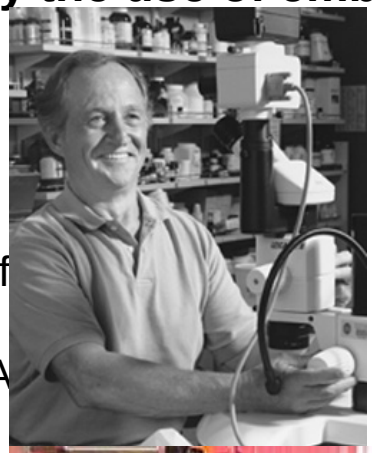
「基因標定」 3學者幹細胞研究人員獲諾貝爾醫學獎 Oct.8, 2007

"for their discoveries of principles for introducing specific gene modificationsin mice by the use of embryonic stem cells"

Mario R. Capecchi, born 1937 in Italy, US citizen, PhD in Biophysics 1967, Harvard University, Cambridge, MA, USA. Howard Hughes Medical Institute Investigator and Distinguished Professor of Human Genetics and Biology at the University of Utah, Salt Lake City, UT, USA

Sir Martin J. Evans, born 1941 in Great Britain, British citizen, PhD in Anatomy and Embryology 1969, University College, London, UK. Director of the School of Biosciences and Professor of Mammalian Genetics, Cardiff University, UK.

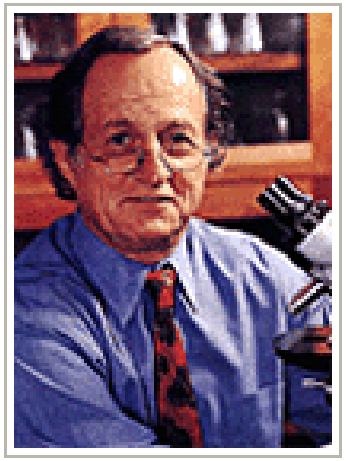
Oliver Smithies, born 1925 in Great Britain, US citizen, PhD in Biochemistry 1951, Oxford University, UK. Excellence Professor of Pathology and Laboratory Medicine, University of North Carolina at Chapel Hill, NC, USA.



全球矚目的諾貝爾獎六大獎項今天開始陸續揭曉。首先登場的是生理學或醫學獎，瑞典卡洛林斯卡學院今天宣布，義大利裔美國籍的馬理歐・卡佩奇（Mario R. Capecchi）、英國的馬丁・伊凡斯爵士（Martin J. Evans）與英裔美國籍的奧利佛・史密西斯（Oliver Smithies）三位學者膺此殊榮。

他們得獎的理由是：「發現運用胚胎幹細胞引發小鼠特定基因改造的原理」。卡佩奇現年七十歲，美國猶他大學霍華休斯醫學中心研究員；伊凡斯現年六十六歲，英國卡地夫大學生物科學院院長；史密西斯現年七十七歲，美國北卡羅萊納大學教堂山分校病理學與檢驗醫學教授。三人均分一千萬瑞典克朗（約新台幣五千萬元）獎金，並於十二月十日諾貝爾忌辰當天前往瑞典首都斯德哥爾摩，接受瑞典國王卡爾十六世・古斯塔夫頒獎。

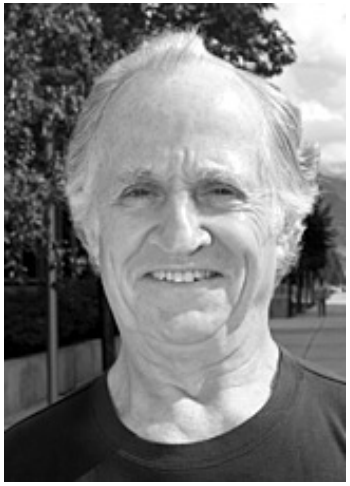
諾貝爾醫學獎得主卡佩奇有段坎坷童年



新出爐的諾貝爾醫學獎得主之一，義大利裔美國人卡佩奇曾有段坎坷的童年，直到九歲隨母親移民美國後才開始過安定的生活及受正常教育。據「義大利國家通訊社（ANSA）」報導，卡佩奇於一九三七年在義大利北部威洛納市誕生，父親是一名飛行員，在二次世界大戰初期即喪生。

