Clinical Aspects of
THE PLASMA PROTEINS

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IGAKU SHOIN LTD. TOKYO

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Foreword

It was the year of 1969 when this monograph was originally published in Japanese by Professor TADASHI KAWAI, titled as "The Plasma Proteins, Their Fundamental and Clinical Aspects." After I read through the Japanese edition, I was impressed by its rather complete coverage of the subjects and their detailed descriptions. I have felt that this excellent monograph should be distributed not only among our Japanese scientists but also among many other colleagues throughout the world. I am happy, therefore, to know that the English edition of his monograph, partly revised, is ready to be published at this time.

Professor KAWAI received his postgraduate medical training in U.S.A. for seven years, and was certified by the American Board of Pathology in both Anatomical and Clinical Pathology in Fall, 1962. Thus, I believe, he is the most suitable fellow for publishing the English edition of this kind.

The first parts of the book are concerned by the fundamental and physiological properties of the plasma proteins. The most important part of this book deals with the pathophysiology of various plasma protein abnormalities. Among innumerable clinical cases that the author has experienced for the past 15 years, more than one hundred representative cases were selected and arranged adequately in the text with most beautiful immunoelectrophoretic patterns, each being analyzed painstakingly by his own judgement. Therefore, the readers should find it valuable to understand, through various plasma protein abnormalities, the fundamentals and pathophysiology of many important disease conditions. In addition, this book makes almost encyclopedic coverage of the diseases accompanying any plasma protein abnormality. This monograph is certainly comparable to the excellent publications by WUHRMANN and WUNDERLY, RIVA, SCHULTZE and HEREMANS, and others, and further it contains many unique opinions of his own.

By writing a foreword to this remarkable book may I praise Professor KAWAI for his hard work!

July, 1973

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Preface

The plasma proteins are indispensable for maintaining many important functions of living cells, and their main functions include the maintenance of osmotic relations between the circulating blood and the tissue spaces, the buffering action of various body fluids and the transport of various important substances necessary for the living cells and of various metabolites. The abnormalities of the plasma proteins are likely to cause more or less functional disorders of the living cells, and, on the other hand, almost every pathology of the tissues may be reflected to the plasma protein changes. Therefore, detailed studies of the plasma protein changes are extremely valuable to evaluate clinically the pathophysiological background of each patient. In addition, among the body proteins, the plasma protein components are the ones most easily purified, and thus recent development in molecular biology has been mainly met with the plasma proteins.

This book is primarily concerned with the human plasma proteins for the purpose of understanding the pathophysiologic and diagnostic aspects of their abnormalities. Since cellulose acetate electrophoretic and immunoelectrophoretic techniques have been receiving a tremendously wide application in clinical medicine, attention is focused particularly upon understanding the pathophysiological backgrounds on many different serum protein electrophoretic patterns, covering as much new knowledge in protein biology as possible. The author, as a clinical pathologist, has attempted to relate various important clinical disorders not only to plasma protein changes but also to other laboratory findings at the same time.

There has been certainly not a few comprehensive literature on human plasma proteins, including "Die Bluteiweisskörper des Menschen" (F. WHURMANN and Ch. WUNDERLY), "The Plasma Proteins" (ed. by F. W. PUTNAM), "Serum Proteins and the Dysproteinemias" (ed. by F. W. SUNDERMAN, and F. W. SUNDERMAN, Jr.) "The Plasma Proteins" (ed. by H. NEURATH and K. BAILEY), "Serum Proteins in Health and Disease" (G. SANDOR), and so on. However, no such monograph had been published originally in Japanese, and the present author attempted it in as early as 1964. In 1966, however, the first volume of "Molecular Biology of Human Proteins" by H. E. SCHULTZE and J. F. HEREMANS was published. It resembled amazingly well to the image that the author had in his mind. Therefore, the author's attempt to publish the monograph was set aside at least for the following two years when the second volume of "Molecular Biology of Human Proteins" was not published as expected.

