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Uniquely written for microbiologists who use statistical models  
and for modelers focusing on microbial ecology

# MODELING THE ENVIRONMENTAL FATE OF MICROORGANISMS

Edited by Christon J. Hurst

*U.S. Environmental Protection Agency, Cincinnati, Ohio*

The movement and survival of microorganisms in the environment, whether infectious contaminants or beneficial GEMs, is a topic of vital importance to scientists in many fields, including pollution and public health research, wastewater treatment and disinfection, plant pathology, soil science and geology, bioremediation, and applied microbiology and virology. Mathematical modeling is an essential tool in all of these areas. Well-constructed statistical models can help to describe and predict microbial transport and die-off, to quantitate factors controlling viral and bacterial transport, and to evaluate methods for microbial inactivation or disinfection.

This book is a unique synthesis, written both for microbiologists interested in the application of statistical models to their work and for engineers and statisticians who have little experience in microbiology. Its five sections present not only microbiological studies but also their mathematical assessment; not only equations and statistical tools, but the theory behind them. Models of microbial behavior, movement, and survival in the subsurface and groundwaters, in the open on foliage and other surfaces, and under various disinfection conditions are introduced and evaluated by the authors, who represent a wide cross-section of the disciplines concerned with environmental microbiology.

The book's broad scope and unique combination of theory and practice will make it invaluable to almost every investigator of microbial ecology and the environment.

## CONTENTS

### I. WHAT, HOW, AND WHY?

1. Background and Practical Applications of Microbial Ecology (*Updegraff*)

### II. FATE IN THE SUBSURFACE WORLD

2. Problems with Using Existing Transport Models To Describe Microbial Transport in Porous Media (*Dickinson*)

3. Modeling Microbial Transport in the Subsurface (*Yates and Yates*)

4. Quantitation of Factors Controlling Viral and Bacterial Transport in the Subsurface (*Gerba et al.*)

5. Parameters Involved in Modeling Movement of Bacteria in Groundwater (*Harvey*)

6. Use of Models To Predict Bacterial Penetration and Movement within a Subsurface Matrix (*McInerney*)

### III. FATE IN THE SURFACE WORLD

7. Using Linear and Polynomial Models To Examine the Environmental Stability of Viruses (*Hurst*)

8. Development of Models to Explain the Survival of Viruses and Bacteria in Aerosols (*Mohr*)

9. Models for the Survival of Bacteria Applied to the Foliage of Crop Plants (*Knudsen*)

### IV. DISINFECTION

10. Virus Inactivation by Disinfectants (*Vaughn and Novotny*)

11. Model of *Giardia lamblia* Inactivation by Free Chlorine (*Clark*)

### V. BIOFILMS

12. Background and Models for Bacterial Biofilm Formation and Function in Water Distribution Systems (*Olson et al.*)

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**Edited by John C. Cambier**

Immunologists agree that one necessary precursor to intelligent therapeutic intervention in immunologic diseases is a full understanding of the means by which ligands and their receptors engage in the transduction of signals across the plasma membrane, with subsequent alteration of gene expression.

This book provides readers with a convenient summary of the current state of research in this area. It features contributions from leading investigators on the role of physiologic ligands including immunogens, major histocompatibility complex class I and class II molecule-associated peptides, and lymphoid cell-associated ligands.

**CONTRIBUTORS:**

Thomas Barrett, Stephen H. Benedict, Anna T. Brini, John C. Cambier, Kerry S. Campbell, Marcia A. Chan, Marcio Chedid, Edward A. Clark, William L. Farrar, Terri H. Finkel, Erwin W. Gelfand, Lisa K. Gilliland, Angelika Grossmann, Louis B. Justement, David J. Kelvin, Ralph T. Kubo, Peter J. L. Lane, Jeffrey A. Ledbetter, Diana Linnekin, Peter E.

Lipsky, Fiona McConnell, Kathryn E. Meier, Dennis F. Michiel, Steven B. Mizel, John G. Monroe, Peter S. Rabinovitch, Neal Roehm, Vicki L. Seyfert, Fumihiko Shirakawa, E. Charles Snow, Judy B. Splawski, Mary A. Valentine.

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# **IDIOTYPIC NETWORK AND DISEASES**

**Editors: Jan Cerny and Jacques Hiernaux**

Since Nobel Laureate Niels Jerne postulated that the immune system is an idiotypic—a self-specific—network, controversy has surrounded this concept which is frequently either overstated or oversimplified. This new book provides a balanced view of the subject and will find an enthusiastic response among immunologists, immunopathologists, and infectious disease specialists.

Two introductory chapters discuss the evolution of antibody idiotypes and current concepts of the idiotypic network. These are followed by seven chapters contributed by leading scientists in the areas of viral infections, autoimmunity, allergy, tumor immunology, mycobacterial infections, and bacterial infections. The result is a balanced perspective on a controversial area of immunology, particularly regarding the issue of autologous activation of the idiotypic network.

**CONTENTS**

**1.** Ontogeny of the Antibody Repertoire (Weido, Jacob, and Kelsoe); **2.** Concept of Idiotypic Network: Description and Functions (Cerny and Hiernaux); **3.** Viral Infections (Gaulton and Weiner); **4.** Occurrence, Roles, and Uses of Idiotypes and Anti-Idiotypes in Parasitic Diseases (Colley); **5.** Anti-Idiotypic Antibodies to Bacterial Capsular Polysaccharides (Westerink, Muller, and Apicella); **6.** Idiotypic Markers of the Immune Response to Mycobacterial Antigens (Ivanyi); **7.** The Idiotypic Network and Immediate Hypersensitivity (Saint-Remy); **8.** Idiotype in Autoimmunity (Zanetti, Dovezenski, Lenert, and Sollazzo); **9.** Modulation of Antitumor Immunity by Anti-Idiotypic Antibodies (Wettendorff, Koprowski, and Herlyn).

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