THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

用於流感病毒快速檢測的納米生物傳感器

Nano Biosensor for Rapid Detection of Flu Virus

以近紅外線激發的上轉換光學方法快速檢測流感病毒

Detect flu viruses rapidly by near-infrared triggered upconversion luminescence

專利申請編號: 15/442850 (美國)

病毒早期檢測可以提升患者的存活率，故非常重要。在常見的傳統檢測方法中，聚合酶連鎖反應 (PCR) 需要較長的反應時開，而酵素結合免疫吸附分析法 (ELISA) 的靈敏度則較低。理大研發的納米流感檢測器採用上轉換發光共振能量轉移的光學方法來檢測病毒，可以憑着光的變化辨別病毒是否存在。此方法對病毒的基因造成較少破壞，因而能夠快速和靈敏地檢測病毒。另外，此方法採用可棄置的納米探針/納米多孔膜的異質設計，能簡便地檢測流感和其子類病毒；新設計若製成微陣列，就可同時檢測數種病毒，大大縮短了測試的時間。

特色與優點

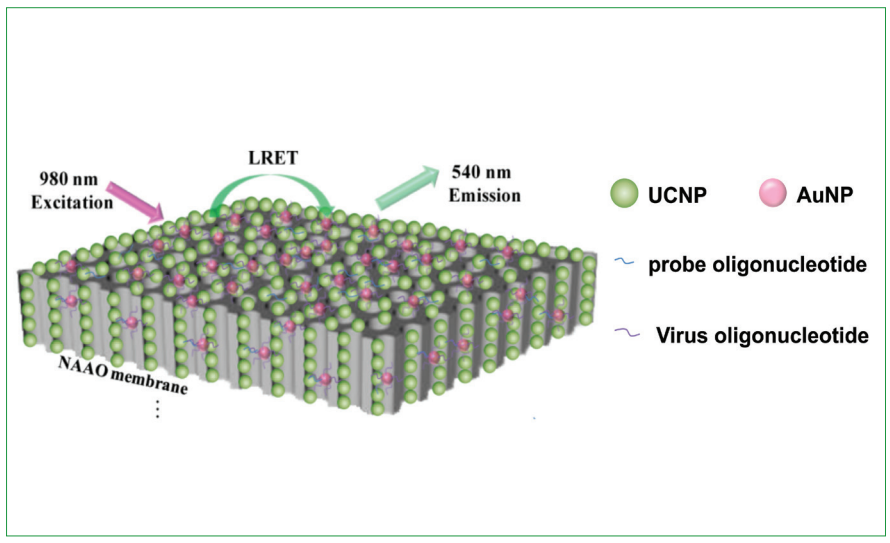
- 對病毒的基因構成較少破壞，不會產生背景螢光
- 異質設計支援密集的雜化反應，令靈敏度上升
- 微陣列設計令此方法可同時檢測多種病毒，增加檢測的效率

應　用

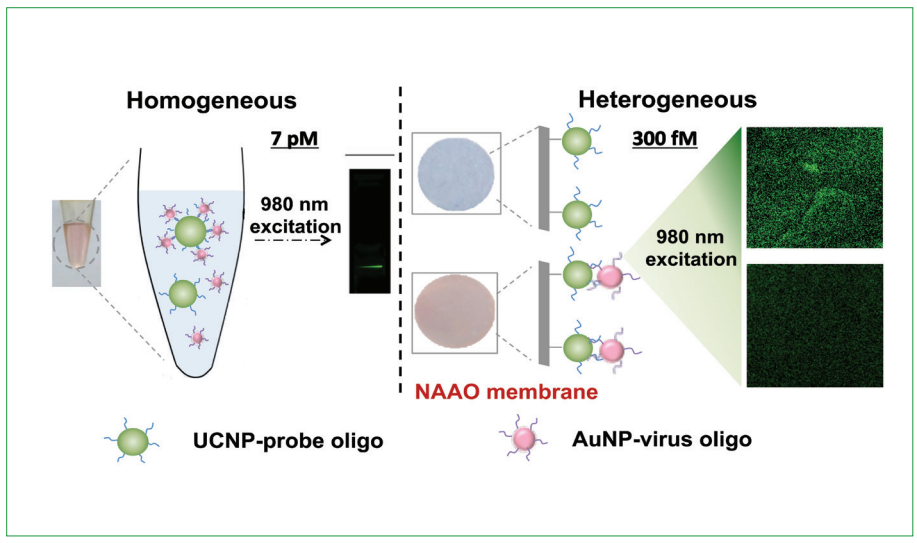
- 即場進行的快速流感病毒檢測

獎　項

- 第45屆瑞士日內瓦國際發明展-評判特別嘉許金獎 (2017年3月)
- 羅馬尼亞科學組織特別獎 (2017年3月)



上轉換粒子納米多孔氧化鋁膜的結構圖
The schematic structure of the UCNPs/NAAO membrane composite



異質設計與同質設計的檢測限比較
Comparison of the limit of detection of invention in heterogeneous assay with homogeneous assay

Patent Application No: 15/442850 (US)

The early-stage detection of epidemic viruses is of prime importance as it may increase the probability of a patient' survival. Conventional detection techniques include polymerase chain reaction (PCR), which requires long processing time for accurate results, and enzyme-linked immunosorbent assay (ELISA), which has low sensitivity. Unlike conventional techniques, this biosensor uses near-infrared triggered upconversion luminescence to capture the virus genes, and reports a change in the luminescence intensity in the presence of virus genes. It enables rapid and sensitive detection of viruses as it poses minimal damage to virus oligonucleotides. Moreover, the hybrid heterogeneous design based on disposable nanoprobe/nanoporous membrane assay is capable of detecting subtypes of influenza viruses in a simple way. It can be made as a microarray for simultaneous detection of subtypes of influenza viruses, which can greatly shorten the reaction time.

Special Features and Advantages

- Poses minimal damage to virus oligonucleotides and does not induce autofluorescence
- Supports denser hybridization reactions with ultrasensitivity
- Detects multiple subtypes of viruses on a single platform simultaneously

Applications

- Rapid detection of flu viruses for on-site operation

Awards

- Gold Medal with the Congratulations of Jury – 45th International Exhibition of Inventions of Geneva, Switzerland (Mar 2017)
- Special Merit Award – Scientific Community of Romania (Mar 2017)

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Principal Investigators

Prof. Jianhua HAO
Department of Applied Physics

Dr Mo YANG
Department of Biomedical Engineering

Contact Details

Institute for Entrepreneurship
Tel: (852) 3400 2929 Fax: (852) 2333 2410 Email: pdadmin@polyu.edu.hk

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