

A SYMPOSIUM ON

Industrial Pulmonary Diseases

EDITED BY

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Postgraduate Medical School
of London

With 98 Illustrations



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INDUSTRIAL PULMONARY DISEASES

*A Symposium held at
The Postgraduate Medical School of London
18th–20th September, 1957
and
25th–27th March, 1958*

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INDUSTRIAL PULMONARY
DISEASES
A Symposium

PREFACE

This book contains the papers delivered at a symposium on industrial chest diseases which was held at the Postgraduate Medical School in March, 1958. It was a "repeat performance" of a previous symposium in September of the preceding year, at which not all those wishing to attend could be accommodated.

In planning the programme we were fortunate to have the advice and co-operation of Dr. J. Rogan of the National Coal Board and Dr. R. S. F. Schilling of the Department of Occupational Health at the London School of Hygiene. It was our purpose to cover the whole field of the pneumoconioses as seen in this country in all their aspects, from the physics and biological fate of dust, through experimental, pathological, physiological and epidemiological studies to the radiological and clinical investigation and treatment of the patient. Industrial pulmonary disease has long been a subject of intensive investigation in this country, and as a consequence we were able to call on leading experts, both on the various chest diseases associated with occupational exposure to different dusts and on the several scientific and medical disciplines which have contributed to our knowledge of these diseases.

Flint grinders' and knappers' silicosis and coal-miners' asthma were among the first forms of industrial disease to be described in Great Britain, stannosis, beryleosis and china clay pneumoconiosis among the more recent. All of these conditions are described in one or more chapters of the book. Several of the classical silicoses have practically disappeared, either from the abandonment of the industrial processes with which they were associated, or through the substitution of other processes or other materials. Other industrial hazards have arisen and other diseases have appeared, or older familiar pulmonary disabilities have come into new and greater prominence. Among the latter, coalworkers' pneumoconiosis is outstanding. With the greatly intensified working of the coal mines of this country, which occurred in the first half of this century, this form of chest disease has come to assume an importance out of all proportion to others encountered in industry. It may appear to the reader that a

disproportionate emphasis is placed on this subject in the several chapters devoted to it. But there is little doubt that coal-dust disease is the most prevalent and serious form of pneumoconiosis encountered in industrialized countries throughout the world, and has received more intensive study than any other pneumoconiosis. We hope that, while giving prominence to coal-dust, we have allowed sufficient space for the adequate consideration of other dust hazards.

The publication of the papers presented at the symposium was undertaken at the request of many of those who attended and participated. The opinion was repeatedly expressed that it would be valuable to present all of the important and comprehensive contributions, embodying both past and present knowledge, as a co-ordinated whole in a single publication. It is a pleasure to record that all of the contributors agreed, and this book is the result of their efforts to present their several papers as chapters in an integrated story which attempts to deal, if not exhaustively, at least comprehensively with the various forms of industrial pulmonary diseases which are encountered in Great Britain.

Our thanks are due to Dr. C. E. Newman and Miss Beryl Brown for their help in organizing the symposia, to Dr. P. Hugh-Jones for valuable assistance with the editing, to Dr. C. M. Tinker for preparing the index and Miss J. C. Rooker for assistance with the preparation of the typescripts and checking of proofs.

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CHAPTER 1

INDUSTRIAL PULMONARY DISEASES IN GREAT BRITAIN

By

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THE earliest precise reference to industrial pulmonary disease in Great Britain occurs in an application made in 1726 by a working painter, Thomas Benson, for a patent for the wet grinding of flints for use in earthenware manufacture. Benson stated that when the process was carried out by the usual dry method 'persons ever so healthfull cannot survive above two years.' (Meiklejohn, 1947.) The disease was not recorded in medical literature until 1796, when Johnstone described the consumption of the needle pointers of Redditch, who used dry grindstones. Thereafter during the 19th century the same disease was described in a wide variety of occupations throughout the country.

