

Causal inference. Edited by KJ Rothman. Epidemiology Resources Inc, Chestnut Hill, MA 1988. 207 pp. ISBN 0-917227-03-4. (Price: USD 21.00)

Results from epidemiologic investigations are often used as a basis for discussions on possible causal associations. This statement is not only true of studies of associations between life-style or environmental factors and the occurrence of cancers, cardiovascular diseases, etc ("etiologic epidemiology"), but also of applications of epidemiologic methods in, for example, health services research.

"When is it possible to conclude that an observed association represents a causal association?" Epidemiology and philosophy meet when one tries to answer this question — or when one tries to show that the question is incorrectly formulated. Examples of the former are Hill's famous "criteria" from 1965 and the Surgeon General's "epidemiologic criteria for causality." Examples of the latter are the applications of Karl Popper's philosophy which have appeared in epidemiologic literature during the past decade.

Causal Inference is a recent anthology with contributions from several well-known epidemiologists discussing these problems. In particular, attention is paid to the question of whether empirical data can "verify" or increase the credibility of a statement (eg, by fulfilling Hill's criteria) — or whether they can only be used to "falsify" statements (Popper). A consistent representative of the latter viewpoint is Stephen Lanes, who also shows that the question is not only of "academic," but also of great practical, importance. Mervyn Susser and Douglas Weed develop different "criteria" aimed at increasing the credibility of the view that an association is causal, but they also show the influence of Popper's skepticism in different ways. Sander Greenland points out the difference between epidemiologic research (where one wants to avoid subjective judgments) and its applications, for example, in preventive medicine (where such judgments — eg, on the basis of Hill's criteria — are necessary in decision making).

The need for decisions and actions, eg, with the purpose of disease prevention, has (perhaps first with the general public) created the impression that certain results from empirical research are "conclusive" in the sense that they "prove" that there is a causal association. But, to quote Imre Lakatos (1984), "Very few philosophers or scientists still think that scientific knowledge is, or can be proven knowledge [p 185]." Proof is not a part of empirical science (including epidemiology), but rather of closed systems such as

logic and mathematics. In epidemiologic (and other empirical) studies one can never rule out potential sources of error, such as confounding and misclassification. Instead, the question is whether the credibility of a causal association increases when certain criteria are fulfilled (eg, Hill, Susser, Weed), or if the credibility can be increased only by repeated failures to refute such an association (eg, Popper, Lanes, Poole).

Other related questions discussed in this volume are the meaning of the concept "random error" and the question of how research contributes to increased knowledge. Susser writes, for example, that knowledge develops both by empirical data giving rise to hypotheses (induction) and by hypotheses being put to the test in empirical investigations (deduction). On the other hand, several authors argue, influenced by Popper and others, that only deduction can contribute to the growth of scientific knowledge. This view is perhaps developed furthest by Charles Poole, who argues that empirical data always show something which is "unexpected" or "not unexpected," and that these "expectations" are thus already implicit hypotheses. Hence, all empirical research is deductive.

The questions discussed in this book are central for anyone engaged in epidemiologic research or its applications, eg, in preventive medicine. Most of the authors are very conversant with both the philosophic and epidemiologic aspects of the problems. The volume comprises three parts, with the authors presenting their views in the first part ("Thesis"), being criticized and commented on by other authors in the second part ("Comment"), and then having the opportunity of clarifying or modifying their views in the third part ("Rejoinder"). It is inevitable that 16 contributions from 13 authors differ with regard to quality and accessibility, but viewed in its entirety *Causal Inference* is a valuable contribution to a discussion that is of fundamental importance in epidemiology. In the philosophy of science a similar discussion was initiated when, in 1963, Karl Popper published his book *Conjectures and Refutations: The Growth of Scientific Knowledge*. In epidemiology, these questions have been actualized during the past decade. Perhaps one may wonder why Popper's influence on epidemiology has required such a long induction time.

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Occupational medicine — Principles and practical applications. Second edition. Edited by Carl Zenz. Yearbook Medical Publishers Inc, Chicago, IL 1988. 1273 p. ISBN 0-8151-9865-5 (Price: USD 205.00)

The editor of this comprehensive work on occupational medicine states that the book is intended to provide basic information to meet challenges of new knowledge and requirements for the protection of all workers, while still retaining the traditional concepts dealing with occupational disease and trauma. In addition to the occupational environmental factors, occupational health now includes the physiological and psychological adaptation of man to work. This shift in emphasis calls for methods devised to improve relationships with workers, labor groups, management, and government at all levels. While reading this volume, I wondered for whom this basic information is intended. I have come to the conclusion that the specialist physician would want more specialized literature as a reference work and that the book is too extensive as a textbook for medical students. As a reference for the medical doctor not daily involved in occupational medicine, and for group practices and some hospital departments, this volume certainly has a function as basic reference literature.

