

THE IMMUNOCHEMISTRY OF CANCER

EUGENE D. DAY, Ph.D.

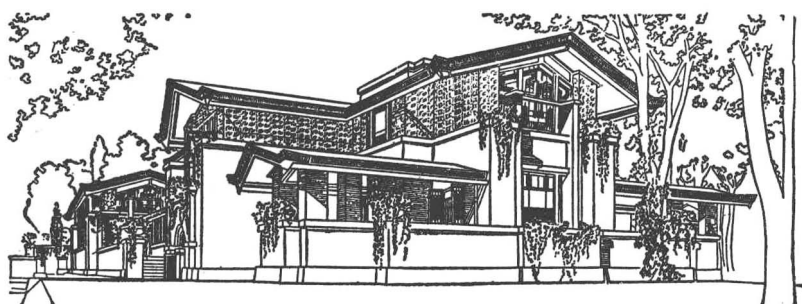
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CHARLES C THOMAS • PUBLISHER
Springfield • Illinois • U.S.A.

Published and Distributed Throughout the World by
CHARLES C THOMAS • PUBLISHER
BANNERSTONE HOUSE
301-327 East Lawrence Avenue, Springfield, Illinois, U.S.A.
NATCHEZ PLANTATION HOUSE
735 North Atlantic Boulevard, Fort Lauderdale, Florida, U.S.A.

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Library of Congress Catalog Card Number: 64-24042

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**The
Immunochemistry
of Cancer**

Publication Number 604
AMERICAN LECTURE SERIES®

A Monograph in
The BANNERSTONE DIVISION of
AMERICAN LECTURES IN LIVING CHEMISTRY

Edited by
I. NEWTON KUGELMASS, M.D., Ph.D., Sc.D.
Consultant of the Departments of Health and Hospitals
New York, New York

FOREWORD

OUR LIVING CHEMISTRY SERIES was conceived by Editor and Publisher to advance the newer knowledge of chemical medicine in the cause of clinical practice. The interdependence of chemistry and medicine is so great that physicians are turning to chemistry, and chemists to medicine in order to understand the underlying basis of life processes in health and disease. Once chemical truths, proofs and convictions become sound foundations for clinical phenomena, key hybrid investigators clarify the bewildering panorama of biochemical progress for application in everyday practice, stimulation of experimental research, and extension of postgraduate instruction. Each of our monographs thus unravels the chemical mechanisms and clinical management of many diseases that have remained relatively static in the minds of medical men for three thousand years. Our new Series is charged with the *nisus élan* of chemical wisdom, supreme in choice of international authors, optimal in standards of chemical scholarship, provocative in imagination for experimental research, comprehensive in discussions of scientific medicine, and authoritative in chemical perspective of human disorders.

Dr. Day of Durham presents the immunochemical basis of neoplastic growths, pursues the serological search for specific cancer antigens, views antigenic transformations in the light of malignancy and explores immunochemical designs of diagnostic and therapeutic anticancer compounds. The newer knowledge of immunochemistry is pointing the way to underlying mechanisms of malignancy that may lead to the development of therapeutic agents capable of immunizing individuals against neoplastic

growths. Unfortunately, the conjunction of disciplines is difficult to effect not only for the varied antigen-antibody systems but for the complex tissue antigens, complement reactions, isoantibody interactivities, protein combinations, serum behavior and colloidal interference. Even the basic mechanisms of tumor immunity go far beyond the classic antibody as is evident in this work teeming with imagination. The immunochemical approach to cancer has the fascination of a growing science that lies in the work of the pioneers at the very borderland of the unknown. But to reach this frontier one must pass over well travelled roads; of these one of the safest and surest is the broad highway of immunochemistry of cancer.

The serological search for specificity reveals many examples of cancer-distinctive antigens of individual experimental design, especially isolated lipids and proteins with immunochemical characterizations that serve as guides for systemic evaluation of other antigens. The author not only unravels distinctive antigen gain but antigenic transformation which enables the formulation of the specific antigen deletion hypothesis. Antigen transformations are further documented as alternate possibilities to distinctive gain or normal deletion. In antigenic diversion, the antigenic profile of the normal tissue of origin is lost in cancer only to be replaced by the profile of another normal tissue. In antigenic reversion, the profile of the embryonic state is recapitulated in the malignant state. In normal antigenic gain, normal tissue components are enhanced without others becoming distinctive or deleted. In antigenic secretion and catabolism, specific metabolic mechanisms bring about the induced changes in the plasma profile of the tumor-bearing host. Immunochemical design and testing of diagnostic and therapeutic anticancer compounds require primary rather than transplanted tumor systems not only for investigating preventive immunity to cancer but for establishing a rationale of immunotherapy of existing cancer. The *modus operandi* of oncological immunochemistry is further delineated in descriptions of the technique of analytical immunofiltration, in the preparation of radioantibody tissue-localizing reagents and in the mathematical formulation of antibody absorption. Experimental experience is expounded with inspiration.

