



NeuroImmune Biology

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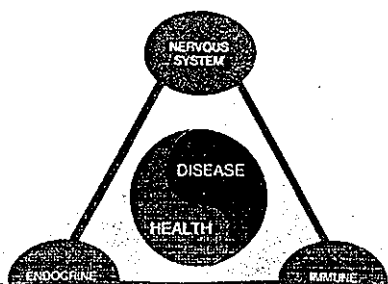
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Natural Immunity

Volume Editors

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Foreword

Susceptibility and resistance to disease have been known to people since prehistoric times. Catastrophic epidemic diseases in medieval times provided ample evidence for both of these concepts. Environmental effects were also identified as one of the factors that affect resistance to disease. The expression "catching a cold" refers to this association. Pasteur made observations between the relationship of chicken cholera (pasteurellosis) and the weather and Koch examined the effect of swimming in cold water on the susceptibility of chickens to anthrax [1]. Mediaeval shepherds knew that if they saved the scabs from pox lesions and inoculated young animals with this material, the disease could be prevented. Jenner and Ehrlich popularized this knowledge and the concept of *adaptive immunity* was born [2]. However, it was clear from numerous examples that adaptive immunity was not fully responsible for resistance to disease. With the advent of virology, it became apparent that there is *species specific resistance*. This means that a particular virus cannot cause disease in some host species but it could do it in other species. This is also true for bacteria, but the host-restrictions are often not as strict as for viruses. It was also obvious that healthy animals and human beings do demonstrate *nonspecific resistance* to infections and a number of other insults, which may be caused by diverse noxious agents. The term "nonspecific" was adopted in relation to adaptive immunity, which is antigen specific. Hans Selye described a syndrome elicited by diverse noxious agents [3], which he later named the *stress response* that resulted in elevated resistance to countless *stressors*. Physical, chemical, biological and in man even emotional agents could act as stressors. During the stress response the hypothalamus pituitary adrenal axis was activated, the thymus exhibited a profound shrinkage, atrophy of lymphoid organs and immunosuppression also occurred, except for gamma globulin, which was elevated. Stressed animals showed increased resistance to numerous noxious insults, and this was named by Selye the *general adaptation syndrome* [4]. Selye knew that in some way he was dealing with the immune system, but it was not possible to understand in those days the mechanisms involved. All that immunologists could see at the time was that the thymus was involuted and adaptive immunity was seriously suppressed or even eliminated by stress. This was in sharp contrast with Selye's conclusion that the stress response was an adaptive defence reaction.

In this book the natural immune system is presented. Its relationship to the adaptive immune system, the neuroendocrine system and to the entire host organism is discussed. This is the system we are born with and it will be with us for life. Most species of the animal kingdom rely on this immune system as the adaptive system is found only in vertebrates. The natural immune system protects us not only from infectious agents, but also from various noxious agents, and during acute danger, this system kicks into high gear, which manifests in febrile illness. In contrast with the commonly held perception, fever is a defence reaction, called the *acute phase response*. It is a very successful defence response as most people with febrile illness recover and become healthy again. The natural immune system also plays important *physiological roles* as presented in this volume. Clearly this is an incredibly effective system, which protects us practically from any kind of insult, and it is able to increase our resistance with unparalleled efficiency. Innate immune mechanisms are deeply embedded in our development and physiology.

This system provides the foundations for the adaptive immune system, which could not function or even exist without our innate system. There is little doubt that the recognition and appreciation of this system is a major milestone in Biology and is a perfect topic to be presented as volume 5 of Neuroimmune Biology.

István Beczi, Lóránd Bertók, Donna Chow

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Preface

Natural immunity is commonly considered to refer to the first line of host defence against microbial pathogens which provides protection before the development of the adaptive immune response. However the recent progressive explosion in molecular, cellular, animal and human research which has dramatically expanded our concept of the natural immune system and its functions, has been captured in this volume. Natural immunity is presented in its broadest terms focusing on the incredible richness in cellular and humoral mediators, their evolutionary origins in ancient times, their intimate interaction with the neuroendocrine system and their unquestionable ability to provide an interactive and multilayered defence against pathogenic invasion all of which must also be considered in the context of their less well acknowledged physiological roles in essential, complex biological processes. The aim of this volume is to mark the significant expansion in our understanding of the scope of natural immunity in order to strengthen the rational basis for both fundamental and applied research on the natural immune system.

Donna A. Chow

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