

4TH INTERNATIONAL CONFERENCE ON PHARMACOLOGY & TOXICOLOGY

MARCH 15-16, 2023 | (Hotel Crowne Plaza Dubai - Deira)



Emtiaz Ahmed

Emtiaz Ahmed^a, Mostafa Kamal Masud^a, Richard Lobb^a, Md. Shahriar A. Hossain^{a, d}, Andreas Möller^c, Yusuke Yamauchi^{a, e*}, Abu Ali Ibn Sina^{a*}, and Matt Trau^{a, b**}

^aCentre for Personalised Nanomedicine, Australian Institute for Bioengineering and Nanotechnology (AIBN), Corner College and Cooper Roads (Bldg 75), The University of Queensland, Brisbane QLD 4072, Australia.

^bSchool of Chemistry and Molecular Biosciences, The University of Queensland, Brisbane QLD 4072, Australia.

^cTumour Microenvironment Laboratory, QIMR Berghofer Medical Research Institute, Herston, Queensland 4006, Australia

^dSchool of Mechanical and Mining Engineering, Faculty of Engineering, Architecture and Information Technology (EAIT), The University of Queensland, Brisbane, QLD 4072, Australia

^eSchool of Chemical Engineering, Faculty of Engineering, Architecture and Information Technology (EAIT), The University of Queensland, Brisbane, QLD 4072, Australia

A mesoporous gold-based single CTC analysis platform to investigate immune checkpoint protein heterogeneity in lung cancer

Immune checkpoint proteins (ICPs) play a major role in patient's immune response against cancer. Tumour cells usually express the checkpoint proteins to communicate with immune cells as a process of escaping the immune response. Identification of the major role-playing ICPs expressed on circulating tumour cells (CTC) could therefore be critical in cancer diagnosis and therapy monitoring. However, low abundance and heterogeneity in CTCs make it extremely challenging to map CTC proteins, e.g. ICPs. In this study, we develop a single circulating tumour cell analysis platform to investigate the immune checkpoint protein heterogeneity in the lung cancer model. The platform combines a nanostructured mesoporous gold surface to capture the CTCs and a Surface-enhanced Raman scattering (SERS) readout to identify and monitor the expression of key ICP proteins (PD-L1, B7H4, CD276, CD80) in lung cancer CTCs during therapy. The mesoporous 3D gold nanostructures enable increased antibody loading on-chip and enhanced SERS signal which is key to our single CTC capture, and accurate analysis of ICPs in CTCs with high sensitivity. Our lung cancer cell line model (HCC827) and clinical sample data showed that our method can detect a single CTC and analyze the expression of four lung cancer-associated ICPs on individual cell surfaces during treatment. We found that the expression of ICPs in CTCs is highly heterogeneous in both pre-treated and treated samples isolated from lung cancer patient blood. We believe these findings will help clinicians in selecting the accurate therapy for patients.

Keywords: circulating tumor cell (CTC), mesoporous gold, immune checkpoint proteins, cancer heterogeneity, liquid biopsy.

Biography:

Emtiaz Ahmed, is a final-year PhD student at the University of Queensland's Australian Institute for Bioengineering & Nanotechnology (AIBN). His research goal is to apply nanotechnology and sequencing-based approaches to reveal the epigenetic and genetic signatures of cancer. Besides, he is focusing on developing a mesoporous gold-based single CTC analysis platform to investigate immune checkpoint protein heterogeneity in lung cancer which might help clinicians in selecting the accurate immunotherapy for cancer patients.