很小就喪父的卡佩奇，三歲半的時候母親藍柏格又因不滿德國納粹的統治而被捕，成爲一名政治犯。

母親在一九四一年被遞解到監獄前，將他託給一家鄰近的農戶照顧。可能因爲戰時生活困苦，卡佩奇在母親被監禁一年之後就遠離家鄉，開始四處流浪的生涯。



母親於一九四五年納粹德國戰敗之後獲釋，並到處尋找他，一年之後終於在維洛納市南方一百多公里的芮吉歐一所醫院中找到當時營養不良又生病的卡佩奇。

母子重逢後，當時已九歲的卡佩奇與母親於一九四六年輾轉經義國南部大港拿坡里搭船移民美國，投靠在費城附近教授物理學的舅舅。

卡佩奇上大學時首先在麻省理工學院唸政治學，後來轉攻分子生物學，之後進入哈佛大學繼續深造，師事被譽爲去氧核醣核酸（DNA）之父的華森。

目前與太太及女兒一起居住在猶他州一棟鄉間別墅的卡佩奇，仍繼續從事對幹細胞的研究。

卡佩奇獲諾貝爾醫學獎
(2007/10/09)
諾貝爾醫學獎得主八日揭曉，由美國科學家卡佩奇和史密斯，以及英國科學家埃文斯奪得。這三位醫學家利用老鼠研究胚胎幹細胞的基因改造，有助研究心血管病、糖尿病和癌症等各種病症的療法。圖爲卡佩奇展示研究樣本。(美聯社)

Breaking News: Professor Sir Martin Evans wins Nobel Prize

8 October 2007

Professor Sir Martin Evans, Professor of Mammalian Genetics at the School of Biosciences, Cardiff University, has won the 2007 Nobel Prize for Medicine.

The Nobel Assembly announced this morning that Professor Sir Martin was one of three winners for “a series of ground-breaking discoveries concerning embryonic stem cells and DNA recombination in mammals.”

Professor Sir Martin was the first to identify embryonic stem cells, which can be adapted for a wide variety of medical purposes. His work has helped in studying cystic fibrosis and in testing the effects of gene therapy.

The Nobel Assembly said of his work: “Its impact on the understanding of gene function and its benefits to mankind will continue to increase over many years to come.”

Professor Sir Martin shares the £755,000 prize with Professor Mario Capecchi of the University of Utah and Professor Oliver Smithies of the University of North Carolina.

The full text of the Nobel Assembly statement can be seen at: http://nobelprize.org/nobel_prizes/medicine/laureates/2007/index.html.

Further information about Professor Sir Martin and his work can be found at: http://www.cardiff.ac.uk/news/articles/knight-bachelor.html.

More updates will follow.

幹細胞研究發光　英美三學者獲諾貝爾醫學獎

中國時報 2007.10.08

胚胎幹細胞開創性研究獲獎 學者:實至名歸

中央社

諾貝爾獎評審團今天宣佈，美國科學家卡佩奇（Mario R. Capecchi）、史密迪斯（Oliver Smithies）及英國科學家艾萬斯（Martin J. Evans）等，因從事胚胎幹細胞開創性研究獲得今年的諾貝爾醫學獎，台灣的幹細胞學者認爲，這三位學者得獎實至名歸。

從事幹細胞研究二十年，目前旅居德國、擔任歐洲幹細包研究學會主席的陳佑華表示，卡佩奇發明定位基因轉殖技術；史密迪斯、艾萬斯則是老鼠胚胎幹細胞研究始祖，是現代胚胎幹細胞研究的先驅者。

陳佑華說，三個人的研究可將老鼠的胚胎幹細胞打入老鼠胚胎中，以基因剔除技術剔除不要的基因，只經過兩代，「想要黑就有黑的小鼠，想要白的就有白的小鼠」；此外，他們還成功讓胚胎幹細胞在培養皿內仍具分裂能力，雖然無法形成完整個體，但可形成骨頭或其他體組織。

她認爲三人的獲獎「實至名歸」。

台大醫院基因醫學部主治醫師蘇怡寧表示，卡佩奇等三人的研究已被用於新藥研發，如老鼠不會患有人類先天遺傳的疾病，透過三名學者研發的技術，可以讓老鼠天生帶有人類遺傳疾病，前中研院分生所副研究員李鴻就是利用基因剔除、轉殖技術，成功創造出全球第一個人類脊髓肌肉萎縮症的小鼠動物模式。

蘇怡寧說，這三位醫學獎得主的成就早已受人推崇，得諾貝爾獎是遲早的事。

Summary

This year's Nobel Laureates have made a series of ground-breaking discoveries concerning embryonic stem cells and DNA recombination in mammals. Their discoveries led to the creation of an immensely powerful technology referred to as *gene targeting in mice*. It is now being applied to virtually all areas of biomedicine – from basic research to the development of new therapies.

Gene targeting is often used to inactivate single genes. Such gene "knockout" experiments have elucidated the roles of numerous genes in embryonic development, adult physiology, aging and disease. To date, more than ten thousand mouse genes (approximately half of the genes in the mammalian genome) have been knocked out. Ongoing international efforts will make "knockout mice" for all genes available within the near future.

