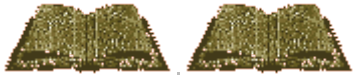
ANIL AGGRAWAL'S
Internet Journal of
Forensic Medicine and Toxicology
The world's first online journal devoted entirely to forensic medicine and toxicology · Published 1 January and 1 July

VOL. 4, NO. 1
Downloaded from www.anilaggrawal.com · ISSN 0972-8074 (Online) · https://www.anilaggrawal.com/ij/vol_004_no_001/reviews/tb/page011.html

Book Reviews: Technical Books Section



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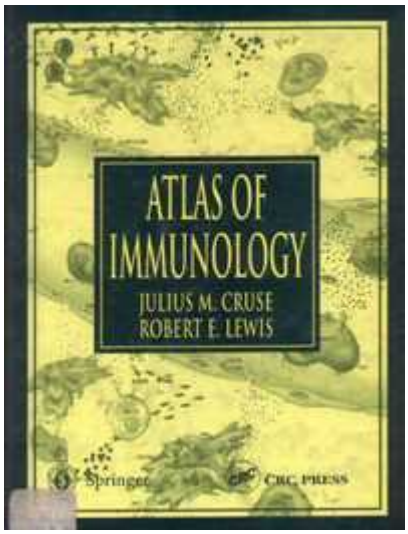
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TWO GEMS YOU MUST POSSESS

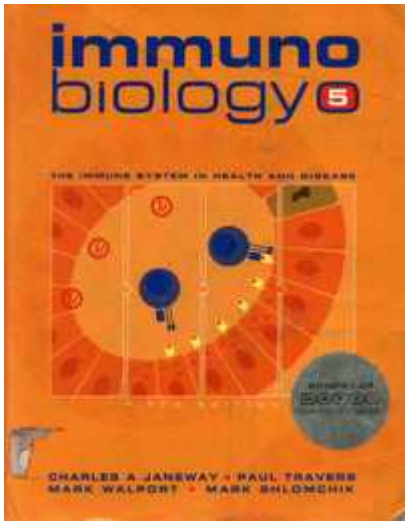
Atlas of Immunology, 1st Edition, *by* Julius M. Cruse and Robert E. Lewis. Hardback, 8.5" x 11". Co-published byCRC Press LLC, 2000 Corporate Blvd., N.W., Boca Raton, FL 33431, USA; and by Springer-Verlag GmbH & Co. KG, Tiergartenstraße 17, D-69121 Heidelberg, Germany. Publication Date 1999, 451 pages, ISBN 0849394899. Price DM 129.00

Immunobiology, 5th Edition, *by* Charles A. Janeway, Paul Travers, Mark Walport and Mark Shlomchik. Softcover, 8" x 11".
Co-published byGarland Publishing, a member of the Taylor & Francis Group, 29 West 35th Street, New York, NY 10001-2299; and by Churchill Livingstone. Publication Date 2001, xx + 732 pages, ISBN 0-4430-7098-9. Price $ 64.95

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What is the immunoradiometric assay (IRMA)? Winn assay? TUNEL assay? Jerne Plaque assay? Raji cell assay? The plaque forming cell (PFC) assay? How do you conduct the Paper Radioimmunosorbent test (PRIST)? 2-Mercaptoethanol agglutination test? Oudin test? Ouchterlony test? Double diffusion test? How do you separate B and T lymphocytes? What exactly is Panning? What is microlymphocytotoxicity? What is the immunoferritin method? What is the Mancini technique? Why and how do you do Ferritin labeling? What is the Elek plate? What is the concentration of IgE in serum? What are DNA microarrays? What is spectratyping?

Stumped?

I wouldn't blame you. I myself was on most of these questions, although I think I am reasonably well-informed in immunology. I accidentally stumped upon these two little beauties in our very own National Medical Library, where I went to conduct research for the chapter on Allergy that I am currently writing for a multi-volume encyclopedia of Forensic and Legal Medicine.

