The British Occupational Hygiene Society

The Assessment of Health and Disease in Industry

The fourth conference of the British Occupational Hygiene Society, which dealt with the assessment of health and disease in industry, was held at the London School of Hygiene and Tropical Medicine on April 4, 1955, the President of the Society, Dr. J. M. Rogan, occupying the chair.

The President said that although their Society was not yet three years old its record of progress seemed satisfactory. Its membership was increasing and its finances were healthy, and it was represented on the Government’s Industrial Health Advisory Committee. In the years to come, however, their progress would be judged by their success in fulfilling the task laid down in its constitution—to promote the science of occupational hygiene. He was confident that they would be successful in attaining this objective, but they would succeed only if their members were active and remained so.

It was the policy of the Society to encourage young workers to give papers, so that inexperience should not deter any member from volunteering to give a contribution. Non-members could also present papers, if they were introduced by members.

Summaries of the papers read and the discussions follow.

Observations on the Assessment of Health in Industry

DONALD STEWART

From the Austin Motor Co., Birmingham

It was appropriate in the first place to ask just how far the sphere of clinical medicine in industry was of major interest to the Society. The President had clarified the matter. In his view it was inappropriate to continue conferences on environmental hazards without bringing the whole subject of occupational hygiene into balance by considering also the measurement of health and disease which must go hand in hand with the environment. The basic reason for the conference was thus to examine and discuss the medical contributions that could be made in the industrial field.

The constitution and membership of the Society are an implicit recognition of the fact that the promotion and maintenance of health in industry is dependent on groups of persons rather than on any one individual or specialist. It would be foolish to think that it could depend on the medical profession acting on its own, under its own impetus, and with its traditional techniques. At the same time, industrial health is the application of medical knowledge to all employment issues affecting the well-being of the worker. And because it is concerned with the man, his work, and his working environment, it is wider in scope and more complex in its implications than curative medicine.

The potential contribution to industrial health of legislation and of employers should be more widely appreciated. Legal standards, enforced where necessary, tend to prevent firms from escaping their responsibilities. Factory legislation, for example, in controlling certain conditions of work for young persons, can be an influence on the health of this important age group possibly more powerful than that of the appointed factory doctor. Industrial managers can make possible hazards safe, and provide good working conditions. The impact of the working day, and the sum of the varying factors that go to make it up, can mould the pattern of living which a man sets for himself outside the factory.

Wide problems of clinical medicine arise in industry and assume importance, contrary to the view of some theorists who maintain that industrial health is largely a matter of engineering or statistical study. These medical problems include the examination and assessment of employees who are exposed to or are suffering from industrial disease, injury from industrial accidents, psychiatric disturbances, and also cases where there has been aggravation of disease processes by the demands of work. Many disabled workers are effective producers in the right job, so medical advice on placement can be valuable. But to be of value this advice has to be related all the time to the physical and mental demands of the work the man does.

Work study therefore is the natural corollary to clinical assessment. There is a need to develop some adequate methodology to meet the needs of doctors and other scientists and technicians working on health matters in industry. Recent investigations have shown that job analysis techniques can be modified satisfactorily for this purpose.

Assessment of health in industry could be facilitated by regional provision of suitable machinery for promoting investigations, and by the wider availability of expert advice in industrial centres—in addition to that provided by the factory inspectorate. Both these proposals could profitably be examined by the new advisory committee on industrial health recently set up by the Minister of Labour.

Discussion

Discussion centred upon the provision of ancillary services, such as radiography, dust counting, and chemical analysis. Expert advice tendered by the Factory Department and the Medical Research Council was mentioned and also the feasibility of organizing this on a more comprehensive scale, or bringing in the universities, or initiating special institutes of industrial hygiene. Extension of the work of the public analysts beyond the analysis of water and food to include the estimation of toxic substances was also suggested.

