

**PARASITES  
OF  
HEALTH**



**PARASITES  
OF  
HEALTH**

**ON THE  
PATHOPHYSIOLOGY  
AND  
MODE OF COMMUNICATION  
OF  
NON-COMMUNICABLE DISEASES**

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Front cover images: *Taenia* egg left, *Toxocara* egg right. Credit to the Centers for Disease Control and Prevention's Division of Parasitic Diseases and Malaria (CDC-DPDx) and to the Oregon Public Health Laboratory.

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Notice: The book explores the probable aetiology and pathophysiology of non-communicable diseases. The hypotheses suggested need to be verified before the treatment suggested in this book can be incorporated into medical practice. It is the responsibility of practitioners, on the basis of their own experience and knowledge, to make diagnoses, determine the best treatment for each patient, and take all appropriate safety precautions. The publisher, author, and editor assume no legal liability for any injury or damage resulting from the use or application of any products, methods, or ideas presented in this book.

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## DEDICATION

### Til Mette

Som et rolig vindpust  
med orkan styrke.  
Det er deg.

Du river meg overende  
og aldri har jeg stått stødigere.  
Du åpner dører jeg aldri har sett  
til rom jeg ikke visste fantes.

Fanget i dine armer  
Har jeg aldri følt meg så fri.

### To Mette

Like a quiet breath of wind  
with the power of a hurricane.  
That's you.

You pull me down  
and never have I been standing more steady.  
You open doors I've never seen  
into rooms I didn't know existed.

Caught in your arms  
I have never felt so free.



If it is terrifying to think that life may be at the mercy of the multiplication of infinitesimally small creatures, it is also consoling to hope that science will not always remain powerless before such enemies. . . . All is dark, obscure and open to dispute when the cause of the phenomena is not known; all is light when it is grasped.

— LOUIS PASTEUR (1822–1895)





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## Preface

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An imaginative conception of what *might* be true is the starting point of all great discoveries in science.

Peter Medawar (1915–1987)

False facts are highly injurious to the progress of science for they often endure long; but false hypotheses do little harm, as everyone takes a salutary pleasure in proving their falseness; and when this is done, one path toward error is closed and the road to truth is often at the same time opened.

Charles Darwin (1809–1882)

As a physicist, I wonder why it is that biology and medicine seem to have so few new theories.

Murray Gell-Mann in 2012

My initial intention with the work presented in this book was only to unravel the aetiology of chronic fatigue syndrome/myalgic encephalomyelitis, commonly abbreviated as CFS/ME. However, the clinical reasoning that made me unravel the very probable family of microorganisms that are involved in the causation of CFS/ME turned out to be so fertile that I continued reasoning far beyond my initial intention. As a result, I have ended up writing a book about the probable aetiology of a number of so-called non-communicable diseases.

The book consists of five parts. The first part describes the problem-solving process that I used to unravel the aetiology of CFS/ME. I started my endeavour during the summer of 2006 and reached a preliminary microbiological conclusion during the autumn of 2008. Since then I have reconsidered and refined the conclusion several times and accumulated circumstantial evidence about *Taenia* larval tissue infection (LTI), with a non-human definitive host as the highly probable fundamental aetiological cause of CFS/ME. The circumstantial evidence consistent with this conclusion comprises the rest of the first part of the book.

During the work of reading, writing, and thinking, combined with observing, examining, and communicating with patients on a daily basis, it was impossible for me to avoid thinking that CFS/ME might not be the only disease caused by this family of microorganisms. In fact, it would have been improbable for the microbiological

agent causing CFS/ME not to cause any other disease entities. Just as the tubercle bacillus proved to be the cause of a number of disease entities, the family of microorganisms that causes CFS/ME probably causes a number of other diseases as well.

The second part of the book is a primer on aetiological thinking on diseases with still unknown aetiology. This section is a theoretical analysis based upon existing biomedical knowledge—a sort of “meta-analysis” of what we actually know about the aetiology of diseases and the potential candidates that may cause diseases with still unknown aetiology. It may be categorized as “theoretical medicine” or “science-fiction medicine” depending on the reader’s evaluation. Whatever the reader’s evaluation might be, the purpose is to trigger thinking about the biomedical aetiology of diseases with still unknown aetiology.