Cruse (left) and Lewis (right), authors of "Atlas of Immunology" (above)

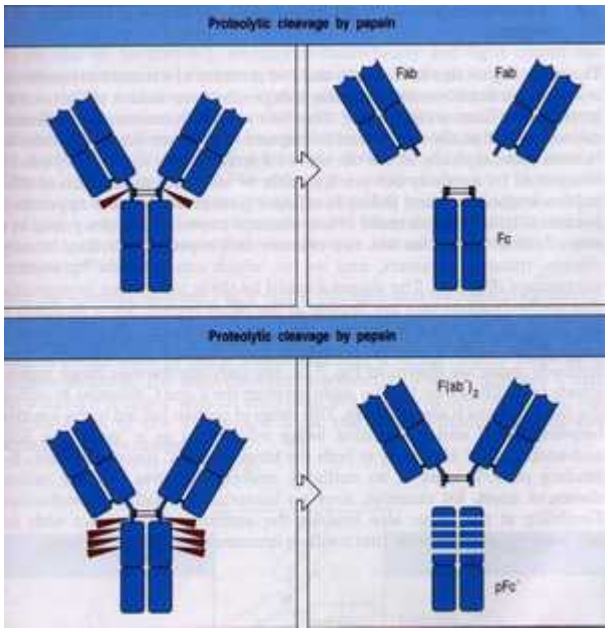




My main purpose was to brush up my rather jaded knowledge of immunoglobulins, various classes of hypersensitivity (Type I till IV), complement system, basics of transmembrane signaling and so on. Of course, in the process of discovering these, I unearthed a lot of other interesting information that I never knew existed. I was so hooked on to both these books, that I spent a considerable amount of time reading them. Much of what I read was not going to be of much use to me for my chapter on allergy. To be honest, my wife was rather annoyed that I was wasting my time reading those books, instead of spending it on more "fruitful" activities (such as writing that chapter on "allergies" for instance). But the information was presented in such nice, interesting and easily digestible manner that I just could not wean myself off them. In fact reading these two books felt almost like savoring lush creamy chocolates - sweet, delicious, and utterly wonderful!

I will refer to the "Atlas of Immunology" as just "Atlas". The "Atlas" is not exactly an atlas. It gives so much textual information that at times, it appears almost like a text book. And "immunobiology" has many features of an atlas. For instance you could spend hours looking just at the beautiful color illustrations and reading their captions. Thus both books share qualities both of an atlas as well as a text book. While the "Atlas" gives all pictures in black and white, "immunobiology" gives all of them in color. At first sight, it might appear that "immunobiology" is a more attractive book, but when you turn to the "Atlas", you tend to get a feeling that it is better - of course, until you get back to "immunology" once again - *ad nauseum*.

"Immunobiology" (above) makes use of clear, crisp, colored diagrams such as this to explain the concepts. This diagram showing the cleavage of an IgG molecule by Papain (top panel) and Pepsin (bottom panel) appears on page 97

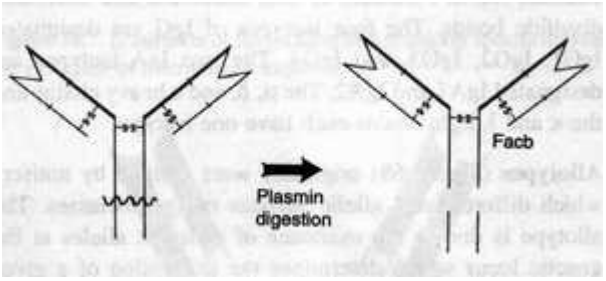


While leafing through both these books, I came across sections on Fab and Fc fragments. Now this is not something I was specifically looking for, but I was hooked on to this information, since as a toxicologist we have to deal with Fab fragments in connection with Digitalis toxicity. Antisnake venom too now comes as Fab fragments. I only had a vague idea about Fab fragments, but these books cleared my concepts a great deal. Why do you call a fragment Fab for instance? Because it is **f**ragment **a**ntigen **b**inding. And why do you call the other fragment Fc? Because it comes after "a" and "b", right? Wrong. It is called so because it is the **c**rystallizable fragment.

In modern times, for the treatment of digitalis toxicity (and also in modern antisnake venoms, as seen above), you tear away the Fc portion of the Immunoglobulin molecule and use only the Fab portions. Why? Because while Fc fragment would fix the complement (giving rise to all the unfavorable symptoms of anaphylaxis), it is the Fab fragment which binds to the antigen. It is also the Fc fragment which attaches itself to various effector cells liberating vasoactive and other peptides. It would almost appear as if while Fab is the rose, Fc is the accopanying thorn. The two come invariably together, but you pluck away the thorns and just use the Fab fragment. Simple, right? Well, not so, until you have read these two books.

