ASPECTS OF MODERN IMMUNOLOGY

During the recent dozen or so years we have been observing a fascinating development of some branches of immunology. This happened owing to the application of extremely sensitive biochemical, biophysical and immunochemical methods as well as genetic engineering techniques to the investigation of various processes contributing to the organism's immunity to pathogens. The moment of molecular recognition, resulting in the formation of a unique bi- or multimolecular complex possessing a certain stability in particular spatial and temporal dimensions, plays a very important role in almost all of those processes. Incorrect molecular recognition in the immune processes has a critical effect on the organism and leads to severe pathologic conditions and sometimes to death.

The purpose of the present issue is to acquaint the readers with the latest achievements in research on the mechanisms underlying the organism's immunity, and to provide a review of the most important problems of modern immunology.

The immune system, which consists of various cell types (T and B lymphocytes as well as antigen-presenting cells), and of a wealth of protein molecules, protects the organism against intracellular and extracellular pathogens, as well as against any changes in the cells which might be harmful to the organism. The pathogens may be viruses and bacteria proliferating inside the cells, extracellular bacteria and parasites, and their toxins. In the case of intracellular pathoghenic changes, the defensive function is assumed by cytotoxic T lymphocytes, which neutralize the infected or modified cells. The defensive role in respect of extracellular pathogenic changes, ie. those occurring in the intercellular space or in the extracellular fluids, is played by antibodies released by B lymphocytes as a response to activation by helper cells.

Antibodies demonstrate a unique capability for specific recognition of their antigens, i.e. those antigens, for which their synthesis was initiated. They recognize their antigen among numerous other proteins, form a complex with it and initiate a series of nonspecific immune response mechanisms. Among the latter, the activation of complement system factors should be mentioned as well as stimulation for secretion of substances with chemotactic activity, i.e. directing the movements of cells so that they could aggregate at the site of infection and neutralize the pathogen by phagocytosis.

To be able to fulfill those defensive tasks, the immune system has been equipped with mechanisms allowing for the recognition of an enormous variety of antigens, and, what is most important, for their differentiation from the endogenous ones. Most of the papers comprising the issue present various aspects of this problem. The first two articles describe the elements of the reaction of molecular recognition of an antigen by the components of the immune system. On the basis of protein antigens, the regions of the molecule

which may form an epitope, i.e. a strictly defined region of the molecule directly involved in forming the complex with the paratope — an antigen-binding site present on the antibody molecule — were described for the first time (E. Lisowska). A comprehensive analysis of the structure of the antigen epitope provides not only information concerning the mechanism of the formation of a complex by this antigen and its antibody, but also concerning the structure of the protein itself. Antibodies with well known complex-forming characteristics are very useful as so-called molecular probes, detecting changes in the structure or determining the region constituting the epitope. They are also used to investigate the regions localized on the cell surface or inside the cell, or to recognize the receptor sites. The subsequent paper discusses the process of induction of the immune response in its all complexity, with particular emphasis on the mechanism of presentation and recognition of the antigen (W. Ptak). The differentiation between foreign antigens and the own cells of the organism occurs at this stage. It is possible owing to the proteins of the main histocompatibility complex (MHC), also referred to as transplantation antigens. Their structure and mechanism of action mentioned in brief by Professor W. Ptak, have been described in detail in the next paper by P. Kuśnierczyk.

Performing the function designed for the immunoactive cells requires their great motility, as well as directed circulation between the systems of blood and lymphatic vessels (A. Górski). Migration of cells, and their penetration through the vascular walls in particular, are possible owing to the presence of receptors belonging to the integrin family, which recognize the various components of the extracellular matrix. The function performed by integrin receptors in the immune processes consists in making possible not only adhesion and migration of the cells, but also their specific aggregation. The adjunctive role of these receptors in the formation of specific complexes by T lymphocytes has been mentioned in the paper by Professor W. Ptak.

Inactivation of the pathogenic factors acting extracellularly is mainly conducted by antibody molecules. Their structure, great variety, the genetic mechanism responsible for their synthesis, and their biological activity have been dealt with in two subsequent papers (W. Rudnicka, M. Janusz). Despite the same aim of these works, they are complementary to each other, because of different approaches to characterizing the antibody molecules. The next three papers (H. Długońska and W. Rudnicka, J. Salwa, W. Rudnicka and M. Chmiela) are also concerned with antibodies. Since monoclonal antibodies are obtained using a particular method of selection, they represent a population of immunoglobulin molecules with an identical structure and specificity of binding the antigen epitope. Owing to these characteristics and the possibility to obtain large quantities of homogeneous preparations, monoclonal antibodies have been commonly applied in various fields of biological and medical research. They provide a valuable tool for the analysis of various

proteins, detection of their modifications, blocking their functions, localization in various cellular structures, etc. Anti-idiotype antibodies are a very particular case, because of the character of the recognized epitope. The peculiarities of such antibodies, their putative regulatory role during the immune response, and their practical applicability have been presented in the papers by J. Salwa, and also by W. Rudnicka and M. Chmiela. The former initiates a series of articles describing the mechanisms regulating the immune response. According to Jerne's theory, anti-idiotype antibodies may play such a role, although more and more reported observations do not support this view. Undoubtedly, the regulation of the immune response, besides the possible involvement of anti-idiotype antibodies, is controlled by complex genetic and neuroendocrine mechanisms (W. Jędrzejczak, M. Zimecki, P. Berezowicz).

It was impossible to include in the present issue many papers representative of the current state of knowledge about numerous other important problems investigated by immunologists, e.g. problems associated with immunopathology, autoimmunization, allergy or immunology of neoplasmas. The role of the complement system in immune and inflammatory processes has not been included here, either. I think that, considering the importance of these immunological problems, the papers devoted to them should be published in a separate issue.

A review of various problems of modern immunology based on contributions of numerous authors, each of whom presents a selected problem, is always associated with the recurrence of many of these problems in some papers. It is indispensable for a more comprehensive presentation of the problems described and their relationships with a wider context of immunological problems. In the cases of two problems, i.e. the structure and properties of antibodies, and the role of cytokinins in the regulation of the immune process, we have included two papers prepared independently and presenting different and complementary approaches to these topics.

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