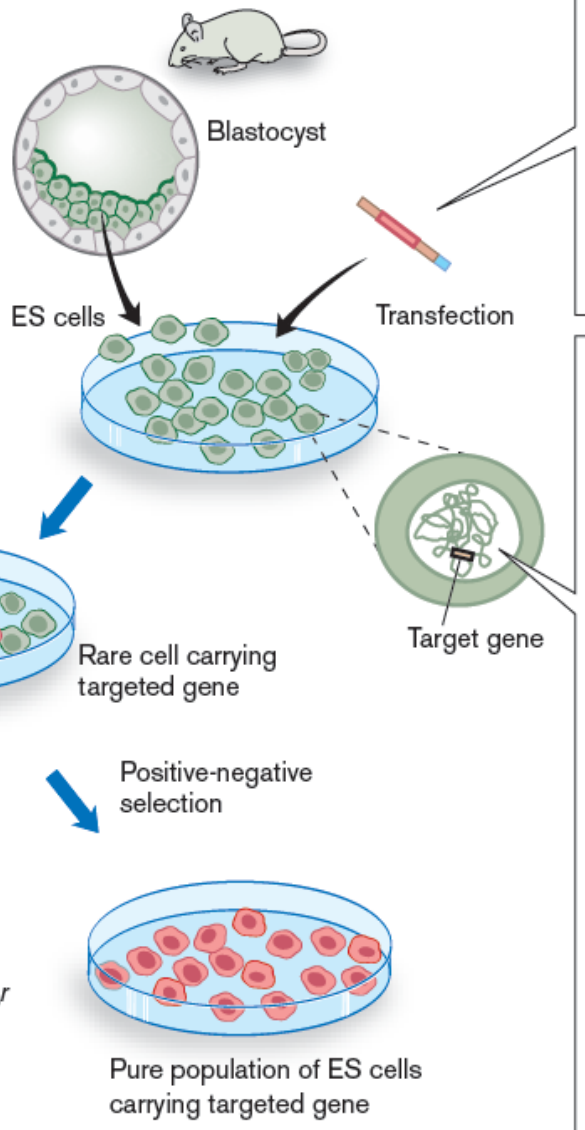
With gene targeting it is now possible to produce almost any type of DNA modification in the mouse genome, allowing scientists to establish the roles of individual genes in health and disease. Gene targeting has already produced more than five hundred different mouse models of human disorders, including cardiovascular and neuro-degenerative diseases, diabetes and cancer.

General strategy for gene targeting in mice

Step 1 Gene targeting in ES cells

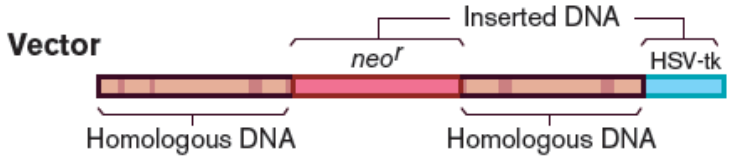
1. ES cell culture

Embryonic stem (ES) cells are cultivated from mouse pre-implantation embryos (blastocysts).



4. Proliferation of targeted ES cell

Selection for presence of *neo*^{r} and absence of HSV-tk enriches targeted ES cells.

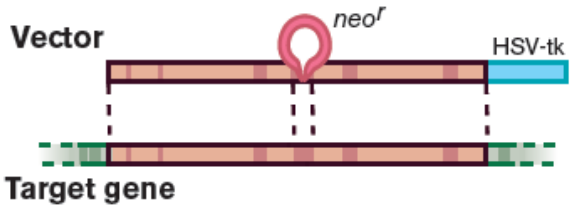


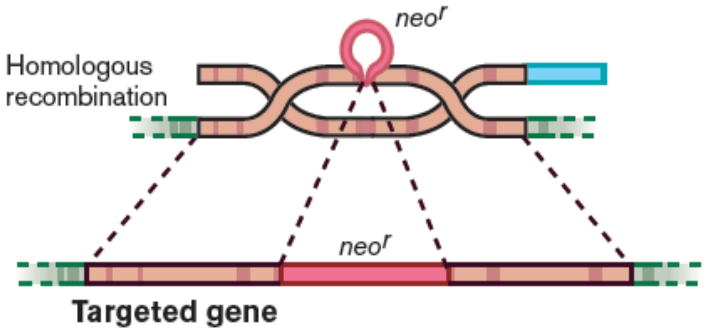
2. Construction of targeting vector

The vector contains pieces of DNA that are homologous to the target gene, as well as inserted DNA which changes the target gene and allows for positive-negative selection.

3. ES cell transfection

The cellular machinery for homologous recombination allows the targeting vector enables the target vector to find and recombine with the target gene.





