

## PNEUMONOKONIOSIS IN VICTORIAN INDUSTRY.

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Since the end of World War II Australia has been undergoing rapid industrial expansion in all fields, coupled with large-scale immigration. Although in 1955 some 45% of the national income comes from wool, the situation in the years to come may well be different. In view of the ravages to health which such industrialization has produced in the past in other countries, it was considered essential to obtain some facts on what had happened in Victorian industry in the immediate past in terms of industrial chest diseases. Without accurate knowledge of where the hazards really lie, it is impossible to have industrial expansion without a health toll. Without this knowledge there can be no planning for the future, and the mere policing of regulations leaves much to be desired in the field of preventive medicine. Accordingly, in 1955 a survey to determine the sources and incidence of pneumokoniosis was commenced by the Industrial Hygiene Division, and the various aspects of the findings are now presented.

The total number of cases reported to the division prior to the survey was 525, which included 361 among miners and 175 industrial cases. The figures now read as follows: total 1125, with 837 in miners and 288 in industry. The X-ray investigations were carried out on full size film (17 inches by 14 inches) on personnel who in the opinion of the division were employed in dusty trades. The total number of individuals radiologically examined was 3323. Table 1 shows the results of the investigation.

In the survey, the number of moulders radiologically examined was 1915, and the percentage affected was 3.4. Three hundred asbestos workers were examined and this number would cover most of those exposed to dangerous amounts of dry asbestos dust; here the percentage was 15.

The most dangerous occupation is mineral grinding, mostly of quartz and here 60% of those radiologically examined were affected. In the other categories the people surveyed were those exposed to the greatest risks in the particular occupation, and not the employers as a whole, so that any comparison as to the percentage affected in those industries would be erroneous. In the 350 cases found, all the subjects have been examined, their industrial histories have been taken and their exposure to dust has been confirmed. Apart from those suffering from asbestosis, the great majority are silicosis, many of whom are greatly disabled and many short of breath; others appear to be quite well apart from a slowing up and slight shortness of breath, and some are entirely symptomless.

## Discussion.

## Silicosis.

If we consider the conditions in the various types of occupation we find the following factors:

1. Moulders are exposed to silica in the moulding sand and often in the parting powder. One of the clearest boundaries investigated produced the highest proportion of silicosis (100%), owing to the fact that they were using silica flour, which is very finely ground quartz as a parting powder. Many moulders with long exposure are grossly disabled.

2. Dressers are exposed to moulding sand and so fine metallic particles produced when castings are cleaned by rotary wheels, automatic chisels and swing grinders. The tools in general use are now power-driven, and recently methods of exhausting the actual tool are being evolved. Some of these men have gross X-ray changes which are out of all proportion to their symptoms, while others with less pronounced changes are gravely affected. In cases in which the bulk of the inhaled dust is metal, the symptoms are usually slight.

3. Brick, tile and pottery workers are exposed to silica, and conditions in these occupations are particularly

hazardous, inasmuch as the silica-containing substances are newly ground. The highest incidence was in a tile (wall) works, where flint was used in considerable quantity.

4. Mineral earth workers are the most exposed of all. Quartz, diatomaceous earth and asbestos are ground with usually makeshift machinery, and the dust hazard is extremely bad. One subject, a man aged thirty-five years, died of uncomplicated silicosis within nine years of commencing employment. These places have an unsavory record of death and disablement.

5. Masons and quarrymen are exposed to the dusts of various types of stone. Granite can contain up to 30% of free silica, and Slawell stone and Sydney freestone are for all practical purposes pure sand. Basalt quarrymen can develop an X-ray picture which is hard to distinguish from silicosis, but these men are free from symptoms.

6. Boilermakers and welders are exposed to mixed dusts. Few in this group are incapacitated.

7. Metal polishers are subjected to silica dust through the abrasive they use, which is basically impregnated with pure silica and known to the trade as "tripoli".

8. Stokers are exposed mainly to coal dust.

TABLE 1.

| Subject's Occupation           | Number Radiologically Examined | Number of Cases of Pneumokoniosis Found | Percentage of Positive Findings |
|--------------------------------|--------------------------------|-----------------------------------------|---------------------------------|
| Moulder                        | 1915                           | 65                                      | 3.4                             |
| Asbestos worker                | 300                            | 45                                      | 15                              |
| Mineral earth worker           | 200                            | 25                                      | 12.5                            |
| Mason                          | 150                            | 10                                      | 6.7                             |
| Quarryman                      | 100                            | 15                                      | 15                              |
| Boilermaker                    | 50                             | 5                                       | 10                              |
| Welder                         | 50                             | 5                                       | 10                              |
| Metal polisher                 | 50                             | 5                                       | 10                              |
| Stoker                         | 50                             | 5                                       | 10                              |
| Brick, tile and pottery worker | 50                             | 5                                       | 10                              |
| Other                          | 50                             | 5                                       | 10                              |
| <b>Total</b>                   | <b>3323</b>                    | <b>1125</b>                             | <b>33.8</b>                     |

8. Rubber workers are exposed to talc, which is magnesium silicate; this can produce similar effects to silica and a similar radiological picture.

