Abstract

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Title: Antimicrobial potential of diverse nature-based synthetic analogues and bio-fabricated nanoparticles derived from ethnomedicinal plants *Albizia lebbeck* and *Oxalis corniculata.*

The main motivation of this research is the exploration of more efficient less toxic antimicrobial drugs using less expensive biofriendly materials following semi-synthetic green techniques. Synthesis of silver nanoparticles has been carried out by using two folk-lore of Jangalmohal, West Bengal. These are *Albizia lebbeck* (local name, Sirish) and *Oxalis corniculate* (local name, Amrul) and the antibacterial activities of the crude extracts of *Albizia lebbeck* and *Oxalis corniculata* lie at 250-1000μg/ml. The antibacterial activities of AgNPs@*Albizia lebbeck Oxalis corniculata* have been significantly improved. A series of new sulfonamide derivatives incorporating nature-based analogues of Coumarin is reported in this Thesis. On the other hand, different nucleoside and non-nucleoside analogues have been synthesized, characterized, and used to discover less toxic better antimicrobial agents. The characterizations of the derivatives have been done by spectroscopic and other photo physical techniques and bio-fabricated nanoparticles have been characterized by both spectroscopic and microscopic techniques. The antibacterial susceptibility was evaluated by standard disc-diffusion, agar and broth-dilution methods. Some of the derivatives are used to investigate the interaction with surface glycoprotein of Herpes Simplex Virus (HSV)-1 to discover their antiviral activity, if any, in virus-infected Vero cells.

The thesis consists of six chapters. **Chapter 1** is the review of literature for ethnomedicine and *in vitro* anti-microbial activity of green synthesized nanomaterials and different semi-synthetic compounds including new Schiff bases incorporated with coumarin moiety and Sulfonamide derivatives to discover new lead molecules with high activity and less cellular toxicity. The **Chapter 2** describes the synthesis, structure and bioactivity studies including antimicrobial and anti-oxidant activities of silver nanoparticle (AgNPs)

synthesized using the bark extract of *Albizia lebbeck*. **Chapter 3** includes the spectral characterization and anti-bacterial activities of bio-fabricated silver-nanoparticles AgNPs from the herb *Oxalis corniculata*. Here, we also include the significant anti-biofilm activities, followed by and cell viability assay of AgNPs in Vero cell. The **Chapter 4** represent the synthesis characterization of novel nucleoside-based pyridine functionalized derivatives, along with their anti-HSV activity. Here, we have re-examined the anti-HSV-1 activity of certain amides compounds having nucleoside-moiety by cytopathic effect (CPE) and standard Plaque reduction assays, with the possible mode of action in HSV-infected Vero cells *in vitro*. While the **Chapter 5** depicts the antimicrobial activity of Schiff's base derived from 7-Hydroxy-4-methyl-2-oxo-2H-chromene-8-carbaldehyde and four different sulphonamides (Sulfapyridin, Sulfathiazole, Sulfamethoxazole, Sulfamerazine). The last chapter, **Chapter 6**, contained supramolecular assembly of an Au (III)-complex and its biological activities. Here, 2-(3-Phenyl-1H-1, 2, 4-triazol-5-yl) pyridine acts as bidentate N, N′-chelator, and forms Au (III)-complex [**Au** (2-ptp)$_2$]Cl (**1**). The structure has been characterized by single-crystal X-ray diffraction technique and other spectroscopic data.

Dr. Chattopadhyay

Dr. Debprasad Chattopadhyay
Former Founder-Director & Scientist G
ICMR-National Institute of Traditional Medicine Belagavi, Karnataka
And Scientist F, ICMR-Virus Unit
Kolkata (Now ICMR-NICED)

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Prof. Chittaranjan Sinha
Department of Chemistry
Jadavpur University, Kolkata

Professor of Chemistry
Department of Chemistry
Jadavpur University
Kolkata-700 032

(Signature of the Supervisors, date with Seal)

Dr. D. Chattopadhyay
M.Sc., Ph.D.
Fellow RSAC (England)
Former Director & Scientist-G
ICMR-National Institute of Traditional Medicine
Nehru Nagar, Belagavi-590010, INDIA

Ananya Das Mahapatra
Senior Research Fellow, DST-INSPIRE
(Signature of the Candidate)