Summarizing the many reports it appears that the disease clinically was described as asthma, bronchitis, phthisis, rot or consumption and pathologically as cirrhosis of the lung, chronic interstitial pneumonia, fibroid phthisis and grit (gritty) phthisis. The condition arose out of work in pottery manufacture, grinding of metals, sandstone dressing and quarrying, coal-mining, metal-mining and from certain occupations in iron foundries and textile mills. Fine dust inhaled into the lungs was identified as the causative agent, and according to the nature of the dust several varieties of dust disease of the lungs, pneumonokoniosis (now pneumoconiosis), were successively differentiated, anthracosis, siderosis, silicosis, byssinosis and others. The precise pathology of these diseases was not understood, particularly their relation to tubercular phthisis. Many of the patients died, according to current terminology, 'generally anasarous.'

Many authors recorded that patients died at the age of 30 or even earlier. Relative to this, however, it must be remembered that in the

first half of the 19th century boys started in trades about the age of 10 and the working day was 12 hours or more. In certain occupations the disease seems to have been almost universal after 20 years at risk. Patients suffered considerable prolonged physical distress which terminated in untimely death. From necropsy reports it appears that the main form of the disease was what is now named complicated pneumoconiosis.

Statistics of Mortality and Morbidity

Faced by such a serious problem it is not surprising that doctors, then, as now, sought to measure the prevalence of the disease in industries and occupations. The statistics are divisible into two groups, mortality and morbidity. Compilation of mortality figures was assisted by the institution of the Census in 1801 and thereafter at ten-yearly intervals, and the Registration of Births and Deaths in 1837.

Mortality

Dr. William Farr was appointed Compiler of Abstracts in 1839, an office which he held for forty years. In the course of his duties he made many outstanding reports. The General Report, on the Census of 1851, published 1855, was the first of the Registrar-General's Decennial Supplements on Occupational Mortality. Invaluable as these statistics undoubtedly are, proper regard has not always been had to their limitations. It is not sufficiently realized that the vital statistics of occupations can only be general and approximate. As time passes changes in public health, social habits, environmental conditions in mines and factories, hours of work, methods and processes of manufacture diminish the value of statistics compiled decades—indeed a century—ago. The difficulties of embracing a whole range of occupations, even in a single industry, into a few groups are almost insuperable, while general designations such as miner, foundry worker, metal worker, potter, labourer and so on are valueless for accurate analysis. The fallacies which arise from changes of employment are too well known—but so frequently forgotten—to require discussion. Date of birth or age of a workman seem very simple factual matters, but even among men they are not always remembered accurately. Certificates of sickness and death are notoriously unreliable. In this connexion the Minutes of Evidence of the Departmental Committee on Compensation for

Industrial Diseases (Samuel Committee) (1907), are highly illuminating: for example, Dr. McPhail of Coatbridge, Lanarkshire, stated with reference to the certification of death of colliers in his practice:

‘Alcoholism might have been certified in many of these cases, but for care to omit terms, which might lead to insurance moneys being refused.’

Further difficulty arises from the need to arrange the causes of death into categories. Where several causes are recorded the Registrar-General has been compelled to establish priorities. Thus tuberculosis takes precedence over fibrosis of the lungs and cancer over many other conditions. Schilling (1957) has described how from such statistics he was misled into a field study of heart disease among operatives in the Lancashire cotton industry, instead of into a study of respiratory disease. With a view to improving the value of his statistics changes of classification have been frequent even by the Registrar-General. Again we are all aware of changing fashions in diagnosis and hence certification, which follow recent advances and the pronouncements of experts.

Farr and his successors, however, were fully aware of these difficulties and the consequent weaknesses and deficiencies of their compilations. They stated and discussed these matters and Collis and Greenwood (1921) have pertinently commented:

‘It is not possible to absolve the student of official tables from the necessity of reading the introductory and explanatory matter.’

and further:

‘No statistical tests can in any way guarantee the material accuracy of the data.’

The Registrar-General’s statistics of mortality have been admirably supplemented by generations of Medical Officers of Health, who in their Annual Reports have dealt with trade diseases in their area.

Morbidity

Statistics of morbidity of occupational groups were originally derived from the records of Friendly Societies and of the Sick and Burial Clubs of Craft and Trade Unions. These statistics, however, are subject to all the fallacies already cited and many more. In the present century the incidence and morbidity of dust diseases of the lungs in particular industries and occupations and in geographical areas have been provided by specially designed enquiries. Among

these the current Rhondda Fach project led by Dr. A. L. Cochrane (Cochrane *et al.*, 1952, 1955) is supreme.