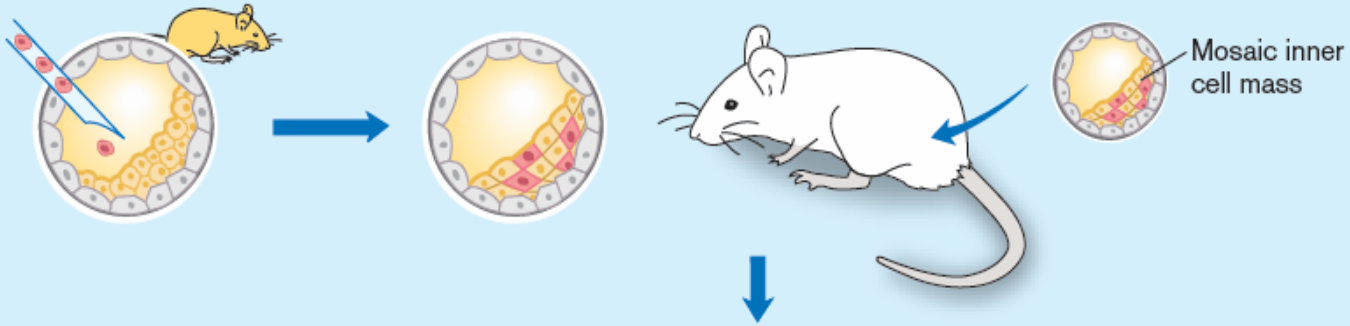
Step 2 From gene targeted ES cells to gene targeted mice

5. Injection of ES cells into blastocysts

The targeted ES cells are injected into blastocysts...

...where they mix and form a mosaic with the cells of the inner cell mass from which the embryo develops.

The injected blastocysts are implanted into a surrogate mother where they develop into mosaic embryos.



6. Birth and breeding of mosaic mice

The mosaic mice mate with normal mice to produce both gene targeted and normal offspring.

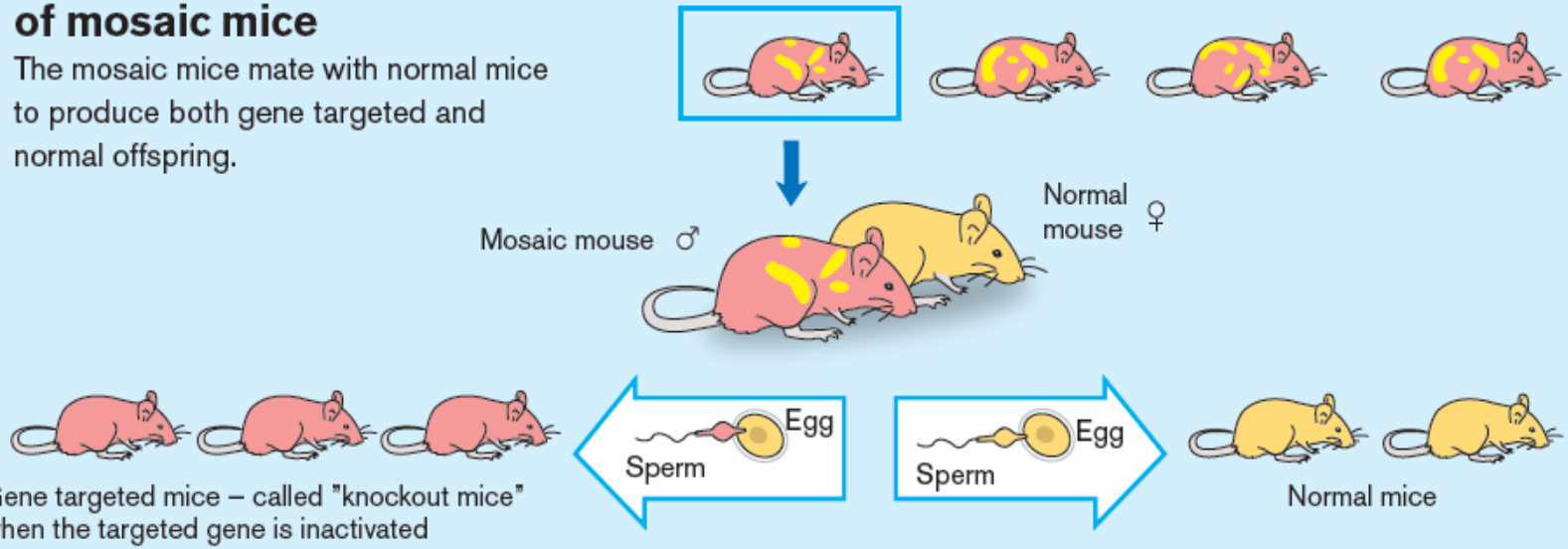


 Illustration: Annika Röhl