10. Clinics operators are exposed to carbon, metallic oxides, fluorides and silica from the carbon arc lights used in the machines.

11. A casual X-ray picture of a worker in a dry-cleaning establishment showed no symptoms. Investigation showed that diatomaceous earth is used in the process of dry cleaning and constitutes a hazard. A survey of this industry is under way.

The radiological appearance must not be used as a yardstick to measure the severity or otherwise of the disease. Some subjects with gross X-ray changes are almost symptomless, while others who are gravely disabled show very little abnormality.

In the survey there are several sets of brothers who both developed silicosis in entirely different occupations. This suggests a familial tendency. One family group of seven boasts six silicosis affected in three different professions.

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A person quite unaware that he is suffering from silicosis can, after an acute pulmonary episode, become totally disabled in a very short time. There are at least 20 cases who have graduated from the "mild short of breath" class to the "totally disabled" in periods of all cases less than four years. The use of 25 millimetre film is generally unsatisfactory in the diagnosis of pneumoconiosis. Many cases, especially early ones, are missed. This could explain the great number of silicotics who are under treatment for dyspnoea, who have misled their doctors unwittingly by saying that in the mass X-ray examinations their chest findings were clear. The X-ray appearances can return to normal after the subject's removal from exposure to some dusts. This has occurred with wood dust, powdered food, starch and meat. Very few cases reported in this survey are complicated by tuberculosis. However, several cases have been reported from sanatoria, in which exposure to dust has been proved and compensation obtained. No cases of carcinoma of the lungs were found.

Both silicosis and asbestosis are so insidious in their progress and so easily influenced by acute pulmonary conditions that it would appear wise to advise the subject to seek a new occupation away from the hazard when changes of breath become apparent, irrespective of his age. The following case illustrates this:

In 1951 a moulder of twenty years' standing was found to have typical silicotic X-ray appearances with nodulation and mild symptoms. He was working the night shift and did not feel disposed to give up his job. In 1953 he had influenza with pulmonary complications, and today he is completely incapacitated.

The fact that pathological changes can continue in the lungs long after removal from the hazard must also be realized.

A woman, now aged thirty-nine years, was employed in a factory plant. She worked there from the age of fourteen years until she was twenty-one, when she married. She had three children and carried on quite happily until five years ago, when she began to be short of breath, and an X-ray examination revealed abnormalities. Her condition was eventually diagnosed as asbestosis after tentative diagnosis of tuberculosis and sarcoidosis were discarded.

An inadequate industrial history delayed the correct diagnosis in this case.

There are two interesting subjects who served in the Western Desert with the Royal Australian Air Force during the last war. They were moulder in used engines and their X-ray findings are typically silicotic. It would appear that they developed the condition on service. Heavy transport and tankers probably ground the sand to powder fines, and the propellers of these men used to being protected an intensely heavy cloud of pure silica.

Many incapacitated men could cope with a sedentary job if it were not for the effort of breathing to and from work. In view of the progressive nature of the disease and the limited non-payable compensation, we advise affected people to remain at work as long as possible—out of the hazard, of course. The ability to continue in useful employment is often increased by a course of physiotherapy.

#### Asbestosis.

In the section of the survey relating to asbestos workers, 240 men were examined; 166 had symptoms consistent with asbestosis, and of this 166, 47 had positive X-ray findings. In this last group all had symptoms ranging from shortness of breath on exertion to gross incapacity.

The procedure adopted was as follows: Specimens of sputum were taken and examined for the presence of bodies. When these were demonstrated, the patient was radiologically examined. When both tests gave positive results the patient was interviewed, a complete industrial history was taken and his clinical condition was assessed. If he had symptoms referable to the disease a diagnosis of asbestosis was made and the patient was advised to apply to the Workers' Compensation Commission for acceptance of his disability. Subsequently practically all workers exposed to dry asbestos have been radiologically examined.

