the passage number of cells. Lifeline's designation of 'primary cells' are cells that have been isolated from tissue, plated onto culture vessels, expanded, harvested and cryopreserved. The term 'secondary' indicates that the cells have been isolated, plated and expanded in culture vessels twice before being harvested for cryopreservation.*



Endothelial cells, P3, 4 to 7 days after inoculation with 2,500 cells/cm_2, 100X 1) HAoEC 2) HPAEC 3) HCAEC 4) HUVEC 10-Donor Pool

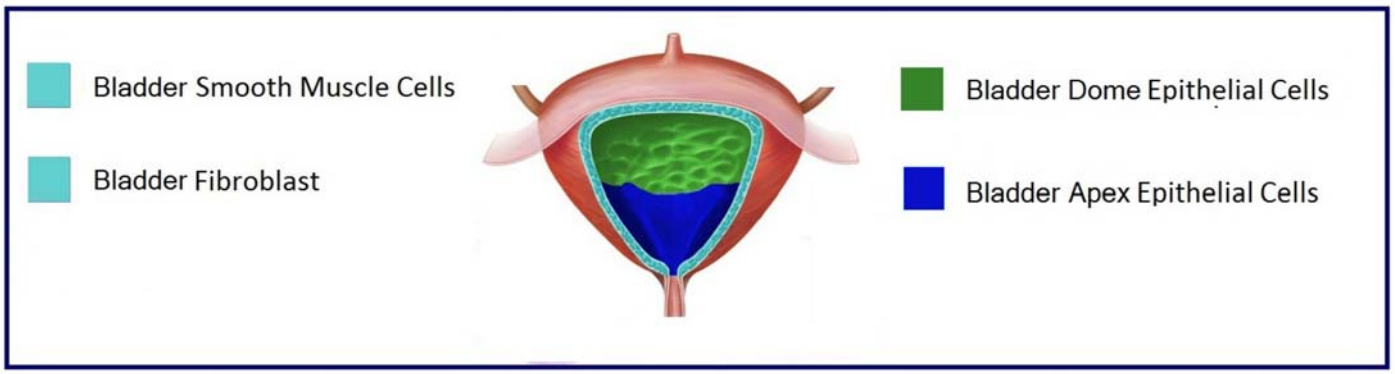
Normal Human Bladder Cell Systems and Media

- Bladder Apex Epithelial Cells
- Bladder Fibroblasts
- Bladder Dome Epithelial Cells Bladder
- Smooth Muscle Cells

Lifeline 的 Normal Human Bladder Cells 培養在 VascuLife® Medium, 能提供您理想細胞培養模型用以研究膀胱的生物學。

為了確保最佳的存活率及增值效率, Lifeline 的 bladder cells 是在第一代或第二代的初代培養後冷凍保存。

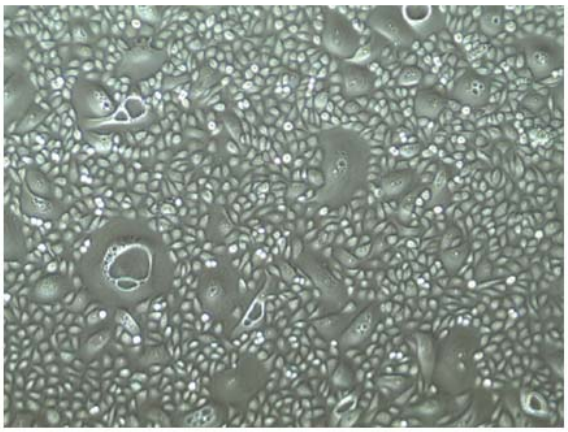
Bladder Apex Epithelial Cells 是培養在 UroLife A Medium, Bladder Dome Epithelial Cells 是培養在 UroLife D Medium, Bladder Smooth Muscle Cells 是培養在 VascuLife SMC Medium, Bladder Fibroblasts 是培養在 FibroLife® S2 Medium.



