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PROJECT TITLE:

"Development of Nanomaterial Based Nanobiosensors for Clinical Diagnostics Applications"

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SUMMARY OF PROPOSAL

One of the major challenges in medical science is to develop a technology to improve the health of people in the poorest regions. Efficient diagnostics systems are urgently required for rapid and point of care (POC) detection of various communicable diseases such as tuberculosis, cholera, typhoid, meningitis and diarrhea etc. Some of the clinical applications of nano-diagnostics are mentioned along with technologies for diagnosis of infectious diseases, neurological disorders and non-communicable diseases such as cancers. In this context present research proposal is focused in the applications of various metal/metal oxide nanomaterials/nanocarbon materials for clinical diagnostics applications. Nanocarbon materials such as carbon nanotubes (CNTs), graphene, graphene quantum dots (QDs) and fullerene (FDA approved) has been recently recognized as a potential materials in the field of drug delivery, biomedical applications and development of biosensing devices. Nanocarbon materials have attracted the attention of many researchers in few decades, because they not only have all the advantages of easy surface modification/functionalization, but also have unique properties, such as thermal stability, low cost and, unlimited applications in diagnostics, therapeutics, biosensing probe and development of drug delivery systems. Nanomaterial particularly, graphene based devices possess the requisite biocompatibility to be amenable for in situ biosensing.

The conventional laboratory diagnosis techniques such as biochemical reactions, immunological and serological test and polymerase chain reactions (PCR) for the diagnostics of infectious diseases are expensive, time consuming (2-3 days or a week) and requires manpower and during this period, the disease can spread explosively. Thus, there is an urgent need to develop rapid, sensitive, and cost-effective nanodiagnosis devices for the detection of virulent pathogens. Many biosensing techniques have been developed for the detection of various bacterial and viral pathogens such as immunosensors and DNA biosensor. However, electrochemical detection technique offers many advantages in terms of sensitivity, accuracy, and easy-to-use and point-of-care detection. Nanobiosensing technology is economic and easy-to-use for the direct clinical applications. In this context, nanocarbon materials based nanobiosensor provides an effective diagnostic tool for rapid, sensitive and low cost detection.