With the view that Louis Pasteur’s “germ theory of disease” should be revived regarding non-communicable diseases, and inspired by the Standard Model of particle physics, I propose a Standard Model of medicine:

*The deterministic cause of all physical and psychiatric diseases is microorganisms, except for some already known genetically determined disorders, prions, physical injuries, harmful chemical substances, and radiation, as long as the body’s metabolic needs are met. The expression of disease is the result of the interaction between the microorganisms, the immune system, and the tissues involved. Susceptibility to disease may be increased as a result of genetic predisposition of the immune system, or manipulation of the immune system by infections.*

My main assertion is that the “goddamn particle” or microorganism causing so-called non-communicable diseases is actually helminth infections, that is to say, taeniid and *Toxocara* LTI, with canine and feline predators as the definitive hosts. These infections are not communicable directly between humans, but are transmitted to humans by faeces from these animals. The infectious reservoirs most important to humans are probably domestic dogs and cats, which—in analogy to the Trojan horse—introduce the infectious helminth eggs to humans who accidentally ingest the eggs. The potential impact of dog and cat helminth zoonoses has been consistently neglected in medical science and increasingly ignored in western lifestyle, as reflected by the advancement of the dog from the doghouse in the garden to the family bed.

The third part of the book presents the result of my efforts to apply Occam’s razor to construct a pathophysiological model of taeniid and *Toxocara* LTI that may explain the development of a number of diseases. This model is principally based on disturbances of the immune system due to helminth tissue infection, disturbances due to a localized metabolic acidosis caused by the helminths’ fermentative energy metabolism, disturbances of the hormonal environment, and disturbances due to the mechanical impact of helminth cysts and resulting granulomas and calcifications. By these principally simple mechanisms, the model may explain the pathophysiology of a number of so-called non-communicable diseases. I propose disease aetiology hypotheses that together may explain more than a hundred of these diseases.

The pathophysiological model of taeniid and *Toxocara* LTI may also fill some gaps in the discussion about nature and nurture that cannot be explained by genetic, lifestyle, or environmental risk factors alone. The third part concludes with suggestions about studies that can be done to test some of the disease aetiology hypotheses.

In the fourth part of the book, I make the assertion that helminth infections in general are the most important causes of ill health globally partly because of the diseases themselves and partly because of the consequences of impaired innate and adaptive cellular immune responses induced by helminth infections when the individual is challenged by viral, bacterial, and protozoan infections. Globally, a number of medically recognized helminth infections affect billions of people living in poverty. These infections probably contribute to increased susceptibility to infections, increased contagiousness, decreased response to antibiotic treatment, development of drug resistance, impaired response to vaccines, and increased risk of emerging diseases. These effects are detrimental to helminth-infected individuals and to the societies that they are a part of. But the development of drug resistance and emerging diseases puts the health of the rich part of the world at risk as well. Therefore, it is in the interest of the rich part of the world to combat and prevent helminth infections worldwide.

The fifth and last part of the book deals with what to do. First, it is about treatment and prevention of taeniid and *Toxocara* helminth infections and what is needed to combat them. Second, it is about what I think should be the future directions of medical research.

In accordance with the pathophysiological model of taeniid and *Toxocara* LTI, I suggest a number of hypotheses regarding the aetiology and development of a number of different diseases. However strange and speculative the reader might find the hypotheses to be, they all have the great advantage of being falsifiable. To propose falsifiable hypotheses regarding a great variety of diseases based on rather limited medical evidence may not be advisable and will make me an easy target. I realize that I have to be prepared to be met with initial ridicule, assault, dismissal, or silence by my medical colleagues. Hostile responses will, I hope, have a scientific basis and be motivated by a wish to advance medical science. However, my hypotheses may undermine the authority and financial interests of parts of the establishment, and therefore some hostile responses may masquerade as being scientifically motivated. The response I sincerely hope for is something like this: "The hypotheses presented in this book seem reasonable enough to be tested before they are dismissed." Considering the history of medical discoveries, however, it may be too much to hope for.

