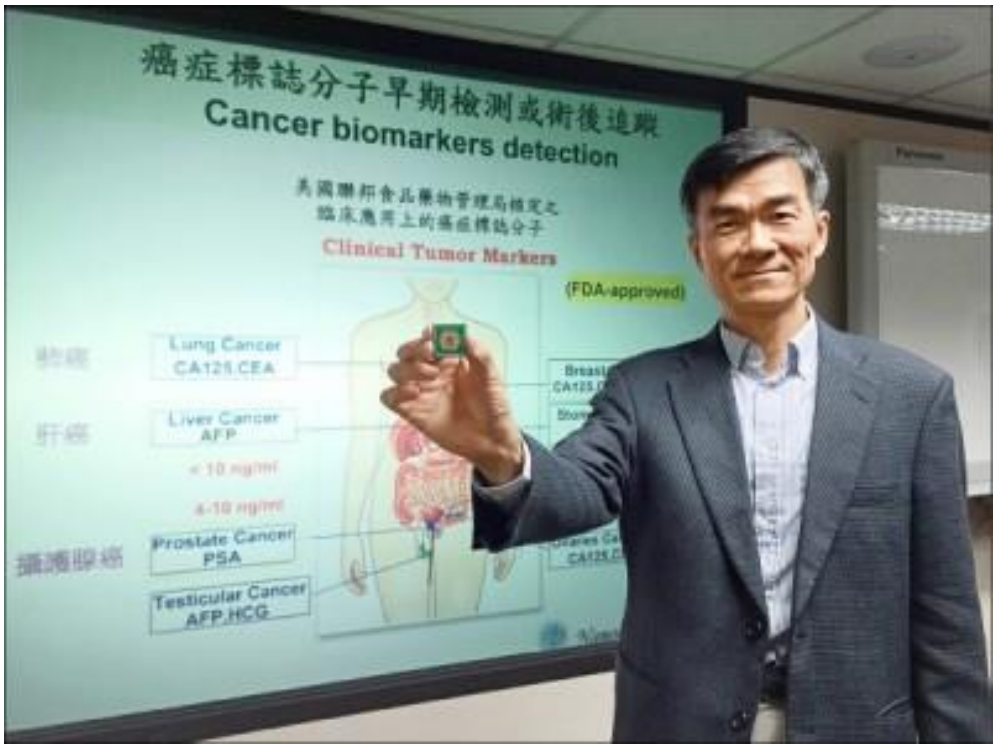
晶片快篩 30 秒檢出癌症



周家復研究員 *"Ultrafast immunoassays by coupling dielectrophoretic biomarker enrichment on nanoslit molecular dam with electrochemical detection on graphene", Lab Chip 2015, 15, 4563-4570.*

