Book Reviews

Pesticides and Health

Aldrin, Dieldrin, Endrin and Telodrin. An Epidemiological and Toxicological Study of Long-Term Occupational Exposure. K. W. JAGER. Elsevier, New York, 1970. viii, 234 pp., illus. $9.

The cyclodiene insecticides have been produced in large tonnage at the Shell Chemical Company plant at Pernis, Rotterdam, beginning with aldrin in 1954. Jager's book deals with a long-term study of the health effects of occupational exposure to the pesticides aldrin, dieldrin, endrin, and Telodrin in a group of over 800 workers at this plant.

Studies of this sort are needed to provide data on the effects of pesticides on human health to supplement experimental studies using animals. Workers may be exposed for long periods to dosages many times higher than those to which the general population is exposed. Therefore, as Jager points out, it should be possible to detect toxic effects in these subjects earlier than they would occur in the general population. This is the most comprehensive study yet published on the health effects of occupational exposure to pesticides.

The twice-yearly medical examination of these workers was quite thorough and included medical and occupational history and general physical examination with (yearly) chest x-ray, urinalysis, blood count, liver function tests, electroencephalography, and determination of blood concentrations of the pesticides under study.

There is no doubt of the high, acute toxicity of these pesticides, as shown by the 54 cases of clinical intoxication reported and by the 52 transfers of pesticide workers to other, unexposed activities on account of suggestive nonincapacitating symptoms. The reported symptoms were reversible and disappeared after cessation of exposure. Medical history and examinations revealed no disproportionate incidence of other types of illness.

A most interesting finding was the fact that endrin workers had lower blood concentrations of DDE than did controls whereas aldrin and dieldrin workers showed no differences from controls in this regard. Also, the excretion of 6-beta-hydroxycortisol in urine remained normal in aldrin and dieldrin workers but was elevated in endrin workers. These results suggest that in man aldrin and dieldrin exposures up to 175 times the exposure level of the general population do not stimulate the enzyme system that metabolizes DDE. However, occupational exposure in endrin manufacturing does appear to induce this enzyme activity.

In general, the author's evaluation of the clinical and laboratory data on the worker groups appears to be sound. However, it must be kept in mind that, in the case of diseases with low incidence and long incubation periods, large numbers of subjects or very long periods of observation or both would be required to detect small differences in incidence between the worker group and the control population.

The early chapters of this book provide a thorough summary of general toxicological data on the cyclodiene insecticides.

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The Myelin Sheath

Myelination. A. N. DAVISON and ALAN PETERS. Thomas, Springfield, Ill., 1970. xiv, 238 pp., illus. $13.50. American Lecture Series, No. 782.

The myelin sheath is a highly ordered material deposited around certain nerve fibers in higher animals. Fibers ensheathed with myelin are able to conduct nerve impulses up to 100 times faster than small, unmyelinated fibers. The advantage of possessing myelinated nerve fibers is obvious, and in higher animals myelin may account for as much as one-third of the weight of nervous tissue. As would be expected, damage to the myelin sheath leads to serious neurological disease (multiple sclerosis, for example). Studies of myelin are thus important to both the biologist and the physician.

During the past 15 years new anatomical and biochemical techniques have considerably changed our views regarding the nature of the myelin sheath. The electron microscope has established that the myelin sheath is formed from the membrane of a nonneuronal cell; biochemical techniques (including methods for isolating myelin from brain tissue) have allowed precise determination of the constituents of myelin, as well as studies of the alterations in these constituents during development and in disease.

The strength of this timely book is the primary collaboration of an anatomist and a biochemist—both active contributors to the knowledge of myelin acquired during the past decade. The initial chapter, on the morphology and development of the myelin sheath, is complete, well illustrated, fair, and indeed fascinating. (How does one myelinating cell provide segments of myelin of appropriate thickness for as many as 30 different nerve fibers?) The second chapter, on myelin biochemistry, documents the gradual evolution in thought regarding the turnover of myelin components. Initially myelin was considered to be one of the most stable materials of the body, but recent biochemical studies (utilizing more direct labeling techniques) have established that each myelin component has its own turnover rate, half-lives varying from over a year for cerebrosides to about 35 days for the three protein components. This chapter also documents the gradual realization that myelin is not composed of typical plasma membrane (though it is formed therefrom); its chemistry reflects its special function as a barrier material, without agencies for active transport.

The third chapter falters somewhat. Beginning with the unfortunate misprint that "whether or not myelination results in intellectual or other deficiencies is not yet established," it treats the problems of abnormalities of myelin composition too superficially to establish certain of the arguments set forth. With respect to small defects in the book two other points may be made: (i) The surname of the German histologist Lanterman, who published on the presence of the clefts along the length of the myelin sheath

in 1877, is consistently misspelled (with a double *n*) in this text as in many others. (ii) The use of the term "myelin" rather than "myelin fraction" for material biochemically separated from the brain can be misleading; is it correct to imply that this fraction contains only myelin and nothing else?

