**Label-free SERS nanosensor for the detection of Insulin in biological fluids**

*Saiqa Muneer a, Godwin A. Ayoko b, Nazrul Islam c, Emad Kiriakous a*

aDiscipline of Molecular design and synthesis, School of Chemistry, Physics and Mechanical Engineering, Science and Engineering Faculty, Queensland University of Technology, Australia.

bDiscipline of Environmental Technologies, School of Chemistry, Physics and Mechanical Engineering, Science and Engineering Faculty, Queensland University of Technology, Australia.

cSchool of Clinical Sciences, Faculty of Health, Queensland University of Technology, Australia.

Abstract.

Introduction.

Protein sensing using Surface enhanced Raman spectroscopy (SERS) is becoming popular due to simple and rapid means of detecting proteins from real-life samples at the point of care. SERS is particularly useful in detecting conformational changes and structural information down to a molecular level. Insulin, a polypeptide hormone secreted by pancreatic cells, is a key regulator in glucose homeostasis. Its deficiency leads to insulin-dependent (type I) diabetes whereas resistance to insulin is common in type II diabetes, obesity and a range of endocrine disorders. Immunoassays are potentially very cheap, highly sensitive, and very readily transposed to a point of care. Though they are rarely suitable for complex biological mixtures or applicable to low molecular weight targets.

Aims.

Herein, we present a rapid and simple SERS method for the quantification of Insulin in human plasma that is capable of detecting trace concentration of insulin down to pM by Handheld Raman device that is portable and available in the remote areas.

Method.

The method utilises thiol chemistry of the biomolecules to immobilise on the surface of gold nanostructures to fabricate a target-specific and highly efficient extractor-chip.

Results and Discussion.

After the selective capture, the filtered protein was then released from the nanosensor gold surface by altering the pH of the working environment and directly chemisorbed onto another commercially available gold-coated substrate using handheld Raman spectrophotometer.

Conclusion.

The new nano sensing method has strong potential for the pathological laboratories and can be easily extended to other proteins present in blood as well.



Fig. 1 SERS spectrum of Insulin

**References**

Soffe, R., Nock, V., & Chase, J. G. (2018). Towards point-of-care insulin detection. ACS sensors, 4(1), 3-19.