

「小芯連線」之MPS Day系列報告回顧 器官晶片如何賦能GSK科學家的疫苗研發？

小芯連線

「小芯連線」系列旨在分享各行業專家如何利用器官晶片賦能藥物研發或科學研究的精彩講座回顧，展示各行業採用器官晶片後的實際案例，幫助大家更深入理解器官晶片的價值和潛能。

GSK 科學家 - Josie McAuliffe

來自GSK的科學家Josie McAuliffe為大家作題為《Lymph Node Chip for Vaccine Characterization》的精彩報告，分享GSK的科學家團隊如何利用Emulate器官晶片來進行RNA疫苗開發。



Bethesda MPS Day



SESSION

Lymph Node Chip for Vaccine Characterization

Josie McAuliffe

Lab Head, Cell Biology and In
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1. 傳統體外模型無法準確複現淋巴濾泡和淋巴小結的典型特徵

- 體內免疫反應通常發生在淋巴濾泡高度特化的組織微環境中。並且B細胞從一種抗體同種型轉換到另一種抗體（Ab）同種型所需的DNA修飾酶，如活化誘導胞苷脫氨酶，只有駐留在淋巴濾泡內的B細胞才能表達。傳統2D或者3D模型，在靜態培養條件下，無法複現淋巴小結的典型特徵。

2. Emulate器官晶片可充分複現淋巴濾泡和淋巴小結的生理結構和功能

- Emulate淋巴晶片可在流動和拉伸的動態培養條件下能夠形成淋巴小結，並表達AID和CXCL13和支持漿細胞分化。在使用疫苗或佐劑感染後，能捕獲到與人類似的免疫反應過程，完美複現淋巴濾泡的結構和功能。詳細原文見之前的公眾號推文<[如何構建淋巴器官晶片](#)>

3. 引入Emulate器官晶片平臺的價值巨大

- GSK的科學家們充分評估了Emulate淋巴晶片的前景，尤其是看到Emulate淋巴晶片能複現淋巴組織典型特徵，他們開始在內部實驗室引入Emulate器官晶片系統，在Emulate團隊專業的技術支援下，開展更深入的淋巴晶片應用探究，建立疫苗開發和驗證的創新體系。

▸ Rationale to Internalize Chip

- Ability to test **proprietary vaccines candidates**
- **Building capabilities** in house with potential to transfer to other models and projects
- Direct comparison of vaccine candidates in animal models and **animal tissue chips**
- Potential **cost savings** on collaboration fees
- No requirement contract—direct testing of samples
- **Removal of risks** associated with shipment of samples
- **Development** of internal staff

面對GSK科學家在疫苗研發中遇到的困難，Emulate淋巴器官晶片是否能夠說明解決？

當看到傳統模型效果不佳，GSK的科學家們開始尋找其他體外模型來替代，Emulate器官晶片豐富的解決方案為科學家們提供了全新視角。

最初，GSK與Emulate學術創始人，哈佛大學WYSS研究所創始所長Donald E. Ingber院士合作，**初步探索新型淋巴器官晶片的開發**。

在最初期的合作中，GSK科學家們主要考慮以下四個方面：

- 1) 哪種**細胞類型**對抗原產生和抗體生成很重要？DC、單核細胞還是人骨骼肌母細胞？
- 2) 淋巴結晶片免疫後會產生哪些**細胞因數/趨化因數**？
- 3) 淋巴結晶片能否產生**新型抗原的抗體**，(如狂犬病G 蛋白)？、
- 4) 淋巴晶片 "接種"疫苗後，濾泡 (**follicles**) 的數量和大小會增加嗎？

► Questions for Lymph Node Chip Collaboration

Phase 1 objectives for WYSS Collaboration

1. Which **cell type** is important for antigen production and antibody generation? DCs, Monocytes or human skeletal myoblast?
2. Which **cytokines/chemokines** are produced following transfection in lymph node chip?
3. Can the lymph node chip produce **antibodies to novel antigen**, Rabies G protein?
4. Do number and size of **follicles** increase with "vaccination" of chip?

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經過系統實驗觀察，GSK的科學家發現，上述問題均能利用Emulate器官晶片來解決。

► Goals and Key Endpoints

- Build **internal capability** for microphysiological systems
- Evaluate **dynamic range** of lymph node model by testing it with pre-clinical vaccine candidates with varying levels of efficacy
- **Translational correlation:**
 - 3D chip with 2D *in vitro* assays
 - Animal models with *in vitro* models
 - *In vitro* models and clinical efficacy

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在與WYSS的合作後，看到Emulate淋巴晶片能複現淋巴組織典型特徵，GSK開始在內部實驗室引入Emulate器官晶片系統，**建立疫苗開發和驗證的創新體系**。

Emulate團隊如何幫助GSK的科學家們

Emulate作為器官晶片行業領導者，能說明解決藥物研發過程中遇到的實際困難，並且效果更佳。Emulate強大的科學家團隊可在**實驗設計，驗證，資料分析以及疑難雜症對策**中給予充分的技術支援。

► Summary and Next Steps

Internal Lymph Node Chip Studies

• Key Accomplishments Upon Internalization of Lymph Node Chip at GSK

- Training of staff by Emulate was successful!
- Troubleshooting removed technical difficulties (bubbles) and established key steps for recirculation protocols
- Key chemokines/cytokines which correlate with data from vaccine recipients were produced in chip above media control background
- Follicle formation, AID, T and B cell staining was visualized in chip by confocal imaging

• Next Steps:

- Repetition of cytokine panel in subsequent rounds of treated chips
- Analysis of antibody production by S-Flow and Luminex
- Immunophenotyping and single cell seq on cells in chip
- Additional markers for staining

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報告精彩呈現

究竟Emulate器官晶片是如何說明解答GSK科學家遇到的問題呢？讓我們跟隨影片，一探究竟。

The slide features the Bethesda MPS Day logo at the top left, the Emulate logo at the top right, and a central video player with a play button. Below the video player is a circular portrait of Josie McAuliffe, with her name and title: Lab Head, Cell Biology and In Vitro Models, GlaxoSmithKline.

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Lymph Node Chip for Vaccine Characterization

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Lab Head, Cell Biology and In Vitro Models, GlaxoSmithKline