The volume *Occupational Medicine — Principles and Practical Applications* is a collection of articles from 95 authors arranged in seven parts with 71 chapters and two appendices. In addition there is an index of key words of about 95 pages. Each section is followed by a list of references. For some chapters only key references are given; for others the reference list is extensive, with more than 300 being included. Most authors are from the United States, but 26 are from other countries, mostly Finland and Sweden with a few from other European countries. Many of the authors are well known experts in their fields. Others do not seem to be so distinguished, and there is an obvious wide range of quality between the different chapters. Such differences in quality are difficult to avoid in a volume like this, and it is probably not worse in this one than in other similar books. More important with books of this structure is the long time-span between the acceptance of the manuscripts and the time of publication. I found no reference to papers published later than 1984, and therefore the book was already four years out of date at the time of publication. This lag is probably somewhat the same as that for similar books, but it brings up the question of whether or not such books are at all profitable.

The first part of the book concerns administrative and clinical aspects of occupational medicine and consists of 13 chapters. The authors are, with a few exceptions, from the United States and, although this section also gives general information, it will be of primary interest to physicians working in that country. One of the exceptions is an excellent chapter on

biological monitoring by Antero Aitio and his co-workers from Finland. Other important chapters in this part are on trauma, occupational dermatosis, ocular responses to chemical and physical injury, and determination of fitness to work. The chapters on organization and administration and on the description of the tasks of the different categories of people within occupational health departments are of considerably less interest.

Occupational pulmonary diseases have been given a section of their own, consisting of five chapters including an overview of occupational pulmonary diseases, hypersensitivity pneumonitis, and occupational asthma and chapters on establishing causation and evaluating pulmonary impairment and pulmonary function testing in industry. This part is general in outline and gives a good overview of the topic. The editor uses, in this case, an organ system as the framework for discussing occupational diseases. In other chapters both single chemical substances or physical interactions with the human organism are used, as well as selected work categories. This approach is fruitful, as the physician using this volume as basic reference literature may meet the occupational disease either by investigating an organ system or by the patient telling about exposure to a certain chemical or physical agent. He may also ask about the patient's work and then deduct the source of the problem from such information. These different approaches make the book particularly useful.

The third part discusses the physical occupational environment. It consists of 10 chapters treating biomechanical problems, hearing loss, vibration, heat, and low temperatures, as well as ionizing radiation and other types of energy emission. There are also chapters on practical ergonomics and work with video display terminals and a chapter on the medical aspects of commercial diving and work with compressed air. In this chapter the publication lag is obvious, as no discussion on the possible hazards to the reproductive system from video terminals is included. Neither has this problem, even if it has been regarded as not important, been mentioned in the section on reproductive toxicology and occupational exposure, even though radio-frequency and microwave radiation are discussed.

The section on the chemical occupational environment consists of 24 chapters discussing a number of important chemicals in the work environment. Special chapters have been added on the health effects of solvents in general, psychological effects of exposure to solvents and other neurotoxic agents in the work environment, and on occupational neurotoxicology. These chapters are written by selected Finnish and Swedish scientists in the forefront of research in these fields, but they definitely suffer from the four-year gap in this rapidly expanding field. The same objections can be raised for the chapters on occupational genotox-

icology and occupational cancer risks. In particular the genotoxicology chapter is however excellently written.

The selection of work categories in the part describing selected work categories of concern seems reasonable. Women at work is given a special chapter, as well as reproductive toxicology and the occupational exposure of women and men. Less important and somewhat out of place is the chapter on preplacement medical evaluation and recommendations, and the detailed ergonomic checklist for industrial trucks seems very specialized. The chapter on hazardous waste sites may be out of context, and the observations on fiber glass in relation to health suffer again from the publication gap. In general, however, I feel that these selected work categories should be of interest to the physician using this volume as a reference work. Altogether, 15 chapters are included in this section.

The section on psychosocial considerations consists of three important chapters, one on stress at work, one on shift work, and a chapter on the diagnosis of absenteeism. The chapter on stress at work is up-to-date and describes a modern interactive model for work environment analysis. The absenteeism chapter seems to be more appropriate for the situation in the United States and is of less interest from the international and, specifically, Scandinavian point of view.