Immunochemistry has its cathedrals, built by the efforts of a few architects and of many workers since the turn of the century. In these loftier monuments of scientific thought the friendly usages of colloquial speech give way to a certain severity and formality. While this may sometimes promote precise thinking, it more often results in the intimidation of the neophyte. Therefore, the author attempts while conducting the reader through the classic edifice of immunochemistry, into the workshops where construction is now in progress, to temper the customary severity of the science in so far as is compatible with clarity of thought. It gives us the deep-seated feeling that the immunochemist is making an ever-widening circle of excursions into tangential disciplines in his search for real clues to the intrinsic nature of cancer in order to arrive at rational hypotheses in the cause of prevention and treatment inherent in *Vis medicatrix naturae*.

*"But beyond the bright searchlights of science,
Out of sight of the windows of sense,
Old riddles still bid us defiance,
Old questions of Why and Whence."*

I. NEWTON KUGELMASS, M.D., PH.D., SC.D., *Editor*

PREFACE

T*he Role of Immunochemistry in the Study of Cancer.* In the hands of the immunochemist anticancer antibodies are primarily reagents for the analysis of cancer antigens. Only secondarily are they potential therapeutic agents. From this point of view the scope of immunochemical investigations may range through wider fields than the severely limited one of autochthonous cancer in animals and man. For example, a transplanted tumor that has been maintained by successive inoculations into animals for thirty years may still provide an excellent source of cancer-distinctive substances which the immunochemist's antibody reagents may detect. The remarkable message obtained from such studies, as a matter of fact, is the apparent chemical permanence of cancer specificity under physiological conditions so drastically changed from autochthonous situations.

The role of immunochemistry in the study of cancer may therefore be said to be primarily concerned with the question of whether cancerous tissues contain cancer-specific substances, and, if so, what they are and how they are distributed. The role of immunotherapy may then be said to be concerned with the exploitation of such specificity in the production of cancer-specific antibodies that may have some therapeutic effect in the control of cancer. Hence, the chapters that follow first present a critical analysis of the body of knowledge encompassing the subject of the antigenic profile of cancer and then turn to the subject of the immunochemical design of antibodies for the diagnosis and treatment of cancer. At that juncture one would hope that the immunotherapist would be left with a truly applicable body of

knowledge for his rational approach to the eventual establishment of immunity to cancer in man.

*... in the real world it is more important that
a proposition be interesting than that it be true.
The importance of truth is, that it adds to interest.*

—A. N. WHITEHEAD, 1929.

ACKNOWLEDGMENTS

THE AUTHOR GIVES his sincere and grateful thanks to Mrs. Jane Turner and Mrs. Christie Powell for preparation of the typescript; Drs. G. I. Abelev, D. Bernard Amos, John L. Burke, David Pressman, and Michael Schlesinger for providing pre-published information; the many publishers, cited separately in text and references, for granting permission for inclusion of copyrighted material; his wife and son for assistance in preparation of the index; and Mrs. Jane Mahaley and Messrs. Sylvester Lassiter, Richard Dennis, Lewis Rigsbee, and Larry Lepionka for keeping the laboratory functioning during the last several days of manuscript preparation.

E.D.D.

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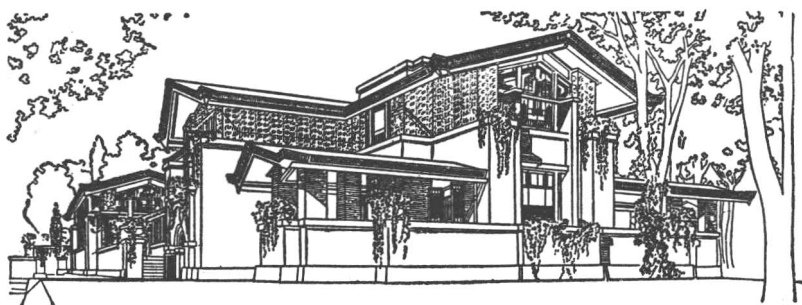
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PART I
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