In reply, Dr. Stewart said he thought that the country could not afford to have such investigations carried out at the public expense and that industry should pay for them and would be willing to do so if proper arrangements were made. A lead should be given by the Ministry of Labour.
The Contribution of the Factory Department to the Assessment of Health and Disease in Industry

R. MURRAY

H.M. Medical Inspector of Factories

The experience of the Factory Department in assessing health and disease in industry has been long and comprehensive and it would not be possible in a short time to pay full tribute to it. This summary, therefore, is mainly confined to the part played by the appointed factory doctor and the medical inspector.

Appointed Factory Doctors

The appointed factory doctor, formerly called the examining surgeon, of whom there are some 1,800 throughout England, Scotland, and Wales, is usually a general practitioner. His main duties are as follows:

Examination of Young Persons.—(i) All young persons starting work in any factory for the first time must be examined within 14 days to determine their fitness for employment and thereafter every year until they reach the age of 18. (ii) Boys over 16 who, in certain industries, are permitted to work at night must be examined at the start and every six months thereafter.

The appointed factory doctor may issue a certificate permitting employment unconditionally. In special circumstances he may issue a conditional certificate subject to re-examination after a specified interval or to conditions respecting the nature of the work in which the young person is to be employed. A provisional certificate lasting 21 days may be issued to enable him to obtain further medical data.

Periodic Medical Examination.—Certain codes of regulations and section 59 of the Factories Act 1937 contain provisions for periodic medical examination. A few codes require pre-employment examination. The intervals between examinations vary according to the nature of the hazard. Some of the more recent regulations provide for medical supervision in addition.

Investigation of Cases of Notifiable Industrial Disease and Gassing Accidents.—The diseases notifiable under section 66 of the 1937 Act if contracted in a factory are lead poisoning, phosphorus poisoning, manganese poisoning, arsenical poisoning, mercurial poisoning, carbon bisulphide poisoning, aniline poisoning, chronic benzene poisoning, toxic jaundice, toxic anaemia, compressed air illness, anthrax, epitheliomatous ulceration, and chrome ulceration. These must be distinguished from the prescribed diseases under the National Insurance (Industrial Injuries) Act, which now number 39 in addition to pneumoconiosis and byssinosis.

The appointed factory doctor may be asked by the Ministry of Pensions and National Insurance to give an opinion on claims for injury benefit for a prescribed disease in his district. The duties of investigating cases of notified industrial diseases and gassing accidents cannot be delegated to any doctor other than the appointed factory doctor, but the duties of examining young persons and of examining workers under various codes of regulations may be delegated, by certificate of the Chief Inspector, to the works doctor.

Medical Inspectors

The contribution of the medical inspectorate to the assessment of health and disease in industry is well recognized. The early pioneer work of Legge, Collis, Middleton, and Henry, and the work of the present medical inspectors give ample evidence of the work of this branch in the field of research.

On the more day-to-day aspect, the medical inspectorate are concerned with factory inspection, with the supervision of the work of the appointed factory doctors, the further investigation of notified diseases and the recognition and assessment of industrial hazards. They maintain a liaison with other ministries, with works medical officers, general practitioners and hospital consultants, with employers, and with trades unions.

The Need for Improved Assessment of Industrial Diseases.—The object of assessment is to provide information on which control measures can be based, and there is no doubt that the data available at present are inadequate to assess fully the true incidence of industrial disease and to recognize the part played by working conditions in the causation of disease.

Notification.—The limitations of the value of notification have been indicated by the Chief Inspector, who says in his Annual Report for 1953, in relation to epitheliomatous ulceration:

"It is evident that the notifications received in compliance with section 66 of the Factories Act 1937 are only a partial indication of the incidence of this disease. The duties of the medical practitioner and of the employer as regards notification are of prime importance for prevention, since the application of preventive measures to new processes and their intensification in recognized hazards are the immediate sequelae."

A considerable improvement in notification is needed from the medical profession and from employers. The Annual Report of the Ministry of National Insurance indicates that among those in insurable employment there were in 1951 43,600 spells of incapacity arising from the prescribed diseases, all of which are as amenable to preventive measures as the notifiable diseases, and if fuller information regarding these were available to the Factory Department, more precise efforts could be made in their assessment and control although the task is a huge one. There is a close liaison between the Ministry of Pensions and National Insurance, the Registrar General's office, and the Factory Department concerning current industrial disease as well as mortality records.