This monograph appeared originally in 1969, in Japanese, including the following major topics: the fundamental structure of proteins, the analytical methods of plasma proteins, the physico-chemical and biological proterties of plasma proteins, the metabolism of plasma proteins, and the clinical abnormalities of plasma proteins. In this English edition, the whole section on the analytical methods and a portion of the other sections were removed, and the text was revised partly. However, the time lost for English translation has made the text of certain chapters less up to date than expected. For this the author asks the indulgence of the readers, but I sincerely hope that graduate students,

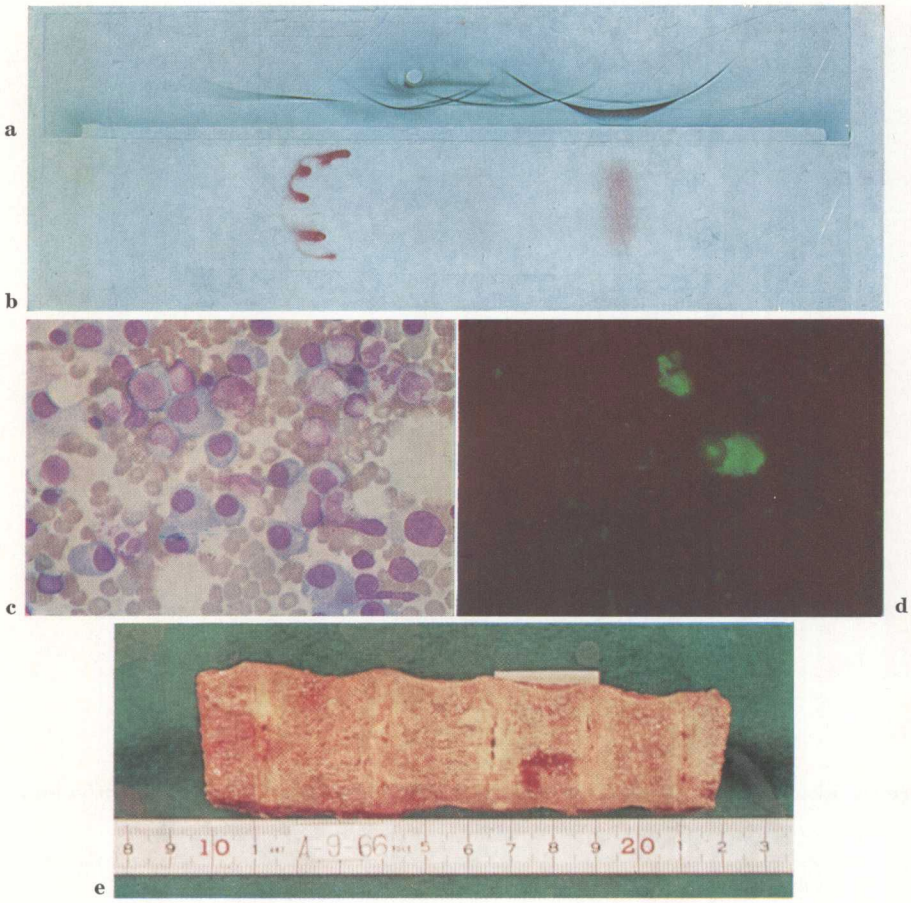
medical technologists, clinical pathologists and clinical practitioners all find this book a valuable reference for understanding the pathophysiology of plasma protein diseases and their related clinical abnormalities as well.

My greatest thanks are due to all those who have contributed in studying valuable cases cited in this book, such as many clinicians and technologists in the Central Railway Hospital of the Japanese National Rialways, and the Nihon University Hospitals. I take this opportunity to express my sincere thanks also to the staff of the International Publishing Department, Igaku Shoin Ltd. for their tremendous cooperation.