So you fragment the molecule with papain to get an Fab and an Fc portion. But if you cleave it with pepsin, you would get a $F(ab')_2$ fragment. Why is $F(ab')_2$ written with a prime? To be honest, I did not know it. I thought it was just one of those idiosyncrasies of immunologists. But turn to page 97 of "immunobiology" and you will know why is this so. It is because this fragment contains a few more amino acids than Fab, including the cysteines that form the disulfide bonds. Since it is not exactly Fab + Fab (It is Fab + Fab + hinge region of the IgG + disulphide bonds), you can't simply write it as $F(ab)_2$. Deriving from the knowledge I gathered from these books, I concluded there is no way you could have an $F(ab)_2$ fragment, i.e. a fragment which is exactly equal to Fab + Fab (because they got to be joined by "something", and that "something" would immediately change its nature). I looked around in the books for these fragments, and was quite satisfied to find, that indeed no such fragments exist. It ensured me I was getting my facts right.

The "Atlas" too explains concepts by means of a number of diagrams. They are in black and white, but much more numerous. This diagram showing the cleavage of an IgG molecule by Plasmin (giving rise to Facb) appears on page 121



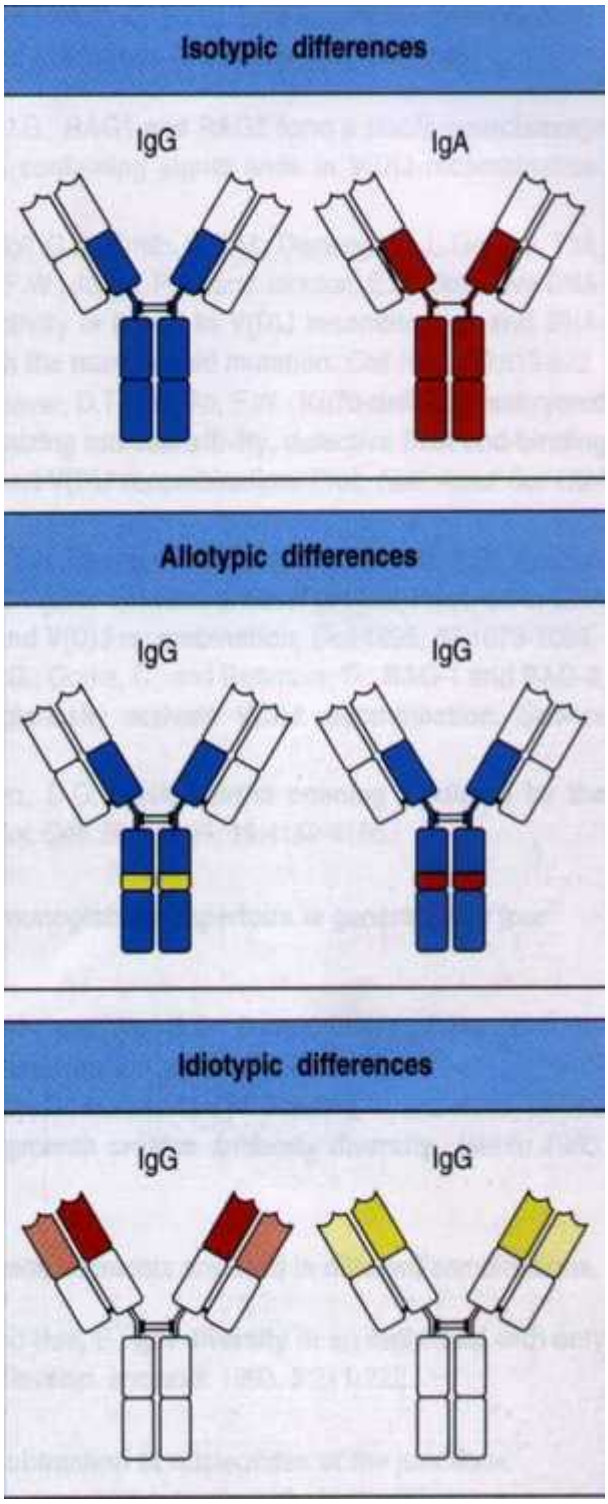
Turn to pages 118-120 of the "atlas", and you will get to read a number of other fragments. It was a revelation to know that so many different kinds of fragments existed. Among others you get to know about Fd fragment, Fc' fragment, Fabc fragment, Fab' fragment, Facb fragment, Fb fragment and Fv fragments.

What is the difference between Fabc and Facb fragments? Well, an **Fabc fragment** is produced by partial digestion of IgG by papain in which only one Fab fragment is cleaved from the parent molecule in the hinge region. This leaves the Fabc fragment which is comprised of a Fab region bound covalently to an Fc region and is functionally univalent. The book does not tell us the origin of the name, but presumably it is called so, because it is a combination of Fab and Fc fragments.