HUMAN BLADDER CELLS ARE TESTED FOR:	
• Cell Count	500,000 cryopreserved cells per vial
• Proliferation	Population growth at various densities
• Cell Viability	≥ 70% viability when thawed from cryopreservation
• Morphology	Normal cell appearance for 15 population doublings
• Sterility Testing	Negative for mycoplasma Negative for bacterial and fungal growth
• Virus Testing	Negative for HIV-1, HIV-2, HBV, and HCV by PCR
• Specific Staining *(Smooth Muscle Cells)*	Negative for von Willebrand Factor Positive for Smooth Muscle α-Actin after differentiation

PRODUCT INFORMATION:	
Part #	**Description**
FC-0040	Normal Human Bladder Apex Epithelial Cells, Primary – 500,000 per vial
LL-0063	UroLife – A Complete Medium Kit - *For the culturing of Bladder Apex Epithelial Cells*
FC-0079	Normal Human Bladder Dome Epithelial Cells, Primary – 500,000 per vial
LM-0042	UroLife – D Complete Medium - *For the culturing of Bladder Dome Epithelial Cells*
FC-0050	Bladder Fibroblast, Primary – 500,000 per vial
LL-0011	FibroLife® S2 Complete Kit *for the culturing of Human Bladder Fibroblasts*
FC-0059	Normal Human Bladder Smooth Muscle Cells, Primary – 500,000 per vial
LL-0014	VascuLife® SMC Medium Complete Kit - *For the culturing of Bladder Smooth Muscle Cells*

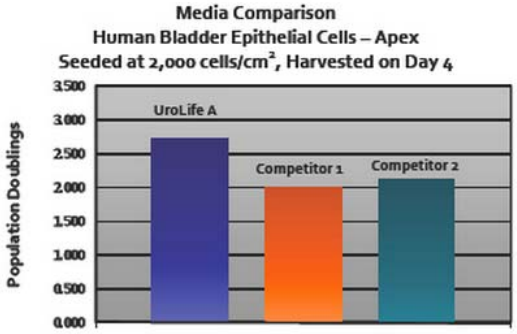
Performance Tested to Insure Value

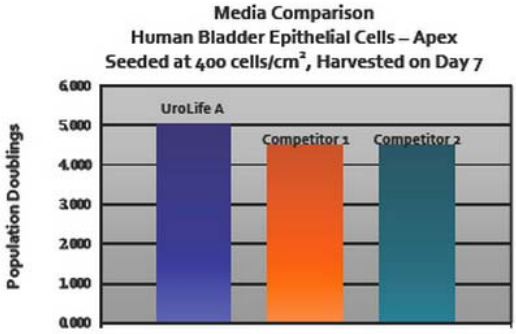


UroLife™ A Medium grows human bladder epithelial cells- apex through at least 15 population doublings at rates that meet or exceed other commercially available media while maintaining excellent cell morphology. In comparisons with other commercially available media, UroLife A shows superior proliferation at different seeding densities.

Shown at left: Human bladder epithelial cells - apex, passage 2, 6 days after inoculation 100X.

Shown below: human bladder epithelial cells - apex inoculated at the stated density and harvested and counted on Day 4 or Day 7. Cells were counted and the number of population doublings was calculated.





在 24-well seeding 1000 cells/cm^2 培養 4 天或 400 cells/cm^2 培養 7 天後，偵測 O. D. 590 吸光值顯示，使用 LifeLine UroLifeTM A Medium 培養 human bladder epithelial cells 相於他牌培養液，有較高的細胞數，證實在不同細胞濃度下 LifLine medium 皆能使細胞有較佳的增殖能力。