Tokyo/Japan
March, 1973

T. Kawai

Laboratory Findings in Multiple Myeloma



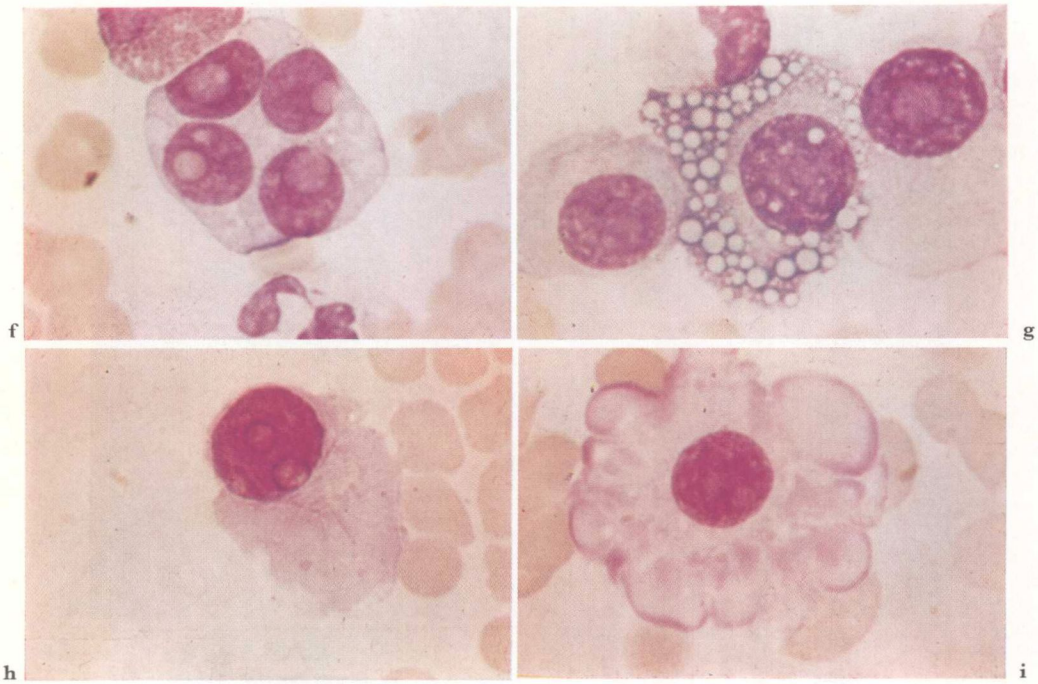
a. Agar gel immunoelectrophoretic pattern of the serum taken from the patient with IgG-K type multiple myeloma. The IgG precipitin line shows a characteristic M-bow near the point of serum application. Both the IgA and IgM lines are not recognized.

b. Cellulose acetate (Oxoid membrane) electrophoretic pattern of the same serum shows a characteristic wavy M-protein band at the cathodal end. The other protein fractions are only vaguely demonstrated because a very small quantity of the serum sample was applied.

c. The sternal bone marrow smear obtained from the same patient shows an increased number of pleomorphic plasma cells, occupying approximately 60% of the total nucleated cells.

d. One of the myeloma cells containing a large amount of IgG is shown through the indirect fluorescent antibody technique. Interestingly, the cell contains a positively stained inclusion body in the nucleus.

e. The thoracic vertebrae are involved by the neoplastic change, showing an osteolytic lesion which is recognizable macroscopically.



Various kinds of the abnormal plasma cells recognized in multiple myeloma:

- **f.** Multi-nucleated plasma cell, containing intra-nuclear inclusion bodies.
- **g.** Abnormal plasma cell, containing many strongly basophilic intra-cytoplasmic inclusion bodies or Russell's bodies.
- **h.** Abnormal plasma cell, containing several azurophilic rods in its cytoplasm.
- **i.** "Flame cell" or abnormal plasma cell showing distinct peripheral eosinophilia on Giemsa staining.

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