From the foregoing comments it may appear that I attach little value to the Registrar-General's statistics. This is not so; properly used they have great merit. The important fact, which I wish to underline, is that the figures are not to be construed narrowly. Fletcher (1948) summarizes it admirably:

'The figures provide contrasts, which though imprecise, point to possible lines for further inquiry.'

Present Situation

What is the prevalence of the dust diseases of the lungs in Great Britain at the present time? Quite simply, no one knows. However, official statistics of pneumoconiosis cases from which one may derive a crude idea—and I emphasize crude—of the prevalence of these diseases in various industries have been published annually since 1948 in the Report of the Ministry of Pensions and National Insurance. The figures are based on applications, examinations and decisions by the Pneumoconiosis Medical Panels in pursuance of their duties under the National Insurance (Industrial Injuries) Acts. At this point it is necessary to explain that the Pneumoconiosis Medical Panels do not certify, they merely diagnose and assess. The Insurance Officer is the executive. Nevertheless, it is easier to speak of certifications so long as you are aware of the terminology of organizational practice. Accordingly I shall use certifications and diagnosed and assessed cases as synonymous. Next let us acknowledge that prevalence rate has a precise meaning to the epidemiologist, and this scientific measure is not satisfied by calculations based on certifications. The number and terms of certifications are liable to a wide variety of influences including intensity of applications, standards of early diagnosis, lack of uniform standards between panels, quality of radiographs and alterations in relevant legislation. Despite these defects they merit critical scrutiny. Indeed they have been the basis of comment and inferences by accepted scientific experts, Fletcher (1948), Warner (1956), Davies (1957) and by members of Parliament and trade union leaders. Whatever their deficiencies I believe that they present some idea of *incapacitating* disease. If used after the manner of Farr and his successors they provide contrasts indicating lines for further enquiry by appropriate scientific studies.

Pneumoconiosis in Various Industries

Table I, extracted from Table 51, Report of Ministry of Pensions and National Insurance for the year 1956 (H.M.S.O. Cmd. 229), shows the range of industries in which cases were certified.

Table I

CASES OF PNEUMOCONIOSIS ACCORDING TO INDUSTRY
FOR THE YEAR 1956

Industry	Cases diagnosed
Coal-mining cases	4,331
All industries other than coal-mining	1,352
Refractories	45
Sandstone	11
Pottery	431
Asbestos	31
Coal trimming	4
Tin-mining	6
Hæmatite-mining	17
Slate-mining	7
Slate splitting	15
Graphite	—
Building	28
Sandblasting	10
Tunnellers	5
Metal-grinding	6
Steel-dressers	63
Abrasive soap powders	1
Barytes-mining	—
Quarrying	16
Furnace dismantling	27
Carbon electrode manufacture	1
Boiler scaling	12
Foundry workers	282
Fireclay-mining	20
Other clay-mining	9
Chert-mining	1
Lead-mining	—
Oil shale mining	2
Stratified ironstone mining	—
Other mining	3
Other scheduled occupations	60
Unscheduled occupations	23
Cotton (byssinosis cases)	216

It is not possible to represent the trend of certifications in all these industries over the years, as the necessary figures have not been published. Table II comprises the main causative industries. The absolute numbers of cases are impressive, but their comparative

order is dependent on the number and composition of the populations at risk. I would comment simply that on these figures the pottery industry constitutes the most serious problem. This recalls

Table II

PNEUMOCONIOSIS CERTIFICATIONS IN CERTAIN INDUSTRIES 1951-1956
First Examinations Only

Industry	Number of cases diagnosed by years						
	1951	1952	1953	1954	1955	1956	1951-1956
Coal-mining	3,305	2,948	3,787	4,151	4,562	4,331	23,084
Refractories	20	31	34	24	46	45	200
Pottery	135	153	350	338	373	431	1,780
Tin-mining	6	3	5	5	8	6	33
Metal-grinding	4	8	8	9	1	6	36
Asbestos	15	15	22	31	48	31	162
Cotton (byssinosis)	43	48	50	62	109	216	528

Benson's statement in 1726, previously quoted, and Farr's conclusion in 1875 that,

'Earthenware manufacture is one of the unhealthiest trades in the country.'