Information about the Use and Supply of Dangerous Materials.—The Factory Inspector in the course of his work is able to note the introduction of new materials and to pass on to his medical colleagues information which can be followed up to prevent risk to health.

The Atomic Energy Authority keeps the Department up to date concerning the supply of radioactive isotopes.
to industry. This kind of information is of enormous value in enabling precautions to be taken at the earliest possible moment.

**Chemical and Physical Investigations.**—The Engineering and Chemical Branch of the Department are able to give precise information as to the nature and composition of materials used in industry, and the Information Service has available relevant data from medical, chemical, and other technical journals.

**Clinical Pathology.**—There is no provision for appointed factory doctors to assess variation from normal at routine examinations by any means other than clinical examination. One of the medical inspectors carries out haematological investigations on a variety of process workers throughout the country and assists in assessing the effects of exposure, but obviously more pathological data and facilities for hospital investigations are needed. The Ministry of Agriculture and Fisheries has arranged with regional hospital board laboratories to have investigations carried out on men exposed to dinitro-o-cresol or to the organic phosphorus insecticides.

**Radiology.**—Radiology is a specialty in itself, and the appraisal of the radiographs of industrial workers is a difficult task demanding experience not only of radiology but of the particular occupational exposure.

**Other Specialties.**—Industrial medicine has need of many specialists to make a full and complete assessment of the nature and extent of industrial diseases.

Skin disease, for example, is the commonest cause among the prescribed diseases of claims for injury benefit, and the one on which expert advice is most needed, if only to reduce the risk of recurrence. The dermatologist needs to be familiar with industry and industrial processes to appreciate what and where are the risks of contracting dermatoses.

**Education.**—Education is the essence of the problem. The man who is sick goes to see a doctor, and it depends on how well informed the doctor is whether he can make a true assessment of the case. Doctors should be taught the elements of industrial medicine as undergraduates and the link between diagnosis and prevention should be emphasized.

**The Future Contribution of the Factory Department**

The setting up of the Industrial Health Advisory Committee is an indication of a fuller recognition of the needs of industrial health. Industrial health services will be developed on a voluntary basis, but as and where necessary the Minister will use his statutory powers under the Factories Acts.

With the assistance of industry the Department looks forward to the more efficient control of hazards and the promotion of health in factories, but this depends very largely on improved methods of appraisal and assessment which can only be achieved with the cooperation of all concerned.

**The Clinical Assessment of Health and Disease in Industry**

R. McL. ARCHIBALD

*Medical Officer, National Coal Board (North East Division)*

Health in industry can be assessed by the pre-employment and periodic examinations. The pre-employment examination must not become an end in itself but must be related to the industry it serves. The object is to find not the superman but the man who will do the job without harm to himself or to others, and on whom the work will have no cumulative ill effect. There is a need for caution about set standards and to examine critically opinions about the employment of disabled persons such as chronic bronchitics and those who have had abdominal operations. It is not easy to assess the potential effect of work on the skin. Standards must bear some relation to the age and experience of the applicants. In the physical examination many factors are capable of accurate measurement such as the height, weight, visual acuity, urine analysis, and chest radiograph. Sexual development and literacy are checked. But heart murmurs and the anatomy of the foot cannot be assessed so objectively. It was possible only to guess at such things as reaction time and accident proneness.

Many industrial medical officers follow up the findings of the pre-employment examination, particularly in youths from 15 to 18. But the industrial medical officer must be satisfied that the reward is worth the work. A follow-up of a sample of one in ten over a period or of borderline cases might be beneficial.

Notifiable diseases are no longer such a major problem, but rather is it the new compounds which cause concern. Their production should be discussed with the doctor at an early stage so that he may assess the likely hazards. Sometimes, however, pilot production may proceed to an advanced stage and cases of unknown disease be the first intimation to the doctor of a new hazard. He may have to call a halt while he assesses the position.