The following occupations are involved: handling the substance in its raw state; grinding the substance prior to

its use in some process; mixing with diatomaceous earth or kiesel to form lagging materials; sawing, cutting and planing any product containing asbestos—for example, brake linings, asbestos sheeting and various insulating materials; tearing down old lagging—this is a very dangerous process, even in the open air; spraying asbestos on walls and ceilings as an insulator.

The pulmonary effects of asbestos workers is insidious in its onset, irregular in its course, and variable in its termination; but once established it constitutes a grave threat to life and health. Briefly the pathological changes are such that the air cells become obliterated by fibrous tissue. As this progresses the lung tissue becomes used up and the elasticity of the lung decreases, the amount of lung available to carry out functions diminishes and symptoms appear. The condition is progressive and irreversible, and once the stigma appears the subject should be removed from the hazard. The main symptom is steadily increasing shortness of breath. While there is no evidence that asbestosis predisposes the subject to acute pulmonary infections, the presence of the condition seriously impairs the chance of recovery when infection does occur. The advent of the sulphamide drugs and of the antibiotics has greatly improved the prognosis in these cases.

The most sought after asbestos in industry is the type with long needles, but unfortunately this is the most hazardous type to handle. The needles enter the lung by inhalation, and after a time undergo changes in appearance and are then known as asbestos bodies. They are brown or yellow in colour and are found in no other condition. The bodies are all modifications of a straight fibre and are shaped like dumb-bells, a drum major's baton, and so on. It is impossible to state at what period these appear, but they have been found in this survey as early as fifteen months after exposure commenced. The presence of these bodies must not be regarded as diagnostic of asbestosis, but it is conclusive proof that the patient has been exposed and that some abnormal process is at work in the lungs.

Unlike silicosis, the radiological findings in asbestosis are in accord with the severity of the symptoms. The greater the symptoms, the more one expects to see in the X-ray film. In the well-developed case the bases of the lungs show especially the field, show a ground-glass appearance, and the middle of the lungs is irregular or "hazy". It is fully realized that a radiological diagnosis of early asbestosis is extremely difficult, and our cases were regarded as such only after the most careful consideration. A few films picked out at random were sent to England for review, none of them being from well-developed cases. One case was diagnosed as asbestosis on English standards. In the survey, when it was noticed there were increased markings at the lung bases, the viewer stated that he had seen many similar films in his area from people who had never been exposed to asbestos. However, as these films were taken in a highly industrialized area where fog, soot and smoke abound, it is thought that to compare these with films of Australians of the same age proved misleading. Criticism will no doubt be directed at the standards of diagnosis; but if one waits until the minimum of a well-developed case appears, one can do little for the patient.

It does not follow that everyone is going to accept the advice tendered to leave the hazard; but since the number of workers in this group is comparatively small, the realization that their future was being exposed to harm is a very heavy burden for a man to carry. It is usually suffering from asbestosis and is eligible for compensation is making most workers very conscious of the hazard. Much more care has been exercised by the workers in recent times, and they are much more easily persuaded to wear a mask.

The most common symptom is shortness of breath on exertion. Tightness in the chest and pain in the chest are not uncommon, with lack of energy and tiredness. Most patients show an improvement after a course of physiotherapy. The patient gives a course of physiotherapy and all been accepted for compensation, and all were kept in hospital for at least a month, so that the rest and elimination of worry for the future were also beneficial.

factors. All those given this course are still working at light sedentary occupations. When this survey started, eight cases of asbestosis had been reported and the disease was regarded as a rarity. It will be seen from the figures that the incidence of the disease is far too high. In addition to those found in the investigation, there must be many more older folk suffering from the complaint in whom it has not been diagnosed, and who are incapacitated and very poorly off financially, and should be receiving adequate compensation.

#### Summary.

Three hundred and sixty cases of pneumoconiosis were found in industry in Victoria. No doubt there are many more, either symptomatic or undiagnosed.

Billicosis and asbestosis are not diseases of the aged. Many of these subjects belong to the thirty to fifty years age group, and for this reason it is imperative that conditions improve in the dusty trades. The two conditions can occur together, causing gross disability. Six affected persons, who showed nodulation and also asbestosis bodies, were found in the same factory. They are very disabled, and two are aged under forty years.

The survey illustrates the necessity of impressing on medical practitioners the need for taking a complete industrial history of all patients irrespective of sex. It is not sufficient to ask a person his or her occupation—a bread carrier today may have been a miner twenty years ago. Many women have worked and are still working, although the hazards now are less damaging.