Normal Human Male Reproductive Cell Systems and Media

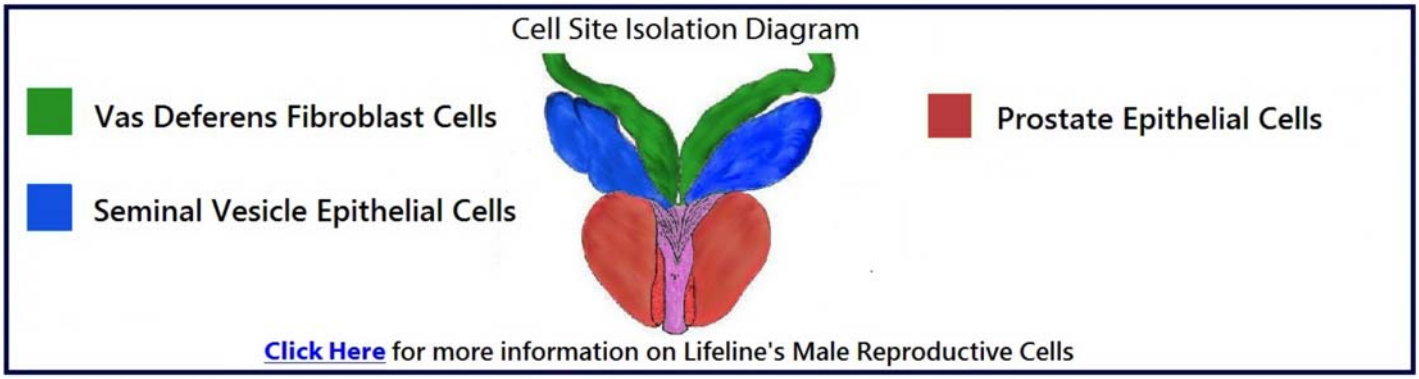
- ## Vas Deferens Fibroblast
- ## Cells Prostate Epithelial Cells
- ## Seminal Vesicle Epithelial Cells

Lifeline 的 Male Reproductive Cells 培養在 Lifeline brand culture media, 能提供您絕佳的體外細胞培養模型用以研究男性生殖生物學。

Lifeline 的 Male Reproductive Cells 培養系統可作為癌症研究中的 normal controls,也適用於研究 androgen receptors and prostate cellular proliferation; reproductive cell morphogenesis; 及細胞毒性與藥物研發。

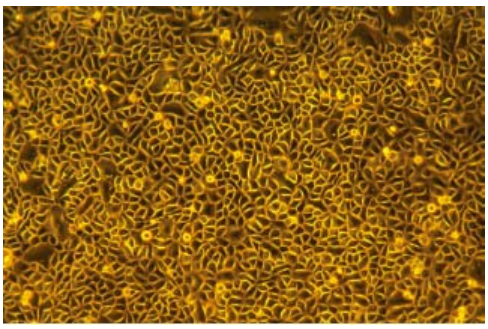
為了確保最佳的存活率及增值效率, Lifeline 的 Male Reproductive cells 是在第一代或第二代的初代培養後冷凍保存。

Prostate Epithelial 及 Seminal Vesicle Epithelial Cells 是培養在 ProstaLife Medium ,而 and Vas Deferens Fibroblast Cells 是培養在 FibroLife S2 Medium。

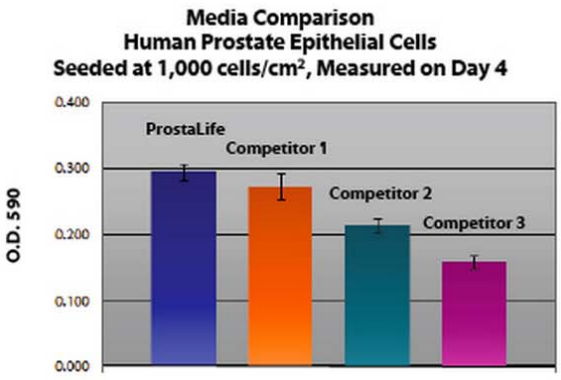


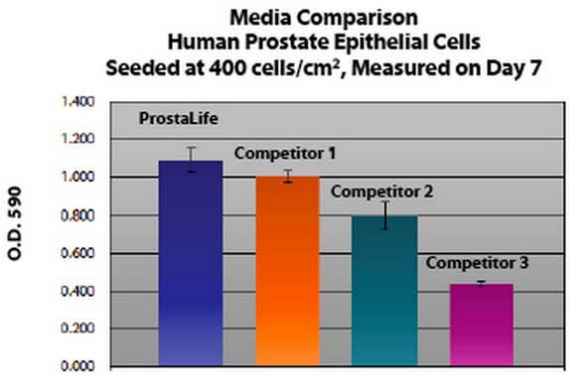
HUMAN MALE REPRODUCTIVE CELLS ARE TESTED FOR:	
• Cell Count	500,000 cryopreserved cells per vial
• Proliferation	Population growth at various densities
• Cell Viability	≥ 70% viability when thawed from cryopreservation
• Morphology	Normal cell appearance for 15 population doublings
• Sterility Testing	Negative for mycoplasma Negative for bacterial and fungal growth
• Virus Testing	Negative for HIV-1, HIV-2, HBV, and HCV by PCR
• Specific Staining *(Smooth Muscle Cells)*	Negative for von Willebrand Factor Positive for Smooth Muscle α-Actin after differentiation

