ABSTRACT

Index No. 1/20/Maths./26

Title: A Comprehensive Study on Leprosy and its Control Through Mathematical Standpoint

Submitted by: Salil Ghosh

Abstract: Leprosy is a chronic mycobacterial infectious disease that causes peripheral neuropathy in human body which results irreversible nerve damage and loss of sensation in skin and disabilities of various organs. In-depth research of leprosy continues to be a very challenging topic for scientists worldwide as the infection of leprosy is a very complex process and difficult to execute the same in laboratory. In spite of the invention of multi-drug therapy (MDT), leprosy is far from eradicated and still remains a public health problem in many densely populated countries like India, Brazil, China, Indonesia and some parts of Africa, Europe and USA etc. According to WHO (World Health Organisation), there were 202, 256 new leprosy cases registered globally in 2019 from 161 countries from the six WHO Regions. Considering this context, this thesis deals with several mathematical models demonstrating and decoding the basic infection mechanism and disease dissemination process of leprosy. Also, exploring safe and effective treatment policies and regimens to overcome the hindrance of drug-resistance scenarios, adverse drug impacts and the difficulties in framing a perfect tenure of treatment is the key focus of the thesis. Each chapter of this thesis is divided into two parts: theoretical part and numerical part. In theoretical section, systems are constructed in such a way so that their solutions remain biologically meaningful and also the existence, uniqueness and boundedness of solutions remain biologically plausible. Finally, novel numerical tools and techniques are utilized to illustrate and validate all the analytical outcomes.

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Priti Kumar Roy
Signature of the Supervisor 09/10/2023

Salil Ghosh 09.10.2023
Signature of the candidate

Prof. (Dr.) Priti Kumar Roy
Professor
Department of Mathematics
Jadavpur University
Kolkata-700 032, West Bengal