The origin of **Facb** is interesting. One would imagine that it could be some rearrangement of Fab and Fc regions and hence the transposition of letters. But this is not so. The name Facb comes from Fragment **a**ntigen and **c**omplement **b**inding. It is produced by the action of plasmin on IgG molecules denatured by acid. The process cleaves C_H3 (Constant region 3 on the heavy chain) domains from both heavy chain constituents of the Fc region. This yields a bivalent fragment functionally capable of precipitation and agglutination with an Fc remnant still capable of fixing complement

And what is the difference between an Fd and an Fd' fragments? Don't worry, the book tells us all. An **Fd fragment** consists of the heavy chain portion of a Fab fragment produced by papain digestion of an IgG molecule. It is on the N-terminal side of the papain digestion site. An Fd' fragment, on the other hand, is the heavy chain portion of an Fab' fragment. It has an **extra** heavy chain hinge region.

Another crisp diagram from "Immunobiology". This diagram appearing on page 151 explains isotypic, allotypic and idiotypic differences between Immunoglobulin molecules. For forensic professionals like me, this information is very vital. Quite a number of times we depend on Gm allotypes to determine the maternity of mixed up newborns in a hospital. This book explains the concepts of Gm allotypes very nicely



The difference between an Fc' and pFc' fragments? May be you would want to refer to the atlas itself. There are so many other fragments to see, you will simply get intoxicated.

Do you know why IgM is called so? May be you do, but I didn't. I thought they had just named it at random. But it is not true. The books tell us that it is called so because IgM is a **M**acroglobulin (it makes pentamers). The books give information not only on immunoglobulins and Hypersensitivity reactions, but on all facets of allergy and immunology you can think of. There are chapters on antigens, immunogens, vaccines and immunization, Major Histocompatibility index, antigen presentation, Thymus and T lymphocytes, Cytokines, The complement system, Immunohematology,

Mucosal immunity, Immunological diseases and Immunopathology, AIDS, Transplantation immunology, Tumor immunology, Immunologic methods and a host of other related topics.

...these two books assured me reading immunology can be as good as savoring a delicious goblet of wine ...with quality cheese! Which book is which? Can't say; the books tend to metamorphose back and forth into each other...

And yes, the "atlas" gives a beautiful 22 pages section on the history of immunology (as Chapter 1). The information is presented in a truly atlas form, with lots of pictures and captions explaining them. As a lover of history of medicine, I thoroughly enjoyed going through this section. The section starts from a smallpox cartoon, whereby a pockmarked father is shown lamenting that pretty little children refuse to play with his pox marked children. The children reply that it was their father's mistake not to have inoculated them against smallpox. Throughout this section, we meet scientists, workers and Nobel Prize winners who have worked in the field of immunology one way or the other. The chapter ends with a photograph of Rolf Zinkernagel and Peter Doherty, recipients of the 1996 Nobel Prize for physiology or medicine for their demonstration of MHC restriction.

Both books give interesting appendices in the end. In the "atlas" it is called "Immunologic methods", which is sheer pleasure to read. "Immunobiology" has an equivalent section called "Immunologists' toolbox". In addition the latter has appendices on CD antigens (all CD antigens are explained right from CD1a,b,c,d till CD247 from pages 661 till 676), cytokines and their receptors, biographies (the equivalent of the Atlas' section on "History of Immunology") and a glossary.

Did I complete my chapter on Allergy? Yes, I did - two weeks later than I was supposed to. Why? Because I spent those two weeks ogling at and reading these books. And how did my chapter go? Very well, I think - thanks to these books - although I still have to hear from my editors.

What is the answer to the questions I asked in the beginning? Honestly I would love to tell them all to you. But I don't have space. Moreover, I am sure you would enjoy them much more from the book. So I leave it up to you to get these books and unearth this information all by yourself.

To whom would I recommend these books? To be honest to everyone who has to do anything with biology. Biology students, medical students, immunologists, doctors, allergists, internists, and in fact anyone who loves information on immunology in simple language. It had been my impression that immunology is associated with tears (so confusing can the information be at times, and still more confusingly presented by most authors). But these two books assured me reading immunology can be as good as savoring a delicious goblet of wine ...with quality cheese! Which book is which? Can't say; the books tend to metamorphose back and forth into each other.

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