PRODUCT INFORMATION:	
Part #	**Description**
FC-0038	Normal Human Prostate Epithelial Cells – 500,000 per vial
FC-0048	Normal Human Seminal Vesicle Epithelial Cells – 500,000 per vial
LL-0041	ProstaLife – Complete Medium Kit - *For the culturing of Prostate Epithelial Cells and Seminal Vesicle Epithelial Cells*
FC-0052	Normal Human Vas Deferens Fibroblasts – 500,000 per vial
LL-0011	FibroLife® S2 Complete Kit - *for the culturing of Human Vas Deferens Fibroblasts*
LM-0015	FrostaLife Cryopreservation Solution
LL-0013	Trypkit Subculture Reagent Kit
LS-1085	Penicillin/Streptomycin/Amphotericin B (5 mL)



human prostate epithelial cells, passage 3, 5 days after inoculation with 2,500 cells/cm2, 100X





human prostate epithelial cells inoculated at the stated density in 24-well plates and stained with crystal violet on Day 4 or Day 7.

在 24-well seeding 1000 cells/cm^2 培養 4 天或 400 cells/cm^2 培養 7 天後，偵測 O. D. 590 吸光值顯示，使用 LifeLine Serum-Free Human Prostate Epithelial Cell Culture Medium, ProstaLife™培養 human prostate epithelial cells 相於他牌培養液，有較高的細胞數, 證實在不同細胞濃度下 LifeLine medium 皆能使細胞有較佳的增殖能力。

Normal Human Female Reproductive Cells and Media

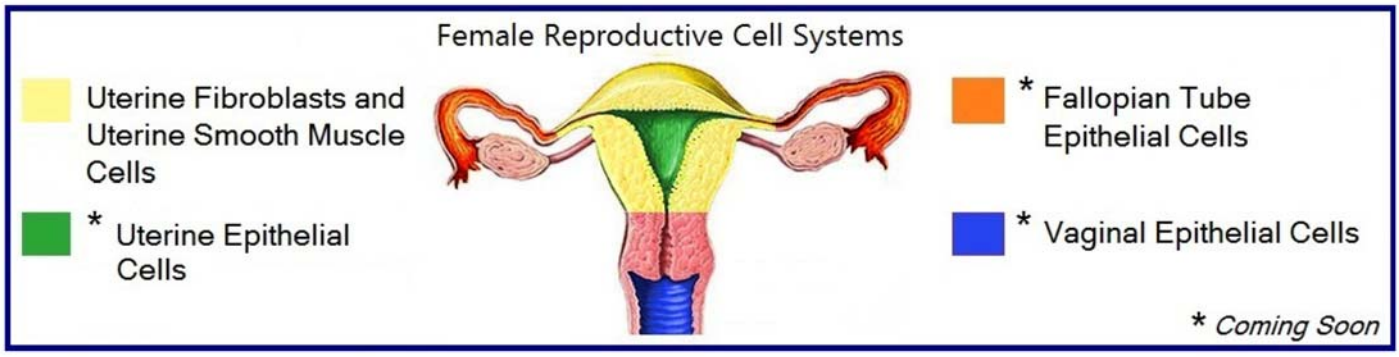
▸ Normal Human Uterine Smooth Muscle Cells (HUtSMC)

▸ Normal Human Uterine Fibroblasts (HUtF)

Lifeline 的 Normal Human Uterine Cells 培養在 Lifeline brand culture medium, 能提供您絕佳的體外細胞培養模型用以研究子宮收縮,放鬆,子宮癌,及一般性的子宮對 estrogen, progesterone, relaxin, oxytocin 及其他雌性賀爾蒙的反應。

