

附件四、技術說明表



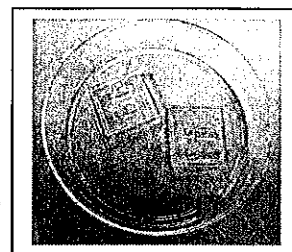
仿生視網膜微注射裝置

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簡歷：(可列出相關連結，例如系所、研究室網頁)

<https://che.ntu.edu.tw/che/jiayu.html>



市場及需求：

顯微注射是一種透過直徑為微米等級的大小的針管，將藥物、質體、DNA、mRNA 或蛋白質等，直接注入細胞膜或細胞質中。因為可以直接穿透細胞或細胞膜將分子送到精確的部位，且還能精準控制遞送分子的劑量，所以也被臨床上作為基因治療的一種途徑。透過顯微注射遞送的藥物可以不受分子量或化學性質的限制而遞送到目的地，也不須使用免疫原性的載體。此案中，本團隊發明一個以高分子彈性材料 (Elastomer) 所製作的裝置，可以使用此種裝置內進行一般細胞培養或三維培養類器官體，在體外建立一個類視網膜的仿生模型，以利進行體外視網膜相關實驗，且裝置中設計了一個側邊通道，使得該裝置能夠方便進行與微注射相關的實驗及測試，可以取代部分動物實驗。

技術摘要(含成果)：

本團隊開發了一種裝置，使用具有高度生物相容性的高分子彈性材料（例如：polydimethylsiloxane, PDMS）為材料，利用常見製造程序（例如：翻模法，三維列印等）進行裝置之製造。此裝置分為兩個部分，前端正方形的空間提供作為一般細胞培養或三維視網膜類器官體培養的腔室，而後端長條形的部分則是顯微注射時所需要的運作空間。透過此裝置的特殊形狀，為在生物體外模擬視網膜微注射治療成為可能。

優勢：

此裝置使用可以簡單取得且具有高度生物相容性的材料組成，且利用材料富有彈性且堅固，不會輕易被破壞等特性，配合新穎形狀的設計，使在生物體外進行模擬微注射治療的實驗容易進行，以取代部分動物實驗。

競爭產品：

無

專利現況：

(1) 專利申請中

(2) 本研究團隊在微流道晶片領域已有多年的研究經驗，由董奕鍾研究員領導，專注於微流體細胞培養、分析、生物醫學儀器及微奈米製造技術的研發。

聯絡方式(請不用填)：

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Bionic retina device for microinjection

PI : Prof. Jiashing Yu

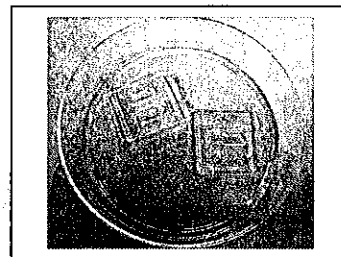
Department of Chemical Engineering, National Taiwan U.

Experience:

<https://che.ntu.edu.tw/che/jiayu.html>

Market Needs:

Microinjection is a technique that uses a micrometer-sized needle to directly inject substances such as drugs, plasmid DNA, mRNA, or proteins into the cell membrane or cytoplasm. Since it can directly penetrate the cell or cell membrane to deliver molecules to precise locations and accurately control the dosage of the delivered molecules, it is also used clinically as a gene therapy method. Drugs delivered via microinjection can reach their target without being restricted by molecular weight or chemical properties, and there is no need to use immunogenic vectors. In this case, our team has designed a device made of polymer elastic material (Elastomer) that can be used for conventional cell culture or three-dimensional organoid culture. This device establishes a biomimetic retinal model in vitro to facilitate retinal-related experiments outside the body. Moreover, the device features a side channel that makes it convenient for microinjection-related experiments and testing, potentially replacing certain animal experiments.



Our Technology:

Our team has developed a device using highly biocompatible polymeric elastic materials, such as polydimethylsiloxane (PDMS). The device is manufactured through common fabrication processes like molding and 3D printing. This device consists of two parts: the square-shaped front section serves as a chamber for conventional cell cultures or 3D retinal organoid cultures, while the elongated rear section provides the operational space required for microinjections. The special design of this device enables the simulation of retinal microinjection therapy in vitro.

Strength:

This device is made of readily available materials with high biocompatibility. The material's elasticity and durability, which make it resistant to damage, are combined with an innovative design to facilitate experiments simulating microsyringe therapy outside of living organisms. This enables easier execution of such experiments and allows for the replacement of some animal testing.

Competing Products:

None.

Intellectual Properties:

- (1) Patent Pending
- (2) Our research team has years of experience in the field of microfluidic chips. Led by Dr.

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Yi-Chung Tung, we focus on the development of microfluidic cell culture and analysis systems, biomedical instruments, and advanced micro/nanofabrication technologies.

Contact (do not need to fill out):

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