

AN EXERCISE MANUAL IN IMMUNOLOGY

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FOREWORD

This manual is the outgrowth of many years of interest in the subject of immunology. It dates back to 1950 when, impressed by the works of Canetti, the senior author, under the guidance of the late Professor L. Daniello, at the University of Cluj, in Romania, prepared his thesis on the subject "Tuberculosis Allergy in Humans." In the two decades that followed, we have witnessed the incredible advancement of this discipline. The biochemical identity of antibodies was established and their structure determined, the role and the complexity of the lymphoid system was clarified, and the mechanism of immunologic reactions was better understood. From the periphery of the medical field, immunology has grown into a major science affecting every sector of medicine. Immunohematology, transplantation biology, carcinogenesis, and the use of immunochemical methods for diagnosis reflect only partially the enormous impact of immunology in related disciplines. As a result, the degree of knowledge in this field has become a favorite subject for examination at various levels of study, licensing, and certification.

It is our experience that multiple choice questions, as a teaching method, can be of value only when they are comprehensive, interrelated, and followed by notes that complete the questions, broaden the area of knowledge, and stimulate curiosity. We used this approach in preparing part of the teaching material used in the Residence Program of the Department of Pathology at the New Jersey College of Medicine and Dentistry at Newark. We were urged repeatedly by our colleagues, particularly by Dr. Edith Howard, Dr. Fritz Tassy, and Dr. Thomas F. Chen, to make this material more readily available in manual form. Dr. Diethelm H. Boehme, the Chief of the Department of Pathology, and Dr. Irving G. Coppel, the Assistant Chief, accepted the idea, with the reservation that the opinions expressed remain those of the authors and not those of the Department of Pathology.

We divided our material into three categories:

- 1 Material of general knowledge for which no notes were necessary
- 2 Sets of questions followed by short reviews or practical notes
- 3 Informative material

Emphasis has been placed on the various aspects of antibody synthesis and the related cellular elements, and pertinent data are reported from the recent literature. Several chapters contain notes on terminology, and the principles of various immunologic tests are outlined in others. A special chapter is devoted to the new theory of antibody formation,

developed by Professor A. Wiener, and our personal interpretation of his views. The chapters related to immunology and cancer are kept in the context of this manual's perspectives.

Immunologic phenomena involving various systems or organs are reviewed, this changing the character of the book to a combined self-evaluation and instruction manual. We have used schemes and drawings abundantly that help in the visual fixation of the problems under consideration, and we have tried to best use our planned number of pages. For more detailed information, the readers are referred to specialty journals in which related papers frequently appear.

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Lazar M. Schwartz, MD Paula Schwartz, MD

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- A Autologous antigen
- B Homologous antigen
- C Heterologous antigen
- D Complete antigen
- E Incomplete antigen

Choose one of the above for each of the following:

- 1 Antigen obtained from the same individual
- 2 Antigen obtained from an individual of the same species
- 3 Antigen obtained from an individual of different species
- 4 Functional antigen
- 5 Most often protein in a colloidal state
- 6 Becomes antigenic after coupling
 - A Haptene
 - B Boivin antigen
 - C Forssman antigen
 - D Kunin antigen
 - E Private antigen

Choose one of the above for each of the following:

- 7 Heterologous antigen
 - 8 Univalent antigen
 - 9 Has endotoxin properties
- 10 Wright antigen
- 11 Heterogenic antigen in Escherichia coli type 0-14
- 12 The active portion of this antigen is a lipid containing a polysaccharide.
- 13 Batty antigen
- 14 Present in the wall of many gram-negative bacteria
- 15 The antigenic determinant in a conjugated molecule
- 16 Present on red blood cells but not tissues of sheep
- 17 Present in the kidney but not in blood of guinea pig
- 18 Functional characteristics of cholesterol coupled to protein

- 19 Functional characteristics of diazotized arsenilic acid coupled with horse serum
- 20 A combination of lipid, polypeptides, and carbohydrates
- 21 Not antigenic when conjugated to a nonmetabolizable carrier
- 22 Levay antigen
- 23 Possible relationship between this antigen and ulcerative colitis
- 24 Most susceptible to inhibition tests
- 25 Has limited distribution in human population

2 / LOCALIZATION OF ANTIGENS

- 1 Antigens injected subcutaneously drain preferentially into
 - A Lymph nodes
 - B Spleen
- 2 Antigens injected intravenously drain preferentially into
 - A Lymph nodes
 - B Spleen
- 3 Deposition of antigen in lymph node follicles occurs in
 - A Dendritic reticular cells
 - B Small lymphocytes
- 4 The cells clustering around the antigen in lymph node follicles are
 - A Dendritic reticular cells
 - B Small lymphocytes
- 5 The immediate localization of antigens in the spleen is in the
 - A White pulp
 - B Red pulp

