

# **Immunochemistry of Proteins**

**Volume 1**

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**Edited by**

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# Preface

The structural features responsible for the immunogenicity of certain parts of native protein molecules have been of interest to immunochemists and protein chemists for over three decades. Following the early work of Landsteiner in 1942, which showed that peptide fragments from silk fibroin exhibited an inhibitory activity toward the reaction of the protein with its antibodies, fragments from many other protein systems have been isolated and studied. However, no concerted effort was (or could be) devoted to the elucidation of the complete antigenic structure of a protein. In order for these endeavors to be successful and meaningful, knowledge of both the amino acid sequence and the detailed three-dimensional structure of the protein is necessary. Such information was not available for a protein until early in the 1960s. This and the fact that protein chemistry was not in fact sufficiently developed early in the 1960s to enable the successful completion of the entire antigenic structure of a protein were major contributing factors for the slow progress in this field. Determination of the antigenic structures of proteins therefore posed a chemical challenge of enormous proportions. For these reasons, many investigators diverted their attention to study of the immunochemistry of homo- or mixed amino acid polymers in the hope that the information derived from these systems might prove useful in the understanding of the immunochemistry of proteins. A great many data on these systems were accumulated that have been valuable in gaining some information on the immune mechanism. Unfortunately, it has now become clear that information from amino acid polymers is not in any way helpful in understanding the immunochemistry of proteins. Proteins represent the majority of antigens associated with many immunological disorders. Knowledge of the antigenic sites of these protein antigens lies at the basis of elucidating the mechanisms of these disorders at the molecular level. From a purely chemical perspective, the reaction of protein antigens with their antibodies remains one of the most fascinating and least understood phenomena in biochemistry.

The last decade has witnessed a great deal of activity carried out by many workers to investigate the immunochemistry of several protein antigens. Although, so far, only the antigenic structure of one native protein antigen (i.e., sperm whale myoglobin—to be reviewed in Volume 2) has been completed and that of lysozyme is almost complete (Volume 2), a great wealth of information in chemistry, immunochemistry, and technology has accumulated. It is surprising that there has been little awareness of the magnitude of the progress achieved in protein immunochemistry. Many recent immunological treatises have barely touched on this subject, while amino acid polymers, haptens, polysaccharides, etc., have been reviewed extensively. Therefore, critical review of the knowledge available in protein immunochemistry appears timely and should serve as a valuable guide for present and future undertakings.

The various chapters are written by leading and highly active workers in the field. It is now well appreciated that knowledge of protein chemistry and its proper and careful employment constitute the key approach in the elucidation of the antigenic structures of proteins. This fact was recognized much earlier by enzymologists and has contributed immeasurably to the significant advances in that field. Therefore, the work starts out with a critical review and evaluation of chemical modification and cleavage reactions of proteins. Also, the effects of conformational changes and evolutionary mutations on the immunochemistry of proteins are uniquely significant and these subjects will therefore be reviewed separately in detail. In view of the fact that methods and techniques employed in immunochemistry and immunology have been the subject of many excellent texts, the present work does not propose to duplicate these aspects. However, certain approaches (such as immunoabsorbents and fluorescence polarization) are, by the very nature of the subject, of particular relevance to immunochemical studies of proteins and will be reviewed here. Other chapters in this and the following volumes describe the immunochemistry and immunobiology of protein systems whose studies have contributed significantly to our knowledge of protein immunochemistry.

The treatise is intended to be a major reference work for those engaged in research in protein immunochemistry. One of the cruel shortcomings of review articles and books is that any work inadvertently overlooked by the reviewer may tend to be less cited and studied by others. It is my hope that the meticulous effort of the authors has minimized, if not completely avoided, this hazard.

M. Z. Atassi

*Rochester, Minnesota*

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