By contrast I would direct attention to the almost complete disappearance of the disease in metal-grinding. This derives from preventive legislation commencing in 1927.

Owing to lack of published information further examination of these figures, except for coal-mining, is not possible so my further analyses will be restricted to this group.

Pneumoconiosis of Coal Workers

Elsewhere I have told the story of lung diseases of coal-miners from the year 1800 (Meiklejohn, 1951). Briefly, the evidence seemed to show that dust diseases of the lungs were very prevalent among colliers throughout the 19th century. The disease was variously named, spurious melanosis, black spit, miners' asthma, fibroid phthisis, anthracosis and anthraco-silicosis. Arlidge (1892) adequately represents an opinion generally prevailing at the close of the century:

'There is a widespread belief at the present day that the serious lesions of the lungs associated with the calling of coal-getters belong to past history, or, at the most, are very uncommon; and no doubt can exist that, compared with the past, they are becoming rarer, thanks to the introduction of efficient ventilation, of shortened hours of labour and of the increased attention given to the hygiene of mines.'

This situation is exceedingly difficult to understand. However, it will be noted that Arlidge speaks of serious lesions. Further light on the subject is shed by the evidence presented to the Samuel Committee of 1907 by such experts as Sir Thomas Oliver and Professor (later Sir Robert) Muir. It emerges that the experts had come to regard massive fibrosis as indicative of exposure to mixed dust, coal and rock, and dismissed the universal black pigmentation of colliers' lungs—anthracosis—as a benign condition. Indeed the Committee in their report stated:

'We are clearly of opinion that coalminers are not liable to fibroid phthisis, and although cases of anthracosis—using the term to mean cases in which the lung is charged with coal dust—are commonly met with, we cannot find that in anyone that condition has proved to be a contributory cause of death.'

This happy situation was short-lived for the progress of machine mining restored increasingly dusty conditions and commencing in the early 1930s the disease recurred almost as an epidemic, particularly in South Wales. The story of the ensuing period to 1948 has been fully recorded by Hart and Aslett (1942) in the Report on Chronic Pulmonary Disease in South Wales Coalminers and by Fletcher (1948) in the Goulstonian Lectures delivered before the Royal College of Physicians of London in January, 1948. Since then numerous studies of the prevalence of pneumoconiosis in particular colliery areas have been made. These include surveys by the Pneumoconiosis Research Unit in South Wales and North West England (Cochrane *et al.*, 1956), by McCallum and Browne (1952, 1955) in Northumberland and Durham and by Black (1953) in Scotland. A more general picture—admittedly incomplete—of the present situation may be gained from the *Digest of Pneumoconiosis Statistics* published annually by the Ministry of Fuel and Power. Six of these reports commencing 1951 have been published to date. The tables of statistics are derived from various official sources. Unfortunately the Ministry does not provide such simple background information as details of population at risk. The reports are prefaced by a few explanatory notes on the operation of the Pneumoconiosis Medical Board but no commentary after the manner of Farr. For comments—usually scant—one has to study the Annual Reports of the Chief Inspector of Mines and the separate reports of Divisional Inspectors and the Reports of the National Coal Board. I have tried to analyse these tables. Certain facts emerge for comment, but preliminary to this it is necessary to provide some general information.

The analyses have been restricted almost entirely to tables which deal with first examinations under the Industrial Injuries Act. Underground workers (U.G.W.) have been chosen as the measure of the population at risk.

The Coalfields

The coalfields of Great Britain are grouped into 9 divisions, the boundaries of which are based on geographical location combined with administrative convenience. The divisions in turn are split into areas. For example, the South Western Division consists of 9 areas comprising the pits in South Wales, Monmouthshire, Dean Forest and Somerset. These pits produce all varieties of coal, anthracite, steam and bituminous. Whereas in some pits there is practically no silica rock associated with the coal seams, those in Somerset and Dean Forest include Pennant rock, a highly siliceous sandstone.

