

SCIENTIFIC BOOKS

THE PATHOGENESIS OF TUBERCULOSIS

The Pathogenesis of Tuberculosis. By ARNOLD R. RICH. 1008 pp. 89 figures. Springfield, Ill.: Charles C Thomas. 1944. \$10.50.

UNDER the concept of pathogenesis Dr. Rich evaluates and integrates more than 1,400 significant old and new contributions from various branches of experimental biology and medicine which throw light on the origin of tuberculosis, its progress, arrest and prevention. The material is organized in 21 chapters and includes a presentation of the underlying basic principles necessary for an understanding of the various topics, with an attempt to demarcate the boundaries of present knowledge in each instance.

Since Dr. Rich has contributed so much to the field of tuberculosis it is natural that he has formed opinions on most of the subjects discussed and hence his presentation is a marshalling of evidence for certain points of view. Most of his conclusions will probably be widely accepted. At times, however, it is questionable whether all will share his judgment.

Among the many views expressed by Dr. Rich, the following may be mentioned. The lipides of the tubercle bacillus are a factor in epithelioid cell formation, but the phosphatides thus far isolated are not the agents active in the body. No protein has as yet been isolated from the tubercle bacillus which induces the allergic hypersensitivity characteristic of the disease, though it produces anaphylactic sensitization. No toxin has been demonstrated from the tubercle bacillus to which the tissues of the non-tuberculous animal are sensitive. Necrosis in tuberculosis is due to an acquired sensitivity of the cells to the protein of the bacillus. No qualitative difference has as yet been demonstrated in the lipides, proteins or carbohydrates of mammalian tubercle bacilli of different virulence. The nature of virulence is unknown.

Although it has been demonstrated that the human type tubercle bacillus at first multiplies in the body of the rabbit before its destruction the author does not accept the view that the native resistance of the rabbit to this bacillus is acquired during the course of the infection. The tension of oxygen available in the different organs is considered a decisive factor in their resistance to the disease. He is convinced that races and individuals possess varying degrees of hereditary native resistance and different capacities to acquire lasting increased resistance as a result of experiencing the disease. He presents much suggestive data indicating that in man age and sex play an important role in resistance to tuberculosis. The native resistance of some white adults according to

Rich may be sufficient to account for the localizing, slowly progressive tuberculosis characteristic of this period of life. Animal experiments with inbred rabbit families present suggestive evidence for this view. These chapters are beautifully illustrated by human pathological specimens and emphasized by interesting epidemiological statistics.

There is an excellent discussion of the differences and similarities between bacterial allergic sensitivity and anaphylactic sensitization to soluble proteins. According to Rich, allergic sensitivity in tuberculosis plays no role either in the fixation of the bacilli at the site of reinfection or in the suppression of their growth; its influence in the disease, if any, is deleterious. The reviewer holds that the evidence at hand indicates that allergy is not essential to the mechanism of acquired resistance, but it would be difficult to maintain that it may not aid in the resistance to the disease, *e.g.*, agglutinating antibodies can not be held responsible for the more effective fixation at the site of reinfection with tubercle bacilli of non-specific substances such as agar particles and trypan blue in the guinea pig than in the rabbit. (It is noteworthy that guinea pigs localize tubercle bacilli more effectively at these same sites than do rabbits.) But the greater allergic sensitivity of the reinfected guinea pig accounts for the greater release of thrombokinase from the injured cells, which is sufficient to induce the clotting process in the former but not in the latter. It is during this clotting of the exudate that, as demonstrated by Opie,¹ foreign particles and tubercle bacilli are enmeshed in the fibrin threads and removed from the lymph emanating from the site of reinfection.

There are many arguments presented for the view that antibodies are essential both in allergic sensitivity and in resistance to tuberculosis, though no unequivocal evidence is given. Yet the observed suppression of growth of tubercle bacilli in acellular agar islands penetrated by the body fluids in the immune animal as compared with their unrestricted multiplication in such positions in normal animals is attributed not to the bacteriostatic effects of immune body fluid but to the greater fibrin barrier thrown about the foci of the former. If that is true, allergy as such may be a factor in the suppression of growth of tubercle bacilli at the site of reinfection. He admits that the phagocytic capacity of some mononuclears of tuberculous animals may be greater than that of normal animals, but he feels that the bacteriotropins are more significant. That mononuclear phagocytes of immune animals may possess a greater capacity to destroy tubercle bacilli in the presence of antibody

¹ E. L. Opie, unpublished observations.

he conjectures, but the direct evidence for the greater capacity for destruction of tubercle bacilli by mononuclear cells of immune animals is not accepted on the arbitrary judgment that cultural methods are not suitable for such quantitative estimates. Yet histological evidence, in which alone Rich places full credence, leads to the same conclusion. For the same reason Rich does not accept the interpretation that mature epithelioid cells and tubercles result from the destruction of some tubercle bacilli or their products within the mononuclear cells, a concept which explains much of tuberculous lesions.