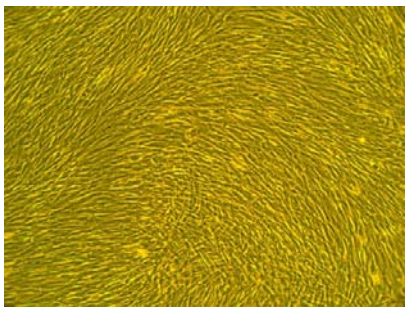
為了確保最佳的存活率及增值效率, Lifeline 的 Uterine cells 是在第一代或第二代的初代培養後冷凍保存。

Fibroblasts 是培養在 FibroLife® S2 , Uterine Smooth Muscle Cells 是培養在 VascuLife® SMC Medium. 這些培養液能支持細胞生長至少 15 代的倍增。VascuLife SMC 及 FibroLife S2 不含 phenol red. 已有文獻發表證實 phenol red 有輕微雌激素 (esterogen) 的作用並且刺激雌激素受體（estrogen receptors）.引起遮罩效應(masking effects) 對於雌性生殖相關實驗結果有不良的干擾。

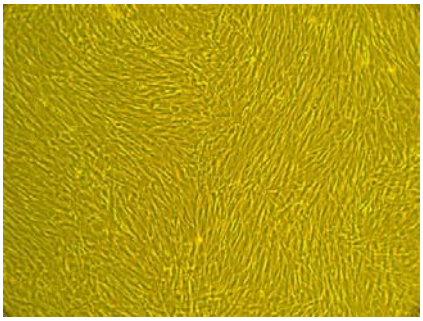


NORMAL HUMAN UTERINE CELLS ARE TESTED FOR:	
• Cell Count	500,000 cryopreserved cells per vial
• Proliferation and Morphology	Normal cell appearance for 15 population doublings
• Cell Viability	≥ 70% viability when thawed from cryopreservation
• Sterility Testing	Negative for mycoplasma Negative for bacterial and fungal growth
• Virus Testing	Negative for HIV-1, HIV-2, HBV, and HCV by PCR
• Specific Staining *(Smooth Muscle Cells)*	Negative for von Willebrand Factor Positive for Smooth Muscle α-Actin after differentiation

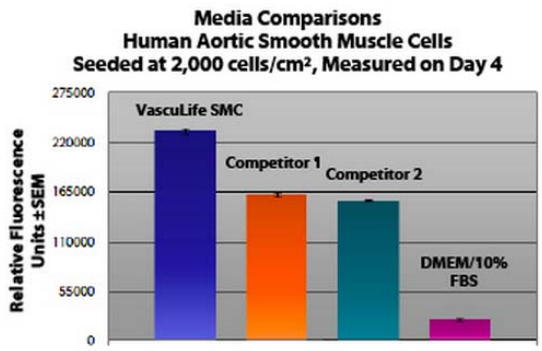
PRODUCT INFORMATION:	
Part #	**Description**
FC-0075	Normal Human Uterine Smooth Muscle Cells – 500,000 per vial
LL-0014	VascuLife® SMC Medium Complete Kit - *For the culturing of Uterine Smooth Muscle Cells*
FC-0076	Normal Human Uterine Fibroblasts – 500,000 per vial
LL-0011	FibroLife® S2 Complete Kit *for the culturing of Uterine Fibroblasts*
LM-0015	FibroLife Cryopreservation Solution, 100 mL
LL-0013	TrypKit 100 mL

