

# Mathematical Models In Population Biology And Epidemiology

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Structured Population Models in Biology and Epidemiology  
Biology, Epidemiology, and Management of Pyrodinium Red Tides  
Molecular Epidemiology of Infectious Diseases  
Mathematical Models in Population Biology and Epidemiology  
Unconventional Agents and Unclassified Viruses  
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Gustaaf M. Hallegraeff  
Lee W. Riley  
Fred Brauer  
O.-R. Kaaden  
Suzane R. da Silva  
Roger S. V. Pullin  
United States. Environmental Protection Agency. Office of Research and Development  
Shama Parveen  
Betsy Foxman  
Stavros Busenberg  
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until about 10 years ago the general view in the field was that mycobacterium tuberculosis the causative agent of human tuberculosis was a clone with insufficient natural sequence variation between clinical strains to be considered biologically and epidemiologically relevant this view

has now changed quite dramatically thanks to the omics revolution particularly the advent of next generation dna sequencing large scale comparative genomic studies over the last few years have revealed that m tuberculosis clinical strains are more genetically diverse than appreciated previously moreover an increasing number of experimental and epidemiological studies are showing that this genetic diversity also translates into important phenotypic variation taken together these findings have led to a paradigm shift such that currently phylogenetic diversity among m tuberculosis clinical strains is being considered in the development of new tools to combat tuberculosis the purpose of this book is to bring together a series of contributions from some of the most influential groups working on various aspects of m tuberculosis diversity and which through their work have contributed to the this paradigm shift this includes authors focusing on the evolution of m tuberculosis in relation to other members of the m tuberculosis complex adapted to animals the co evolution between m tuberculosis and humans the phenotypic consequences of strains diversity both from an experimental and epidemiological point of view the ecology and evolution of drug resistant tuberculosis the diversity and evolution of the bcg vaccine strains and the use of mathematical modelling to study strain diversity and drug resistance in human tuberculosis no such book has ever been published and given the paradigm shift described above this book will be a valuable resource both for established researchers as well as new scientists clinicians and public health officials joining the growing field of tuberculosis research

in this new century mankind faces ever more challenging environmental and public health problems such as pollution invasion by exotic species the emergence of new diseases or the emergence of diseases into new regions west nile virus sars anthrax etc and the resurgence of existing diseases in uenza malaria tb hiv aids etc mathematical models have been successfully used to study many biological epidemiological and medical problems and nonlinear and complex dynamics have been observed in all of those contexts mathematical studies have helped us not only to better understand these problems but also to find solutions in some cases such as the prediction and control of sars outbreaks understanding hiv infection and the investigation of antibiotic resistant infections in hospitals structured population models distinguish individuals from one another according to characteristics such as age size location status and movement to determine the birth growth and death rates interaction with each other and with environment infectivity etc the goal of structured population models is to understand how these characteristics affect the dynamics of these models and thus the outcomes and consequences of the biological and epidemiological processes there is a very large and growing body of literature on these topics this book deals with the recent and important advances in the study of structured population models in biology and epidemiology there are six chapters in this book written by leading researchers in these areas

designed as both a textbook and a reference this book outlines the principles methods and application of this new discipline of public health techniques used in the field of molecular biology have been recognized as critical tools in solving infectious disease problems this introductory volume distinguishing molecular epidemiology from taxonomy and phylogeny will

familiarize epidemiologists with molecular biology and molecular biologists with epidemiology and presents vocabulary and concepts of both fields to infectious disease clinicians

the goal of this book is to search for a balance between simple and analyzable models and unsolvable models which are capable of addressing important questions on population biology part i focusses on single species simple models including those which have been used to predict the growth of human and animal population in the past single population models are in some sense the building blocks of more realistic models the subject of part ii their role is fundamental to the study of ecological and demographic processes including the role of population structure and spatial heterogeneity the subject of part iii this book which will include both examples and exercises is of use to practitioners graduate students and scientists working in the field

among unconventional agents and unclassified viruses the contributions to this volume focused on prion related diseases with special emphasis on bovine spongiform encephalopathy and human spongiform encephalopathies and borna disease virus an agent known since long time to be pathogenic for horses and sheep which is now discussed as a potential pathogen for humans additionally the volume contains articles about newly discovered viruses like porcine respiratory and reproductive syndrome virus and viruses that are classified only provisionally like african swine fever virus hepatitis c and e viruses or the arteriviruses

compiles the most current information on the zika virus and its associated diseases this comprehensive book provides the most up to date information for students medical students and scientists on zika virus and its associated diseases it includes all the information related to the zika virus since its discovery in 1947 its epidemic outbreak in 2007 2014 how the epidemiology changed in america in 2015 2016 its mode of transmission how to prevent and treat it and associated diseases zika virus and diseases from molecular biology to epidemiology offers complete and up to date coverage in 10 chapters it presents information from papers that attempted to associate the virus with diseases in africa until the first animal experiment discusses its association with guillain barré syndrome and microcephaly describes the basic mechanisms for zika zikv replication including important differences between dengue denv west nile virus wnv and zikv explains the difference between the strains and discusses the pathogenesis of them covers the papers that showed all the interferences that zika can cause and the pathways which can be modified and more the first book since 1947 to put together all the scientific information compiles all the information received in the last year about zika virus clearly demonstrates the origin and discovery of the virus zika virus and diseases from molecular biology to epidemiology will appeal to graduate students medical students basic researchers clinicians in infectious disease microbiology and virology as well as people in related disciplines interested in learning more about this topic

the coronavirus disease 2019 covid 19 pandemic has affected almost every part of the globe with millions of cases and over a million deaths the pandemic has had a significant global economic impact and addressing it systematically requires significant efforts from researchers