The two brief final chapters of the book discuss the myelin deficiencies that accompany inborn errors of amino acid metabolism and the myelin diseases that afflict domestic animals. These suggest areas in which research on myelin may be expected to concentrate in the immediate future. One point that might have been made more strongly is the need for more anatomical and biochemical data regarding the myelin changes in multiple sclerosis.

This monograph provides the reader with a comprehensive review of the normal development, structure, and chemistry of myelin, as well as an insight into the fact that fuller understanding of myelin will depend on acquiring more data from instances in which its development is abnormal or its normal state altered by disease.

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Fish Physiology

Circulation in Fishes. G. H. SATCHELL. Cambridge University Press, New York, 1971. x, 132 pp., illus. $7. Cambridge Monographs in Experimental Biology, No. 18.

This is the year for synthesis of matters related to circulation in fishes. Satchell's monograph appears almost simultaneously with Kjell Johansen's review "Gas exchange and circulation in fishes" (*Ann. Rev. Physiol.* **33**, 569–612 [1971]). Satchell's book is meant as an introduction to the subject, directed principally toward the undergraduate student or the mammalian physiologist interested in acquiring an overview of the area. It thus forms a natural bridge to the more technically oriented review by Johansen. The book requires an elementary knowledge of the physical principles of hemodynamics, for various aspects of resistance, capacitance, and compliance in the vascular system are introduced without explanation of their meanings. A brief section on hemodynamic principles would have been helpful for the undergraduate audience. Another difficulty the reader unfamiliar with fish taxonomy will encounter is the use of scientific names with only occasional reference to the larger taxonomic subdivision or habitat. An appendix organizing this information would have saved the reader the frustration of having to turn to reference works for it.

An outstanding feature of the work is Satchell's handling of the venous return of blood to the heart. Fishes are generally characterized by arterial pressures which are low compared with those in most vertebrates. To some extent, this is so because of the loss of energy imparted to the blood by the heart as the blood traverses the gill circuit. Satchell develops, especially well for the elasmobranchs, the role of auxiliary pumps that operate on the venous system and supply additional energy to the blood, favoring its return to the heart. This energy is supplied largely by the action of the muscles of locomotion. Another factor Satchell emphasizes is the importance of subambient pericardial pressure in favoring venous return to the heart, a subject deserving of more attention in other vertebrate groups.

Acquisition of oxygen from a relatively viscous medium containing little oxygen, compared with air, poses for the gill breather problems not encountered by terrestrial vertebrates. Satchell introduces his reader to the anatomical arrangement of the capillaries of the gills, an arrangement that assures that blood flow is counter to the direction of water flow across the gills. Such piping arrangements, long used by industrial engineers for conservation of heat, result in a more efficient extraction of oxygen from the water. Fishes anticipated the human technological development by millions of years. An additional aid to oxygen acquisition is cardiorespiratory synchrony, a phenomenon which Satchell's own researches have gone far to elucidate. Here, the reader learns of the reflex coordination, evident in some fishes, which results in the coupling of cardiac ejection with the respiratory phase in such a manner that maximum gill capillary flow coincides with maximum water flow across the respiratory surfaces. The result is enhanced gas exchange.

Fishes exhibit a variety of special microvascular arrangements characterized as retia mirabilia, in which there is dense packing of inflow and outflow vessels in certain organs. Satchell gives a lucid picture of how such countercurrent systems contribute to the existence of striking temperature gradients between red and white muscles and to the establishment of the high partial pressures of gases which have been demonstrated in both the swim bladders and the eyes of various fishes.

The book also contains useful sections on cardiovascular responses to exercise and to lack of oxygen, the transport of gases by the blood, and the fragmentary data available on the innervation of the cardiovascular system of fishes. For the person interested in acquiring some knowledge of fish circulation, Satchell's little monograph should serve as a useful starting point. There is an extensive reference section for the reader who is stimulated by Satchell to explore further this fascinating subject.

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Biochemistry of Lipids

Lipid Metabolism. SALIH J. WAKIL, Ed. Academic Press, New York, 1971. xiv, 614 pp., illus. $28.50.

According to the preface of this book, "Recent advances in methodology and instrumentation have made more impact on the field of lipids than on any other area of biochemistry. As a result, there is a pressing demand from investigators, teachers, and students for a comprehensive account of the major achievements and trends in this field. This treatise . . . was conceived to help satisfy this need." In my opinion, the authors have succeeded fairly well in reaching the stated objective.

The expertise is there. In three separate chapters on fatty acid metabolism, Salih Wakil, Rubin Bressler, and Paul Stumpf deal, respectively, with the general aspects of fatty acid metabolism, fatty acid metabolism in animals, and fatty acid metabolism in plants. While this fragmentation in the treatment leads to some slight overlap, it is not a serious matter and it enhances the ability of the separate chapters to stand alone.

A second group of three chapters