**Research**

It is easy to slip into a routine and develop a false sense of security. Routine work need not necessarily be dull. Clear-cut objectives are necessary and the industrial medical officer should devote some time to original thought. It is important for him to see the potentialities of some chance result.

**Discussion**

The position of the industrial medical officer in relation to general practitioners was discussed. There might be a tendency for workers to use their general practitioners on all occasions so that the works doctor lost the opportunity of early detection of industrial hazards. The industrial medical officer had to provide an effective service, with the help of management, which would encourage his patients to come to him.
The Measurement of Health and Disease in Industry

A. BRADFORD HILL

Professor of Medical Statistics and Epidemiology at the London School of Hygiene and Tropical Medicine, University of London

In England and Wales it is possible to tabulate the deaths of men according to the occupations which are recorded on the death certificates. Bringing these numbers of deaths (by age and certified cause) into relation with the numbers of men following different occupations, as recorded at the decennial census, gives, in terms of mortality, some indication and measure of special occupational hazards. The interpretation of such occupational mortality rates calls, however, for considerable caution. Thus at ages over 60 increasing numbers of men are described on the census schedules as unoccupied whereas when death is registered an occupation can usually be obtained from the informant. The rates at advanced ages are, therefore, inaccurate and attention must be mainly limited to the working ages 20–64. Occupations are likely to be accurately recorded at the census (by the man himself) and less accurately at registration of death (by the informant), and this must lead to some degree of incompatibility and to error in the death rates. Still more serious are likely to be the effects of selection affecting both entries into and exits from an occupation. Heavy physical labour, e.g., foundry work, is unlikely to attract men of poor physique and health; light jobs, e.g., clerical, may well do so. Further, those who lose their health in one job may seek another and it is to the latter that their death must be debited at registration since no full occupational history is, or could be, sought at that time. Thus the coal-miner stricken with phthisis may die as a newspaper seller, the sergeant major, with rheumatic heart disease, as a cinema commissionaire. Though these selective influences to and from occupations cannot be measured, they must be continually borne in mind. They may profoundly obscure the picture sought.

Such tabulations of occupational mortality were begun by Dr. William Farr of the General Register Office in 1851 and have been issued subsequently at 10-year intervals. The object of them is to isolate, as far as possible, the specific effects of an occupation as distinct from the other factors in the environment with which the occupation may be associated—the standard of living, the housing, living in an insanitary area, and so on. To aid in this object an ingenious but simple device was incorporated in the Registrar General's Occupational Mortality Supplement for 1930–32. The mortality experience of the wives of men occupied in different ways was tabulated. Two comparisons are now available. Men occupied in a given way can be contrasted with all occupied men. The wives of men occupied in a given way can be contrasted with the wives of all occupied men. If the men in that occupation have an abnormal death rate from some cause but their wives do not, it would appear that the occupation may be responsible for the abnormality. If both the men and their wives have abnormal death rates from a cause it would appear that the living environment that they share is more likely to be at fault than the occupational environment to which only the men are exposed. Thus in 1930–32 physicians and surgeons showed a death rate above normal for digestive diseases; their wives did not. Inn-keepers and barmen had a total death rate 50% above normal, a disadvantage that their wives succeeded in avoiding.

Though these data may not have revealed many occupational risks not already known or suspected, they do form a useful guide. Without them the relative death rates of lawyers and doctors, dock workers and carpenters, costermongers and professors, would be quite unknown. It is clear that, like all statistics routinely collected, they may well raise far more questions than they solve—for example, the relatively high death rate from coronary heart disease in the professional classes. But thereby they at least act as important leads to epidemiological inquiry and other special researches. Equally they may save a long and useless investigation by showing that there is no problem.

