AMRS2024 Pre-Conference training proposals

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Training A: Translational research training proposal

1 Introduction

Translational research is an emerging concept which is finding applications in most technical disciplines although it has its roots in biomedical research. In essence, the translational science spectrum proposes the generation of scientific and operational innovations that transcends the traditional challenges along the innovations funnel retarding the efficient commercialization of breakthrough scientific discoveries. The basis of translational research is to translate (move) basic science discoveries more quickly and efficiently into practice (from the lab into industry and the community). The rationale behind this concept is the need to impart to scientists the competence to build into the research process, priorities that address barriers that can curb productivity and the swift translation of research into new practical commercializable technological advances for the benefit of humankind.

2 Training needs

The whole premise behind training research scientists in the translational spectrum is to transform the way in which research is done so as to achieve faster, more efficient, and more impactful tangible outputs from the research process. The process seeks to produce more meaningful, applicable results from both exploratory and applied research.

Among other things Translational Research training will cover the following:

2.1 Introduction to the translational spectrum

2.2 Translational Science principles

2.3 Diversity, Equity, Inclusion and Accessibility (DEIA) focused research prioritization

2.4 Building blocks of bold, rigorous goal oriented (endpoint in sight) research Approaches

2.5 Leveraging creativity, innovation and utility in applied research design

2.6 Integrating multidisciplinary knowledge convergence in research translation

2.7 Building Boundary-Crossing Partnerships for commercialisation

2.8 The Innovation fertile organisational environment

Training B: Green (Biogenic) synthesis of multifunctional metallic nanoplatforms

1 Introduction

Various metallic nanoparticles present advanced multifunctional platforms for unlimited applications with unmatched performances and advanced mechanisms of action. The routes of fabrication of nanomaterials ultimately determines the shape, size, activity and most importantly the safety of resultant products. Concerns regarding the chemical synthesis route of colloidal nano metallic platforms, such as the use of harmful solvents and toxicologically unsafe precursor chemicals which give rise to the production of unsafe, toxic by-products with unknown fates in living systems is the main hurdle in the translation of these amazing technologies in biomedical application. Over the past few years advances in nanotechnology have ushered in new nano-scale biogenic (green synthesised) platforms with optimised attributes. Green synthesis is consequent of the synergistic interaction of nanotechnology and Nano biotechnology to fabricate biosynthesised metal nanoparticles in a safer and easy one pot

processing of low dimensional structures for various biomedical applications. This eco-friendly, synthesis technique employs biological living systems including, plants, yeasts, bacteria and viruses as bio-reducing and stability imparting capping agents to fabricate advanced nanometric metallic conjugates for wide biomedical applications. Green synthesis of metallic nanoparticles present a dynamic, safe and efficacious substitute to chemically-produced nano platforms which is easy to scale up by employing a clean, safe, cost effective and environmentally friendly process of constructing nanomaterials.

2 Training need

Due to the efficacy and the simplicity of the 'one pot" process which does not require expensive equipment as well as the safety of the process products. Green synthesis leverages the potential for African scientists in low resource set ups to be involved in transformational advanced materials research and development at very minimal costs.

Among other things Green synthesis of metallic nanoparticles will cover the following:

Theoretical training (3 Hours)

2.1 Overview of Synthesis methods of nanoparticles

2.2 Common Biomedical Nanoparticles and their properties

2.3 Green synthesis techniques

- 2.3.1 Biogenic nanometallic synthesis using plants and the applications
- 2.3.2 Biogenic nanometallic synthesis using Fungi and the applications
- 2.3.3 Biogenic nanometallic synthesis using Algae and the applications
- 2.3.4 Biogenic nanometallic synthesis using bacteria and viruses applications

2.4 Characterisation of biogenic metallic nanoparticles

2.5 Practical activities (2 hours)

- 2.4.1 Green synthesis of Silver (AgNPs) nanoparticles from selected plant species for antibacterial effects
- 2.4.2 Green synthesis of Silver doped Zinc nanoparticles (Ag-ZnNPs) for anti oxidancy and photoprotection
- 2.4.3 Green synthesis of Gold (AuNPs) nanoparticles for diagnostic imaging