Even if the reader takes an unprejudiced attitude to my hypotheses, it may be difficult for him or her to seriously consider that tissue helminth infections could have a significant impact on health in the rich part of the world. I can assure the reader that, even for me, such a conclusion was unthinkable when I started my search for the infectious cause of CFS/ME. However, the conclusion turned out to be unavoidable when I applied the same thinking as that of Sherlock Holmes, a character created by our colleague Sir Arthur Conan Doyle, as expressed in his famous quote "when you have eliminated the impossible, whatever remains, *however improbable*, must be the truth." Overcoming belief bias is arduous but absolutely essential in the pursuit of science.

My ultimate goal became little by little to unravel the aetiological causes of non-communicable diseases. Reaching this goal is fundamental to allowing medical clinicians to help patients who are suffering from these diseases to live as healthy lives as possible and to prevent these diseases in future generations. I realize that I cannot reach such a goal without risk of making mistakes. Furthermore, I realize that the initial response to my suggestions from my medical colleagues, positive or

negative, proves nothing. Only testing of my hypotheses will prove whether they—or which of them—are right or wrong.

The concept that diseases with still unknown aetiology are “non-communicable” shares some fundamental similarities with the old belief in “spontaneous generation” of life: it is based on speculation alone, it functions as a mere excuse to cover processes we do not yet understand, and it holds back the development of biology and medicine. Somewhat rhetorically, one might say that the belief in non-communicable diseases is a belief in spontaneous generation of diseases, though influenced by certain risk factors. I think time is long overdue to examine whether diseases with still unknown aetiology are infectious or not. The driving force that caused the gradual abandonment of the concept of spontaneous generation of life was experimental biomedical research. Similarly, if the concept of non-communicable diseases shall ever be abandoned, it will also be by experimental biomedical research.

This book is a compromise between my ambition to develop and refine highly reasonable hypotheses about the pathophysiology of dog and cat helminth zoonoses in human disease and the necessity of communicating the hypotheses to the medical community for verification or falsification. I could have continued for years to expand and refine the hypotheses but—however reasonable the hypotheses might be—I do not have the resources needed to test them. I have therefore had to limit my ambition to develop biomedical hypotheses and present evidence consistent with them in a way that is reasonable enough to be taken seriously by unprejudiced medical colleagues. In this way, I could say the same about my hypotheses of non-communicable diseases that John Snow said about his hypothesis of cholera in 1849: “These opinions respecting the cause of cholera [*non-communicable diseases*] are brought forward, not as matters of certainty, but as containing a greater amount of probability in their favour than any other, in the present state of knowledge.”

All of the references in this book are highly recommended reading and will bring you insights of great importance. Among the many references, I will especially recommend two very important books published by the not-for-profit science-based development and information organization CABI. Each of them addresses parasitology of underestimated medical relevance. The first book is *Taenia Solium Cysticercosis: From Basic to Clinical Science*, edited by Gagandeep Singh and Sudesh Prabhakar. The second one is *Toxocara: The Enigmatic Parasite*, edited by Celia V. Holland and Huw V. Smith.

Another most important book is *International Health and Aid Policies: The Need for Alternatives*, written by Jean-Pierre Unger, Pierre De Paepe, Kasturi Sen, and Werner Soors. The book, or at least its introduction, should be compulsory reading for politicians and bureaucrats who sincerely want to promote the health and wealth of the populations they are supposed to serve.

Among the many article references, I will especially highlight the paper of Peter J. Hotez, David H. Molyneux, Alan Fenwick, Eric Ottesen, Sonia Ehrlich Sachs, and Jeffrey D. Sachs from 2006: “Incorporating a Rapid-Impact Package for Neglected Tropical Diseases with Programs for HIV/AIDS, Tuberculosis, and Malaria.” The paper emphasizes the biological and immunological interactions between different chronic infectious diseases, arguing that helminth diseases must be prevented and treated to successfully fight malaria, tuberculosis, HIV/AIDS, and poverty.