Death has the advantage that it is so easy to count—stone dead has no fellow. But many diseases that may be of occupational importance are not lethal. It is therefore important to consider the tabulation of statistics of sickness. A host of troubles immediately becomes apparent. How is "sickness" to be defined? Its development and recession may be gradual, its severity can vary, and its manifestations may be related, and sometimes closely related, to subjective reactions. When is a person ill? When are two people equally ill? In the present issue, i.e., in relation to industry, the definition will almost invariably have to be "incapacity to work". From this it follows that recorded sickness in industry is dependent not solely upon a pathological condition but upon many other factors.

One such factor will be the nature of the employment. An attack of rheumatism that keeps the miner from the coal face will not necessarily keep the bank clerk from his desk. A simple fracture of the radius will put the bus driver out of action; it will not stop the university professor teaching. A second factor will be the economic. Payment of wages or sick benefit during absence will have unknown effects upon the readiness with which the worker will absent himself—or can afford to absent himself—and must have unknown effects upon the duration of absence. Administrative procedures may be a third influence. Long absences may not be wholly recorded—the worker is taken off the books. Short absences of a day or two may not be recorded at all. All such matters must enter into a consideration of sickness statistics and their contrast between one industry and another, one factory and another. As with mortality rates, selective recruitment and selective discharge may be important and age and sex (and with women marital status) must be taken into account since they are known to affect rates of sickness seriously.

In view of these many difficulties of analysis and interpretation it is very doubtful whether the institution of sickness recording as a routine in all factories and
other places of occupation would adequately repay the effort and cost. On the other hand, large-scale and nationalized industries might profitably continue to collect and analyse such records. They would provide some standard experience for comparative use in smaller units where some special risk was believed to exist, and also reveal where the main problems of prevention lie, e.g., in the common cold, influenza, rheumatism. The means of preventing such causes of disability should then be sought in specially designed inquiries with specially recorded data on the attacks of disease. Thus the epidemiology of the common cold may be explored by making precise observations in a selected industry. Is it, and if so, to what extent, transferred from person to person during the hours of work? If it is, to what extent can the transference rate be influenced by different rates of natural ventilation in workplaces? Can the incidence of influenza be reduced by inoculation? To answer such a question carefully designed trials will be essential. Routine sickness absence statistics are likely to be of very little value in these settings.

As regards health it may be very important to ensure the absence of specific disabilities in a man before recruiting him to a certain job. Persons who suffer from epilepsy should not become steeplejacks. But quite often disabilities are not incompatible with health. The short-sighted man may be handicapped and frequently absent "ill" if employed on fine precision work. As a small holder he may be entirely "well" and successful. A pneumonectomy may be a handicap in a professional footballer but not in a professor. The policeman may have to be "fighting fit". Is that same fitness necessary for the pilot of a jet aircraft? The question of occupational health must often be worded as "health for what?".

Discussion

Experiences in the coal industry analogous to those spoken of by Professor Bradford Hill were described in the discussion. The vast majority of miners with massive fibrosis of the lungs died outside the industry; another disadvantage of using death as an index of occupational hazard was the number of diseases, particularly the rheumatic ones, which did not kill.

Absence from work was a possible index for which exact figures were available, but at present they were impossible to interpret. This matter was being investigated by the National Coal Board. It seemed probable that the only place in which health could be measured in relation to an industry was not in the industry itself, but in the associated community.

FIFTH CONFERENCE

The fifth conference of the Society will be on "The Use and Abuse of Protective Equipment" and will be held at the London School of Hygiene and Tropical Medicine on Friday, November 4, 1955.

The morning and afternoon sessions will be introduced by the Chief Inspectors of Factories and of Mines respectively, and the following papers have so far been arranged:

Protection of the Lungs, Mr. A. C. Peacock, C.D.E.E., Porton, and Mr. T. Whittaker, I.C.I. Safety Department.

Protection of the Skin, Prof. J. R. Squire, Birmingham, and Dr. A. Lloyd Potter, I.C.I. General Chemicals Division.

Protection of the Eyes, Mrs. O. R. Campbell, Birmingham, and Mr. G. V. Thom, I.C.I. Plastics Division.
