Mathematical Models of Infectious Diseases and Social Issues

When deadly illness spreads through a population at a rapid pace, time may be of the essence in order to save lives. Using mathematics as a language to interpret assumptions concerning the biological and population mechanics, one can make predictions by analyzing actual epidemiological data using mathematical tests and results. Mathematical models can help us understand the right disease status and predict the effects of the disease on populations, which can help limit the spread and devastation of the illness.

Mathematical Models of Infectious Diseases and Social Issues is a collection of innovative research that examines the dynamics of diseases and their effect on populations. Featuring coverage of a broad range of topics including deterministic models, environmental pollution, and social issues, this book is ideally designed for diagnosticians, clinicians, healthcare providers, pharmacists, government health officials, policymakers, academicians, researchers, and students.

Topics Covered

- Air Pollution
- Co-Infections
- Deterministic Models
- Disease Dynamics
- Disease Prediction
- Environmental Pollution
- HIV-HCV-HBV
- Population Mechanics
- Social Issues
- Vector-Borne Diseases
- Water-Borne Diseases

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Chapter 3
Spread of Tuberculosis Among Smokers:
A Mathematical Model

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ABSTRACT

Smoking tobacco has some hazardous implications on an individual's physical, physiological, and psychological health; health of the passive smokers near him or her; and on the surrounding environment. From carcinomas to auto-immune disorders, smoking has a role to play. Therefore, there arises a need to frame a systemic pathway to decipher relationship between smoking and a perilous disease such as tuberculosis. This research work focuses on how drugs or medications can affect individuals who are susceptible to tuberculosis because of smoking habits and also on individuals who have already developed symptoms of tuberculosis due to their smoking addiction. The mathematical model is formulated using non-linear ordinary differential equations, and then threshold is calculated for different equilibrium points using next generation matrix method. Stability analysis along with numerical simulations are carried out to validate the data.