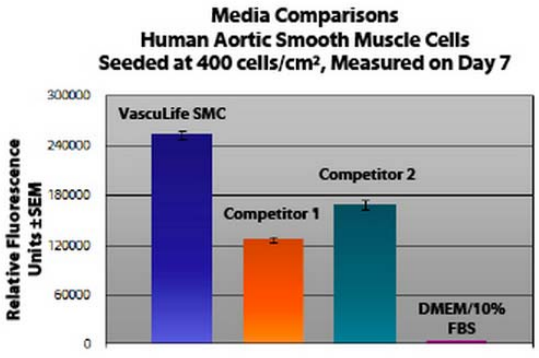


Human Uterine Smooth Muscle Cells: FC-0075



Human Uterine Fibroblasts: FC-0076





在 24-well seeding 1000 cells/cm^2 培養 4 天或 400 cells/cm^2 培養 7 天後，偵測螢光值顯示，使用 LifeLine VascuLife® SMC Medium 培養 human vascular smooth muscle 相於他牌培養液，有較高的細胞數，證實在不同細胞濃度下 LifeLine medium 皆能使細胞有較佳的增殖能力。

LIFELINE® CELL TECHNOLOGY

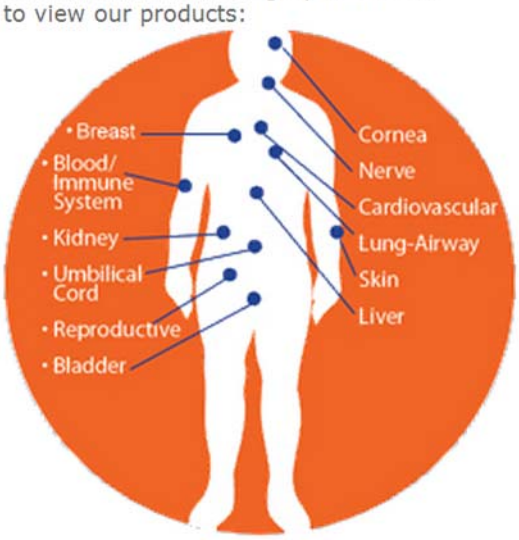
Tissue Type

- Adipose
- Bladder
- Blood Immune System
- Bone Marrow
- Breast
- Cardiovascular
- Cornea
- iPS Validated Fibroblasts
- Kidney
- Liver
- Lung-Airway
- Neuronal
- Prostate
- Reproductive
- Skin
- Umbilical Cord

Additional Products

- Reagents, Supplements and Growth Factors
- Skin Models
- Stem Cell Differentiation Kits

Click on the tissue category of interest to view our products:



Cell Type

- Endothelial
- Epithelial
- Fibroblast
- iPS Validated Fibroblasts
- Hepatocytes
- Melanocytes
- Mononuclear
- Neuronal
- Smooth Muscle
- Stem Cells, Human
- Stem Cells, Non-human

Cell Culture Media

- Blood Immune System
- Endothelial-Large Vessel
- Endothelial-Small Vessel
- Epithelial
- Fibroblast
- Hepatocytes
- Neuronal
- Smooth Muscle
- Stem Cells, Human

嚴謹的品質控管確保產品的一致性及實驗再現性

Lifeline Cell Technology 使用高品質的原物料並嚴謹地執行每一個生產流程以確保品質的穩定性。

The Lifeline® Guarantee

Lifeline 嚴謹的品質控管確保無微生物污染及良好的細胞性狀,以適用於標準化的測試。所有的捐贈組織都來自於捐贈者接受告知程序並且同意 Declaration of Helsinki, The Human Tissue Act (UK), CFR Title 21,及 HIPAA 規範中關於取得並操作人類組織作為實驗用途, 如果 Lifelin 的產品未達宣稱的品質標準,Lifeline 將提供免費換貨或退費。

Safety Statement

Lifeline 僅供研究用途, 並未核准用於人類臨床,動物醫療及體外診斷。

Lifeline 建議將細胞冷凍保存管保存於液態氮揮發氣層。並謹慎操作,於操作細胞過程中配戴護目鏡及手套,特別是自液態氮中取出的冷凍管要進水浴槽前要先在生物安全保存盒中排淨液態氮及其揮發氣體.如果要將冷凍管存於液態氮液體層中,解凍前必須先移至氣態層或 If -80°C 保存 24 小時。

為了使細胞達到最佳的狀態 Lifeline 的 culture media 不含易影響細胞生理的抗生素及酚紅(phenol red),雖然 Lifeline 也能另外提供這些化學物,但建議儘量不使用以避免造成細胞緊迫及發生“masking effects” 干擾實驗結果。