The discussion of the role of nutrition and bacillary dosage is penetrating. His distinction between "soft" and "hard" tubercles is widely accepted. Apical localization in human tuberculosis, according to Rich, indicates some increased resistance of the lung in which the upper part does not share. Rich feels that both endogenous and exogenous reinfection are responsible for adult tuberculosis. That an arrested primary infection affords some protection against reinfection is unquestioned, but the fluctuating character of acquired resistance, according to Rich, accounts for the hazard of reactivation of dormant primary or postprimary lesions.

Excellent illustrations are given of the different types of adult tuberculosis. Both tuberculous meningitis and pleural tuberculosis are considered as resulting from the extension of lesions into the arachnoid space or pleural cavity, respectively, rather than as due to hematogenous spread. The book is a "must" for all workers in tuberculosis and students of infectious disease, stimulating and absorbing reading with the added asset of an outstanding representative bibliography.

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USES AND APPLICATIONS OF CHEMICALS

Uses and Applications of Chemicals and Related Materials. Volume II. By THOMAS C. GREGORY. lxxviii + 459 pp. 6 × 9½ in. Bound in green cloth. New York: Reinhold Publishing Corporation. 1944. \$9.00.

BASED on data published in the *Oil, Paint and Drug Reporter*, the first volume of this valuable compilation was issued in June, 1939, and a review of it appeared in the November 3, 1939, number of *SCIENCE* (p. 422). What was said there in appreciation of the many useful features of Volume I applies with even greater justice to Volume II, and the service it can render in the post-war years.

As stated in its preface, this book not only comple-

ments the subject-matter of Volume I, but also supplements it by the addition of 2,642 chemicals and related materials.

After explaining what the two volumes contain, and how the information is presented, and listing those individuals and organizations likely to find them helpful, instructions are given as to how to use the books.

Part 1 is an "Index of Uses," which records, in alphabetical sequence, the classified applications of 7,809 chemicals and related materials in the converting, compounding and processing industries. Part 2 sets forth the uses of each in a classification by industry and by application in that industry. Then follow Part 3—"Index of Synonyms and Cross References"; Part 4—"Index of Patents," and Part 5—"Index of Addresses" (*i.e.*, of owners of patents listed in Part 4).

As the reader will gather from the above, the work is encyclopedic in scope and a great mine of useful information.

ANCIENT DYES

Ancient and Medieval Dyes. By WILLIAM F. LEGGETT. Pp. iv + 95. 5 × 7½ in. Brooklyn, N. Y.: Chemical Publishing Company, Inc. 1944. \$2.25.

THIS little book, by the associate technical editor of the *Textile Colorist and Converter*, is made up of brief chapters reviewing the ancient and medieval history of the better known naturally occurring dyestuffs, and seems to cover much the same ground as his articles on "Vegetable Dyes of Ancient Usage," which have been appearing in the *Journal of the New York Botanical Garden*.

The vegetable dyes described are Madder, Indigo, Woad, Saffron, Safflower, Weld, Brazilwood, Logwood, Barwood, Camwood, the Fustics, Orseille, Cudbear, Annatto, Turmeric, Cutch, Gambir and Quercitron. Of the animal dyes, Tyrian Purple, Kermes, Cochineal and Lac are included. The few mineral compounds listed (iron salts, malachite, azurite, ochres and chalk) were much more frequently employed as pigments than as dyes.

As stated above, the treatment of the subject is historical and informative. It describes the discovery of the dyes, the origin of their names, something of the natural history of the plant or animal in which they occur, their isolation or the way in which they were applied and their commercial progress through the years. The chemistry involved is not discussed.

The book is interesting, enjoyable and instructive. It tells how the ancient peoples learned about the coloring matters present in flowers, seeds, leaves, woods, insects, sea snails, etc.

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