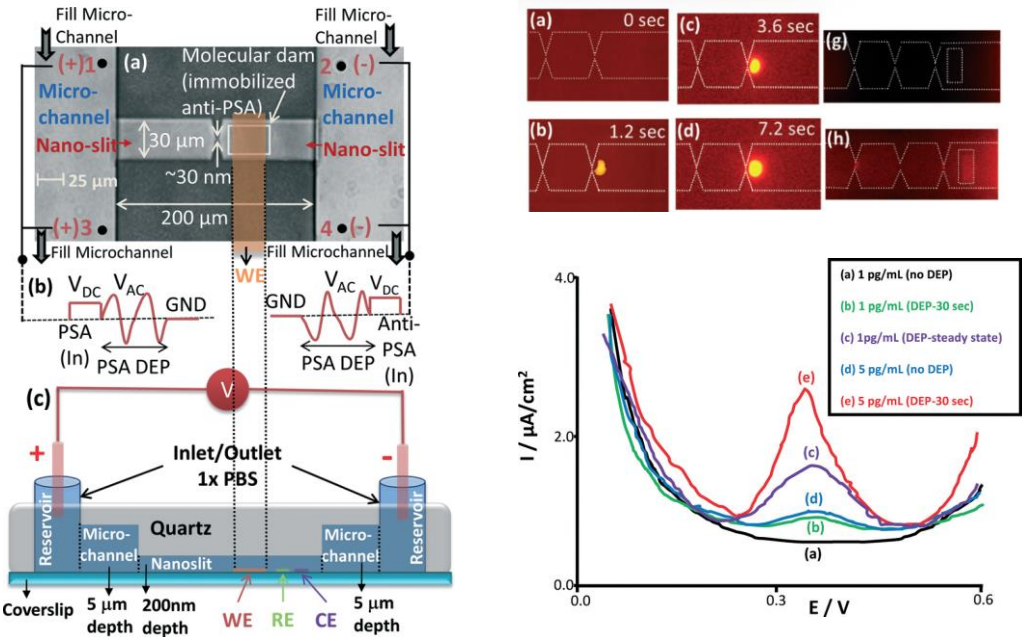
目標：
只要一滴血，就可以在 30 秒內檢測出是否罹患攝護腺癌或其他癌症因子

Ultrafast immunoassays by coupling dielectrophoretic biomarker enrichment on nanoslit molecular dam with electrochemical detection on graphene

Bankim J. Sanghavi, Walter Varhue, Ali Rohani, Kuo-Tang Liao, Lindsay A. L. Bazydlo, Chia-Fu Chou* and Nathan S. Swami*

Lab Chip 2015, 15, 4563-4570.

- We address the mass transport limitations of the analyte within heterogeneous immunoassays to enable rapid signal saturation for improving detection accuracy and enhance the steady-state signal level to improve the detection limit, which is accomplished by nanoslit confinement strategies to eliminate diffusion boundary layers, as well as by creating a highly concentrated plug of the biomarker in the nanoslit, through enrichment under the molecular dam scheme with negative dielectrophoresis (nDEP).
- Prostate Specific Antigen (PSA) biomarkers can be significantly enriched within just a few seconds (~25-fold preconcentration in just over a second) in regions away from sharp lateral constrictions in a nanoslit device.
- Rapid detection of PSA down to 1 pg/mL may be achieved in 30 seconds in physiological condition using nDEP enrichment in the nanoslit coupled to the electrochemical detection assay.



相關文獻：

1. K.T. Liao and C.F. Chou, “Nanoscale molecular traps and dams for ultrafast protein enrichment in high-conductivity buffers”, *J. Am. Chem. Soc.* 2012, 134, 8742−8745 (Featured in JACS Spotlights: *J. Am. Chem. Soc.* 2012, 134, 10307).
2. L. Lesser-Rojas, P. Ebbinghaus, G. Vasan, M.L. Chu, A. Erbe, C.F. Chou, “Low-Copy Number Protein Detection by Electrode Nanogap-Enabled Dielectrophoretic Trapping for Surface-enhanced Raman Spectroscopy and Electronic Measurements”, *Nano Lett.* 2014, 14, 2242–2250.
3. B. Sanghavi, W. Varhue, J. Chávez, C.F. Chou, N. S. Swami, “Electrokinetic preconcentration and detection of neuropeptides at patterned graphene-modified electrodes in a nanochannel”, *Anal. Chem.* 2014, 86, 4120–4125.
4. B.J. Sanghavi, W. Varhue, A. Rohani, K.T. Liao, L. Bazydlo, C.F. Chou, N. S. Swami, “Ultrafast immunoassays by coupling dielectrophoretic biomarker enrichment on nanoslit molecular dam with electrochemical detection on graphene”, *Lab Chip* 2015, 15, 4563-4570.
5. B.J. Sanghavi, J.A. Moore, J.L. Chávez, J.A. Hagen, N. Kelley-Loughnane, C.F. Chou, N.S. Swami, “Aptamer-functionalized nanoparticles for surface immobilization-free electrochemical detection of cortisol in a microfluidic device”, *Biosensors and Bioelectronics* 2016, 78, 244–252.
6. R. Fernandez, B. Sanghavi, V. Farmehini, J. Chavez, J. Hagen, N. Kelley-Loughnane, C.F. Chou, N. Swami. “Aptamer-functionalized graphene-gold nanocomposites for label-free detection of dielectrophoretic-enriched neuropeptide Y”, *Electrochemistry Communications* 2016. 72, 144–147