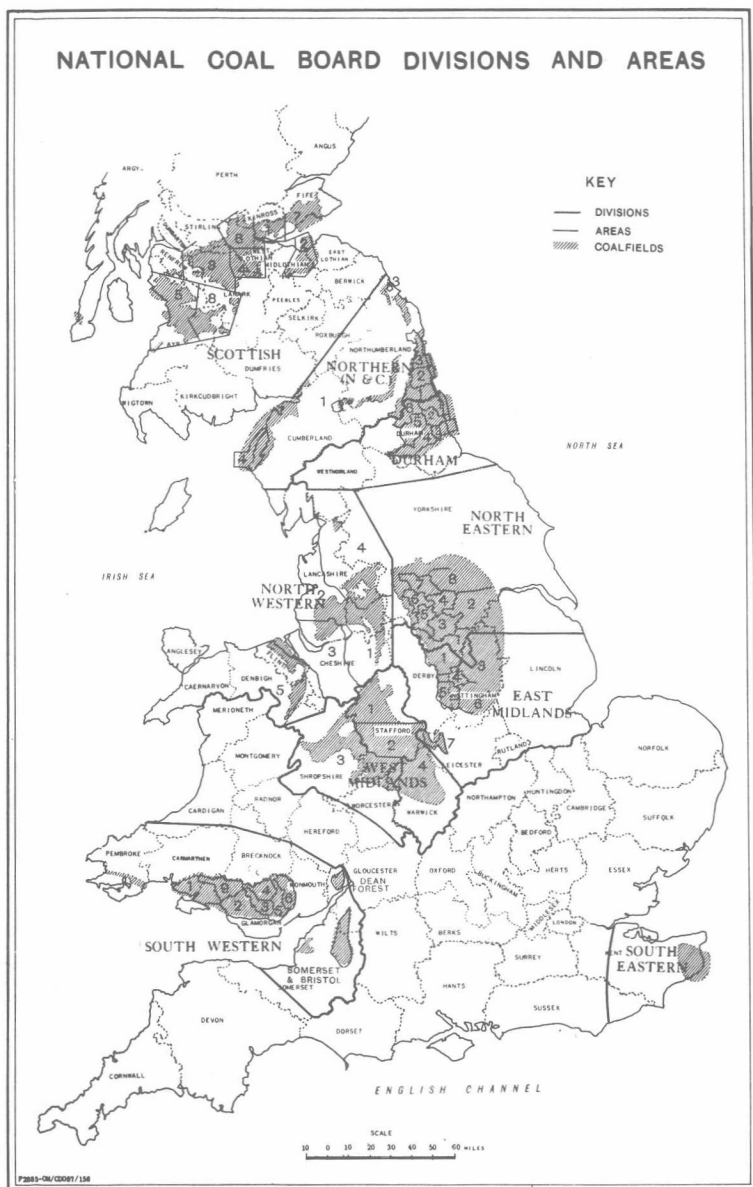
Pneumoconiosis Medical Panels

The decision of claims for disablement benefit for pneumoconiosis is reserved to expert medical officers of the Ministry of Pensions and National Insurance. At present there are ten centres: London, Bristol, Cardiff, Swansea, Stoke-on-Trent, Manchester, Sheffield, Newcastle-upon-Tyne, Edinburgh and Glasgow. The following is a summary of the procedure for dealing with claims.

The workman submits an application, usually but not necessarily supported by a medical certificate from his private or other doctor, to the local Insurance Officer. If he is satisfied that the workman is legally entitled to proceed, he passes the claim to the local Pneumoconiosis Panel. The subsequent stages are described thus in the introduction to the Digest.

'The workman is first sent for an X-ray film of his chest and the film is examined by a doctor of a Pneumoconiosis Medical Panel; the Panel's doctors are specialists in the disease. If the film discloses no evidence of pneumoconiosis, the claim is disallowed without a clinical examination, but the claimant has a right of appeal to a Medical Board and if he appeals must be clinically examined by the Board; if the film discloses evidence that the claimant may be suffering from the disease he is automatically sent for clinical examination by a Medical Board. In either case the Medical Board consists of at least two doctors of a Pneumoconiosis Panel.'

This official exposition does not accurately represent practice, for the doctors distinguish between radiographic evidence of pneumoconiosis and suffering from the disease. This is the controversial issue of category 1 simple pneumoconiosis of coalworkers, and



MAP 1

(Reproduced by permission of National Coal Board)