Finishing the writing of this book coincides with the bicentenary of the birth of John Snow (1813–1858). His excellent biography, authored by Vinten-Johansen, Brody, Paneth, Rachman, and Rip, explains the fundamental importance of John Snow’s



clinical reasoning regarding the probable modes of communication of cholera. This lesson was very helpful to me when I searched for the unknown infectious agent causing CFS/ME in humans. Even though there are many differences between cholera and the so-called non-communicable diseases, the faecal-oral mode of communication is principally similar, though the latter diseases involve non-human species as the infectious source. The subtitle of my book is therefore inspired by the title of John Snow's publications from 1849 on his elegant reasoning and studies of cholera.

Please read the book in your hands *and* the references, use your own intelligence, and allow yourself to adopt independence of mind! If you are in a position to test my hypotheses, I would be most grateful if you will do so. And if you are in a position to do something to prevent the transmission of helminth infections worldwide and you seize the opportunity to do so, people who are now living—as well as future generations—will accomplish healthier lives.

Oslo, August 2014  
Torgeir Landvik



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I would like to express my deep thanks to many individuals and institutions of Norwegian society; without them, this work would never have been initiated or have reached the level of insight presented in this book. First and most of all, I thank each patient I have met during my 34 years of general practice in Enebakk for what I have learned from them. I am especially grateful for the confidence shown by a small group of patients who listened to me and read handouts about my new theories regarding their diseases, and who were willing to try the anthelmintic treatment as a diagnostic method on the basis of these theories. I have done my best to deserve their confidence and support, and writing this book is part of that endeavour.

For 27 years, I worked as a general practitioner without ever thinking seriously about doing anything other than what a general practitioner is expected to do. During these years, I was distressed by the ignorant way that patients with chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME) were treated by the health care system and by my own inability to offer these patients adequate treatment for their perceived illnesses. Even though I experienced an increasing distrust about modern medical research, it never occurred to me that the development of medical knowledge could be done by anyone other than professional medical researchers. However, my beloved professor Mette Gulbrandsen opened my eyes to the possibilities in analysing subjective information from patients as an alternative to counting, measuring, and producing p-values to gain new insights. Equally important was that she was sowing seeds of curiosity in me, which was a prerequisite to my ever thinking that I could do the work myself to gain new medical insights. Without her influence, this work would never have been initiated.

In 2006, I attended a conference at the Norwegian Knowledge Centre for the Health Services regarding the publication of a newly released Norwegian report about CFS/ME. All of the speakers at the conference, except for one, expressed that we actually know next to nothing about the pathogenesis or effective treatment of CFS/ME. The singular exception was neurologist Harald Nyland from Haukeland University Hospital of Bergen, who claimed that he knew that CFS/ME was caused by a physical disease in the central nervous system, even though he did not have any definite evidence to confirm the assertion. His statement inspired me, as his claim seemed to be correct because it was the only way to explain the symptoms seen in patients with CFS/ME. Furthermore, I am grateful to Peter Gaustad, professor of microbiology, and Olav Øktedalen, specialist in infectious diseases at the University Hospital of Oslo, for help regarding some microbiological tests and insightful discussions on microbiology.

One of the conditions for my work is knowledge about the biology of living creatures of all sizes. I therefore express my sincere gratitude to medical and veterinary scientists who have procured this knowledge during the last two centuries. However, without free access to it, I would have been unable to try to increase our common knowledge. For the acquisition of specialized medical knowledge, I owe a debt to several institutions of Norwegian society that provided universal access to knowledge. The Norwegian Electronic Health Library, which offers free access to more than 2000 medical journals for all medical doctors everywhere in Norway, and the free medical and veterinary libraries of the University of Oslo have all been invaluable to me. Last, I am deeply grateful to the Labour Party politicians who instituted the welfare system of Norway, providing universal access to higher education and good quality health care independent of social and economic background. These qualities of Norwegian society made it possible for me to get an education and a job that enabled me to do the work outlined in this book.