

# **SpringerBriefs in Public Health**

For further volumes:  
<http://www.springer.com/series/10138>

Niraj Kumar

# Biogeogens and Human Health

 Springer

Niraj Kumar  
Science and Society Division  
Institute of Applied Sciences (IASc)  
Allahabad  
Uttar Pradesh  
India

ISSN 2192-3698                      ISSN 2192-3701 (electronic)  
ISBN 978-81-322-1083-2            ISBN 978-81-322-1084-9 (eBook)  
DOI 10.1007/978-81-322-1084-9  
Springer New Delhi Heidelberg New York Dordrecht London

Library of Congress Control Number: 2013938753

© The Author(s) 2013

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law. The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

# Foreword

The sustenance and renewal of life in an ecosystem depends mainly on two factors, energy cycling and nutrient flow. Nitrogen cycle and nitrogen fixation are perhaps the best examples of nutrient cycling. Nutrient cycling involves elements moving to/from biotic and abiotic factors in the ecosystem. Energy movement through food chain in biotic factors is an important example of energy flow. Energy is either transformed or conserved.

Plants and some other organisms convert solar energy to chemical energy via photosynthesis which occurs in two parts: light-dependent reactions and dark reactions. The light-dependent reaction happens when solar energy is captured to make adenosine triphosphate (ATP). The dark reaction happens when the ATP is used to make glucose (the Calvin Cycle). Chlorophyll on irradiation with sun light forms antenna complexes which transfer light energy to one of two types of photochemical reaction centers: P<sub>700</sub>, which is part of Photo-system I, or P<sub>680</sub>, which is part of Photo-system II. Excited electrons are transferred to electron acceptors, leaving the reaction center in an oxidised state.

The role played by an organism in its environment is defined as “Niche” in Ecological Biology. A niche may also encompass how the organism interacts with other living things or biotic factors, and also with the non-living, or abiotic parts of the environment as well. All living organisms have a fundamental niche. This is all of the possibilities available for the organism to take advantage of. All possible sources of food, all open roles in the environment, and any suitable habitat is included in a fundamental niche. Any organism does not use all the available resources at the same time. Rather it uses in a very narrow range. This more specific role is called the organism’s realised niche. Abiotic factors, such as water availability, climate, weather, and in the case of plants, soil types, and amount of sunlight can also narrow a fundamental niche to a realised niche. An organism can somewhat adapt to its environment, but the basic needs must be met first in order for them to have time to find their niche.

Abiotic disorders can influence biotic disorders and vice versa. Biotic and abiotic factors are closely linked in an ecosystem. The environment affects the human health in a big way. People tend to be most susceptible to illness when physically or mentally stressed. Stress, energy and immunity form a closely knit network.

The author in the present book has brought out this intricate concept of interdependence of biotic (living) and abiotic (non-living) factors in an ecosystem, resulting in an impact on human health, in an explicitly marvelous manner. As a result a new word “Biogeogens” has been coined, “bio” for living (biotic), “geo” for non-living (abiotic/geographical/climatic/environment) and “gens” for the interactive proceeds of the two. For the ambience embedded with clarity with which the author has explained the flow of energy cycle through these two important factors, “biotic” and “abiotic” and how it influences human health is praiseworthy. I congratulate the author for this Herculean task and hope that readers will find the book useful and interesting.

Prof. Krishna Misra, FNASc  
Coordinator, Indo-Russian Centre for Biotechnology  
Indian Institute of Information Technology, Allahabad  
NASI-Senior Scientist, CBMR-SGPPI, Lucknow  
General Secretary, The National Academy of Sciences, India

# Preface

The WHO data on the burden of diseases suggest that approximately 80 % health problems in rural parts of the India are due to communicable diseases like diarrhea, typhoid, cholera and infective hepatitis etc. Only diarrhea kills approx. 6 lakhs children in India every year. Morbidity and mortality due to malaria are the major public health concerns with around two million cases reported annually; Filaria, T.B., Measles, Flu and worm infestations add further burden. The 50 % of health budget is spent in tackling health impact of disease related to water pollution as vector of communicable diseases in India. Therefore, preventive and promotive health care mechanisms are must to improve the situation.

Realising this very fact, the Institute of Applied Sciences, Allahabad, India, actively involved in the application of scientific know how for the betterment of society has undertaken many research projects to evaluate the geography of health of suburban and rural population in and around Allahabad. The guiding principles to conduct these projects were mainly inspired by the studies of Prof. Rais Akhtar, a noted medical geographer and an eminent scientist of this country. But, the author further analysed several other factors affecting human health, based on his participatory observations done to evaluate the nutritional requirements, water intake, food habits and associated taboos, disease condition and health status of the population under study. Finally, on the basis of the years of strenuous and methodological studies done under the guidance of the author and involving the researchers Prasanna Ghosh and Vartika, a Dogma of Biogeogens has been postulated by the author—which could be helpful for the future scope of research in this field as well as to cast out many doubts in effective management of human health.

From Author's Pen

# Acknowledgments

I deem it to be my proud privilege to take this opportunity to pay my deepest regards and gratitude to the past Presidents of the National Academy of Sciences, India (Hon'ble Prof. A. K. Sharma and Prof. Manju Sharma) and the present President (Hon'ble Dr. K. Kasturirangan) of the Academy; and the Institute of Applied Sciences, Allahabad (Dr. B. P. Agrawal), for their continuous support, inspiration and encouragement that has made this work possible.

I also acknowledge a deep sense of gratitude to Hon'ble Prof. V. P. Sharma (Past President, NASI) and Prof. Krishna Misra (General Secretary, NASI), whose noble guidance, valuable suggestions and advice always helped me to move in a right direction, and do something meaningful to the service of science and society.

It is my genuine abiding desire and great pleasure to express my most sincere thanks to my colleagues Dr. K. P. Singh, Vice-President of IASc, Allahabad, and Dr. Ashwani Kumar, IFS, Former Director, Forest Research Institute, U.P., for their kind support throughout the period of the work.

I express my foremost thanks to my beloved researchers—Prasanna Ghosh, Vartika and Fatmatuz Zohra, for their keen interest in the research projects and carrying out the studies with full devotion and dedication, due to which I could prove my hypothesis.

In the end, my sincere thanks to Dr. Mamta Kapila and Sri Aninda; and all my love, affection and good wishes to my heartiest friends and family members for their helpful and cooperative nature and attitude, especially to my lovely better half and three kids—Aashu, Apaarna and Twinkle.

With all my best regards to my parents (Mother—Smt. Dharmashila Srivastava and Father—Late Shri K. P. Srivastava).

From Author's Heart

# Contents

<b>Biogeogens and Human Health</b> . . . . .	1
Introducing the Concept of Biogeogens . . . . .	1
References . . . . .	5
<b>Dogma of Biogeogens</b> . . . . .	7
References . . . . .	9
<b>Establishing the Concept of Biogeogens</b> . . . . .	11
References . . . . .	32
<b>Appendix A</b> . . . . .	37
<b>Appendix B: Standard Methodologies Followed</b> . . . . .	57
<b>About the Book</b> . . . . .	75