- 6 Antigen concentration in the spleen occurs in the
 - A White pulp
 - B Red pulp
- 7 Antigen concentration in the lymphoid follicles of spleen occurs in
 - A The outer aspect of the follicle
 - B Around the central arteriole
- 8 Following preimmunization, follicular localization of antigens in the spleen increases with
 - A Weak antigens
 - B Strong antigens
- 9 In the first three days following challenge, antigens may be detected in
 - A Antibody-producing blasts of lymph nodes
 - B Antibody-producing blasts of thoracic duct lymph
- 10 Antigen-containing macrophages that have been killed
 - A Induce an immune response
 - B Do not induce an immune response

3 / BACTERIAL AND SYNTHETIC ANTIGENS

- 1 The most toxic antigens of Salmonella are
 - A Boivin-type antigens
 - B Flagellar antigens

Answers to	1	A	6	\mathbf{E}	11	D	16 C	21	A
Exercise 1	2	В	7	C	12	C	17 C	22	E
	3	C	8	A	13	E	18 A	23	D
	4	D	9	B	14	В	19 A	24	A
	5	D	10	E	15	A	20 B	25	E

- 2 In infections with <u>Salmonella</u>, a high titer of antibody production with low protective immunity is characteristic of
 - A Boivin-type antigens
 - B Flagellar antigens
- 3 The immunologic response in pertussis is due mainly to
 - A Surface antigens
 - B Somatic antigens
- 4 The agents that may continuously change their antigenic characteristics as long as present in the infected host are
 - A Spirochetes
 - B Trypanosomes
- 5 The specificity of synthetic antigens is related mainly to
 - A The acid radical
 - B The terminal group of proteins
- 6 The specificity of substituted synthetic antigens is related mainly to
- A The nature of the substituent radical
 - B The position of the substituent radical

Answers to 1 A 6 A Exercise 2 2 B 7 A 3 A 8 A 4 B 9 A 5 B 10 B In 7 to 12, identify the microorganisms containing the following capsular or surface antigens:

- A Polysaccharides
- B Polyglutamic acids
- C Hyaluronic acid
 - D Vi antigen
 - E Envelope substance
 - 7 Bacillus anthracis
 - 8 Pneumococci
 - 9 Streptococcus pyogenes
 - 10 Hemophilus influenzae
 - ll Pasteurella pestis
 - 12 Salmonella typhi

4 / VARIATION OF BACTERIAL ANTIGENS

- A Variation of the S-R type
- B Variation of the V-W type
- C Variation of the H-O type
- $\underline{\mathbf{D}}$ Substitutive variation

Choose one of the above for each of the following:

- 1 Dissociation
- 2 Specific only for <u>Salmonella</u>
- 3 Can be reversed experimentally in pneumococci
- 4 Basis for classification of Salmonella
- 5 Related to virulence as a general phenomenon
- 6 Unrelated to the parasitic activity of the bacteria
- 7 In this variation, the "smooth" type of growth is shown by organisms with complete antigenic structure.
- 8 In this variation, the "rough" type of growth is shown by organisms with incomplete antigenic structure
- 9 Seen with influenza virus during mouse passage
- 10 Involves at the same time the loss of the organ containing the antigen

- 11 Best seen with enteric bacteria but also seen with anthrax bacillus and hemolytic streptococcus
- 12 Seen with trypanosomes during relapse infections in the mouse
- 13 In pneumococci is accompanied by loss of capsule
- 14 Variation of what is initially an antigenically complete cell
- 15 Hard to obtain in the laboratory
- 16 Effect of bacteriophage on S antigen
- 17 The agent responsible for this variation is a highly polymerized deoxyribonucleic acid.
- 18 Seen with the free, living paramecium
- 19 This change affects the survival of bacteria in the tissue of the host.
- 20 May involve specific and nonspecific phases
- 21 Easily obtained by culture
- 22 Best demonstrated with Proteus vulgaris
- 23 Equivalent to "matte" and "glossy" aspect of colonies of hemolytic streptococcus
- 24 A reverse change results in the apparition of the Vi antigen.

5 / GENETICS OF ANTIGENIC VARIATION IN BACTERIA AND VIRUSES

- A Transformation
- B Transduction
- C Recombination

Choose one of the above for each of the following:

- 1 Conjugation
- 2 Related to lysogenicity
- 3 The TP factor of this phenomenon was first isolated from pneumococci.

Answers to	1	Α	6	В	11	\mathbf{E}
Exercise 3	2	В	7	В	12	D
	3	A	8	A		
	4	В	9	C		
	5	A	1.0	A		