The last part of the book, written by Sven Hernberg, describes important principles of epidemiology with practical examples from occupational health. The chapter gives an excellent short introduction to occupational epidemiology and makes the reader impatient to get more information.

There is one appendix which is a reprint from the American Conference of Governmental Industrial

Hygienists' booklet on threshold limit values and biological exposure indices for 1986—1987. It, however, seems unnecessary as this booklet is easy to get and is changed every year. The other appendix is important, as it gives some selected tables for units of measure in the SI system.

The technical qualities of this book are acceptable but not excellent. There are a number of black and white photographs, no color pictures. The illustrations somehow seem to illustrate a number of old-fashioned worksites and may not be representative of the late 1980s. There are a number of tables which are acceptable. Figures sometimes seem primitive with no general standardization. They are, however, mostly appropriate and easy to understand. The paper quality is acceptable, but the printing is small, making the large-field two-column pages hard to read.

In conclusion, this is an extensive reference volume for occupational medicine and its principles and practical applications. I feel that it can be recommended for physicians, group practices, and possibly smaller hospital departments as a reference book for basic information and as a source for further literature search. Even if there is a lag time of four years since most chapters were written, a number of sections contain important, useful, and up-to-date information.

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Occupational pulmonary disease. Number 2 of volume 2 of the series *Occupational Medicine: State of the Art Reviews*. Edited by Linda Rosenstock. Hanley & Belfus, Inc, Philadelphia, PA 1987, pp 213—428. ISSN 0885-114X. (Price: GBP 19.95)

While many of the traditional occupational diseases are disappearing, occupational respiratory disorders remain a significant challenge. The increasing interest in this problem is reflected by the number of textbooks appearing on this subject almost every year.

The present book is a collection of 12 essays on topics of current interest. It is intended for practicing clinicians who actually see patients. Sixteen authors have contributed. They are skilled experts who have been able to condense their texts to essentials. The fact that all the authors except one are from the United States does not weaken the text, but it does make some

of the essays more attractive to North American readers, eg, the chapter "Evaluation of Impairment and Disability in Occupational Lung Disease."

The first essay deals with the well-recognized problem of test failure in spirometry. It reviews the impact of test failure on epidemiologic surveys, but the clinical implications are less thoroughly discussed.

Two essays deal with the evaluation of impairment and disability. Both contain important information, although differences in legislation may narrow the forum to North American readers.

Mark R Cullen discusses some of the controversies concerning asbestos-related lung cancer. One involves the question of whether lung cancer develops as a complication to fibrosis or occurs irrespective of the presence of asbestosis. Another concerns the existence of a threshold for asbestos-induced lung cancer. Both of these controversies are dealt with in a balanced manner. The third "controversy" discussed, ie, whether

chrysotile is less carcinogenic than amosite and crocidolite, seems less important in light of the high incidence of lung cancer among textile workers exposed exclusively to chrysotile. The association between chrysotile and mesothelioma would probably have been of greater interest. The asbestos problem is followed by an excellent essay by Rosenstock & Hudson on the pleural manifestations of asbestos exposure. Asbestosis and pleural plaques are traditionally recognized effects of asbestos exposure. Diffuse thickening of the visceral pleura and pleuritis as a comparatively early manifestation of exposure have received little attention.

An essay on acute inhalation injury is concisely written and assembles the data into one section.

The short chapter on silicosis serves at least two purposes. First, it stresses the fact that the incidence of silicosis has remained surprisingly constant. Second, it points out that current occupational exposure limits do not protect against silicosis.

Other well-written sections include one on the immunologic evaluation of occupational lung disease. The authors (Newman, Storey & Kreis) have struck the

right level in that they assume that the readers do not have a very profound knowledge of the subject.

It is clearly stated in the preface that the book does not attempt to cover the whole field of occupational lung disorders. Therefore some readers may find a few topics missing. On the whole, however, this edition of *Occupational Medicine: State of the Art Reviews* is a pleasant contribution to the literature on occupational respiratory disorders. The understanding of these diseases has improved and changed over the last few years. This issue contains most of what is new, it is easy to read, and most readers will find valuable and useful information in the commendably briefly written sections.