Industry in Victoria is becoming very dust-conscious. While these investigations have been proceeding, the Industrial Hygiene Division has been busy encouraging the suppression of dust. Unions have sponsored the survey and employers have been most cooperative in allowing their personnel to be radiologically examined in the firm's time. In the firms where cases have been found, close inspections have been made, and where possible conditions have been improved by exhaust ventilation, by better housekeeping, or by the utilization of the hazardous substance. The use of respiratory devices is recommended only when the hazard is of short duration and when other methods cannot be used effectively. Conditions in industry can be greatly improved in many cases by very simple means—even damping down the floors in a foundry led to big reductions in dust counts.

Legislation has been introduced to try to improve conditions. Quarz grinding has been declared a dangerous trade. This means that any premises used for the process must be registered, and in the event of the regulations not being complied with the registration can be withdrawn and the firm becomes liable if it continues to work in an unregistered building.

Asbestos regulations are awaiting gazettement. These are very stringent, and when in force will lead to a big improvement in conditions. However, the most important single factor is to educate the worker to protect himself. Many, many times one can see expensive, most effective exhaust apparatus rendered useless by some worker who "didn't like the draught" pushing a bag up a duct or some other equally silly practice.

When one has seen the end results of these two dust diseases—the gross incapacity, the patients' realization that the steady deterioration is inevitable, and in many cases the financial difficulties due to their having used up the compensation paid—it becomes imperative to ensure that as industry expands, industrial hygiene catches the expanding stride for stride.

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#### REMARKS ON CHRONIC GASTRITIS, WITH SPECIAL REFERENCE TO THE PREVALENT INEFFECTUOSITY IN THE EXAMINATION OF THE GASTRIC CONTENTS.

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When a hollow organ is affected by disease, a proper understanding of the processes at work is helped considerably by a study of the discharges provoked by the disease. The discharges are in fact a sign of the disease in the walls. Diagnosis and treatment would flow considerably if this element were neglected. Thus, the nasal and post-nasal discharges, the sputum, the urinary, the fecal, and the contents of the bed pan provide the clinician with valuable information, which helps to truthfully diagnose and to succeed in treatment. Moreover, an increase or decrease in these discharges, or a change in their quality, provides valuable evidence of the progress of treatment.

But the stomach is unique. When it is affected, its signs are often ignored; the nature of the disease is thus unrecognized, a faulty prognosis is given, and the treatment is ordered.

For this, several factors are responsible. One is the neglectful reports on the gastric contents made by pathologists and biochemists. A few years ago I asked a senior teaching biochemist why he gave no report about bacteria in fractional test meals. He gave as the reason that the mucus could come either from the respiratory tract or from the stomach, and that therefore its significance could not be interpreted.

It is, of course, highly unsatisfactory to suppose evidence merely because its interpretation is difficult. Moreover, there is always the chance that somebody else may succeed in the interpretation. Thus, by examining the respiratory tract, the clinician may get a very good idea as to whether it is the source of the discharge. But even the biochemist, if properly instructed in his art, should be able to make the distinction easily.

If the gastric mucus is gastric in origin, it appears in each specimen. It is intimately mixed with the gastric contents, so that, when the contents are poured from one test-tube to another, they are seen to be more viscous. The mucus is finely nucleated. An approximate quantitative account of this mucus can be given in terms of dilution time.

Mucus from the respiratory tract occurs chiefly in the frothy gastric contents. It is in larger discrete masses. It often includes air bubbles. It is easily seen when pressed out under a cover-slip, and it forms on the surface of the gastric contents. The discovery of such mucus or mucus-pus may give a valuable therapeutic hint to the clinician.

The fasting gastric contents should then be examined microscopically. Gastric mucus contains the nuclei of leucocytes whose cytoplasm has been digested, staining deeply with methylene blue, and columnar or goblet cells. In gastritis there may be large numbers of granular cells (these are desquamated glandular cells) or a persistent increase in leucocytes. In cancer one may find polygonal, round or cylindrical cells, with characteristic columns, density and multiplicity of nuclei. Eosinophilic cells may give the clue to an allergy.

Non-phagocytic mucus may contain squamous epithelial cells and carbon particles.

Note should also be made of the bacterial population. It is increased in hypochlorhydric gastritis and in cancer.

A second reason for the failure to study the gastric discharges is the lack of interest in and understanding of gastritis on the part of clinicians. This is not peculiar to Australia. The position was illuminated by a conversation with a distinguished British gastro-enterologist (Dr. "X") as follows:

Dr. "X": "I do not believe that gastritis is a common disease."