healthcare workers and governments the covid 19 pandemic covers relevant aspects of this viral pandemic including information about the sars cov 2 pathogen morphology genome proteins structural protein genes replication global epidemiology transmission risk factors clinical manifestation management host immune response pathogenesis diagnosis and therapeutic agents antivirals natural compounds and vaccines readers will find basic and advanced knowledge about the disease organized into simple and easy to read chapters about the disease making this book a handy and comprehensive reference for general readers academics and biology students alike

molecular tools and infectious disease epidemiology examines the opportunities and methodologic challenges in the application of modern molecular genetic and biologic techniques to infectious disease epidemiology the application of these techniques dramatically improves the measurement of disease and putative risk factors increasing our ability to detect and track outbreaks identify risk factors and detect new infectious agents however integration of these techniques into epidemiologic studies also poses new challenges in the design conduct and analysis this book presents the key points of consideration when integrating molecular biology and epidemiology discusses how using molecular tools in epidemiologic research affects program design and conduct considers the ethical concerns that arise in molecular epidemiologic studies and provides a context for understanding and interpreting scientific literature as a foundation for subsequent practical experience in the laboratory and in the field the book is recommended for graduate and advanced undergraduate students studying infectious disease epidemiology and molecular epidemiology and for the epidemiologist wishing to integrate molecular techniques into his or her studies presents the key points of consideration when integrating molecular biology and epidemiology discusses how using molecular tools in epidemiologic research affects program design and conduct considers the ethical concerns that arise in molecular epidemiologic studies provides a context for understanding and interpreting scientific literature as a foundation for subsequent practical experience in the laboratory and in the field

the past forty years have been the stage for the maturation of mathematical biology as a scientific field the foundations laid by the pioneers of the field during the first half of this century have been combined with advances in applied mathematics and the computational sciences to create a vibrant area of scientific research with established research journals professional societies deep subspecialty areas and graduate education programs mathematical biology is by its very nature cross disciplinary and research papers appear in mathematics biology and other scientific journals as well as in the specialty journals devoted to mathematical and theoretical biology multiple author papers are common and so are collaborations between individuals who have academic bases in different traditional departments those who seek to keep abreast of current trends and problems need to interact with research workers from a much broader spectrum of fields than is common in the traditional monoculture disciplines consequently it is beneficial to have occasions which bring together significant numbers of workers in this field in a forum that encourages the exchange of ideas and which leads to a timely publication of the

work that is presented such an occasion occurred during january 13 to 16 1990 when almost two hundred research workers participated in an international conference on differential equations and applications to biology and population dynamics which was held in claremont

this book covers some of the most novel genetic and genomic concepts in epidemiology such as geospatial statistics and systems biology from a clinical point of view by explaining molecular applications with accessible human studies featuring a comprehensive table of contents it includes chapters from genomics and epidemiology surveillance to transcriptomics and alternative splicing principles across 17 well organized chapters this book meets attempt to explain easily to clinicians and students with basic principles of the genetics genomics molecular biology and its applications to epidemiology and public health the text is distinct from other literature on the market because it covers useful genomic tools applied in epidemiology for clinicians who may not be experts in this branch of health science principles of genetics and molecular epidemiology demystifies the idea that biomedicine is far from being applied in both epidemiology and clinical practice

this monograph reviews the epidemiological demographic and biological basis of population models of human mortality these investigations were motivated by the desire to better understand the regularities of survival processes among adults especially at extreme late ages where empirical data is currently limited the monograph discusses biological mechanisms which shape the age patterns of mortality the effects of an individual health state susceptibility to diseases and death or physical frailty on changes in late age survival are also investigated

the past forty years have been the stage for the maturation of mathematical biology as a scientific field the foundations laid by the pioneers of the field during the first half of this century have been combined with advances in applied mathematics and the computational sciences to create a vibrant area of scientific research with established research journals professional societies deep subspecialty areas and graduate education programs mathematical biology is by its very nature cross disciplinary and research papers appear in mathematics biology and other scientific journals as well as in the specialty journals devoted to mathematical and theoretical biology multiple author papers are common and so are collaborations between individuals who have academic bases in different traditional departments those who seek to keep abreast of current trends and problems need to interact with research workers from a much broader spectrum of fields than is common in the traditional monoculture disciplines consequently it is beneficial to have occasions which bring together significant numbers of workers in this field in a forum that encourages the exchange of ideas and which leads to a timely publication of the work that is presented such an occasion occurred during january 13 to 16 1990 when almost two hundred research workers participated in an international conference on differential equations and applications to biology and population dynamics which was held in claremont

domestic livestock in africa are of importance not only as a source of milk and meat but also as a source of animal traction enabling farmers to cultivate larger areas with crops providing the

staple foods trypanosomosis a parasitic disease transmitted cyclically by the tsetse fly *glossina* spp is arguably still the main constraint to livestock production on the continent preventing full use of the land to feed the rapidly increasing human population sleeping sickness the disease caused in humans by species of *trypanosoma* is an important and neglected disease posing a threat to millions of people in tsetse infested areas often wrongly thought of as a disease of the past the prevalence of human sleeping sickness is increasing in many areas although alternative methods to control the disease are being investigated such as immunological approaches use of chemotherapy or exploitation of the trypanotolerance trait it is only control or eradication of the tsetse fly vector which will remove the threat of the disease rather than providing a better means of living with it as a result of the economic impact of tsetse transmitted trypanosomosis a large amount of research literature has been produced this book provides a comprehensive review of this literature the text is divided into four parts tsetse biology and ecology epidemiology vector control and control of trypanosomosis the book is invaluable for medical and veterinary entomologists parasitologists and epidemiologists

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