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Work-related lung disorders. By JE Cotes, J Steel. Blackwell Scientific Publications, Oxford 1987. 436 p. ISBN 0 632 01511 X. (Price: GBP 65.00)

Work-Related Lung Disorders is a new textbook on occupational lung diseases. All the chapters have been carefully reviewed by well-known referees. The effort of writing the book was obviously triggered partly by the fact that occupational respiratory medicine is in transition and partly by a genuine concern about the regrettable trend towards decreasing research funding in the United Kingdom. As is pointed out in the preface, traditional plagues of workers, such as coal worker's pneumoconiosis, silicosis, and asbestosis may be declining, but allergic lung disease, chronic bronchitis, emphysema, and occupational lung cancer persist and are even increasing. Moreover these disorders are not even fully understood.

The book comprises 436 pages divided into 19 chapters, the first six of which are not concerned with diseases.

After an introduction to the protection of workers, chapters 2 and 3 discuss the basics of environmental monitoring and ways of ensuring clean air through dust suppression and respiratory protection. These chapters are followed by an obligatory overview of the respiratory defense mechanisms. All these chapters have been concisely and comprehensibly written.

The next chapter, which deals with screening and examination procedures, including issues such as ques-

tionnaires on respiratory symptoms and the interpretation of lung function results, is likely to be well received. The same is probably true for the chapter on basic epidemiologic methods. Naturally, rather little can be presented in 15 pages. Still, a general idea is obtained and an urge for further reading is, hopefully, evoked.

Chapter 7 surveys conditions caused by extreme physical climates including cold, heat, high altitude, and the diving environment. It may be argued that these conditions do not primarily affect the respiratory organs or do not harm the lungs at all. Still the chapter is well written and interesting, and presumably reflects the authors' personal interest in physiology.

Textbooks on occupational lung disease inevitably include chapters on various pneumoconioses. For authors these chapters are probably less inspiring, as the diseases are declining and scientific novelties are scarce. Although the chapters on these topics are well written in this book, some issues of current interest seem to have been overlooked. In the chapter on silicosis dose-effect relationships could have been included. In the section on the prevention of silicosis "threshold limit values" are referred to. By this misnomer, the authors mean the occupational exposure limits which have been set in different ways by various countries. The limits are not strictly health-based but include socioeconomic considerations. Therefore, they do not necessarily protect against disease. For example, a WHO study group has surveyed available exposure data and concluded that current limits for

quartz do not protect against silicosis (*WHO Technical Report Series* 734/1984).

Another important issue is the claimed association between quartz exposure and lung cancer. There appears to be an increased risk of lung cancer among workers with silicosis. The risk cannot entirely be accounted for by other simultaneous exposures. The evidence has been reviewed by an international group in Lyon (*IARC Monographs*, supplement 7, 1987). These conclusions should have been discussed either in the chapter on silicosis or in the one on occupational lung cancer.

The chapter on asbestosis contains current data. It is an objective review of the asbestos problem. My personal feeling is, however, that the authors are somewhat overoptimistic as regards their statement of the "recent epidemic of asbestos-related diseases being past its peak." A global review of the use of asbestos and the period during which the maximum use occurred would probably predict an increasing number of malignancies for some years to come.

Another observation is that the benign pleural effects of asbestos are given modest space. There is evidence showing that pleural effusion is the earliest, and a fairly common, effect of asbestos exposure. It also leads to diffuse thickening of the visceral pleura and thereby often causes a deterioration of lung function. Rounded atelectasis or so-called pseudo tumors have not been mentioned even though these manifestations are seen rather often and may lead to invasive measures.

Occupational allergic respiratory disorders have received much attention in this textbook. This con-

sideration reflects the changes in the incidences of occupational lung diseases and is very welcome. The chapters contain current and important information on extrinsic allergic alveolitis and occupational asthma. A little more could have been written about the nonspecific reactions often dealt with under the heading of organic dust toxic syndrome.

A chapter on chronic bronchitis in relation to the work environment deserves attention.

The book ends with a chapter on exercise testing and respiratory disablement and one on the management of respiratory impairment. Both chapters fit the entirety of the book well.

In summary, this textbook is a good alternative to existing literature. Containing some recent and important data, it serves as a complement to earlier textbooks. It is well written and, hence, easy to read. According to WHO semantics, the title of the book indicates an expansion towards the relationship between nonoccupational diseases and the work environment. Such an addition would have been very welcome; however, the definition of the "work-relatedness" of diseases has probably not been accepted by the authors. The book can be recommended for occupational physicians, hygienists, and others interested in occupational lung medicine.

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