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# 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 ...scale immigration. Although in 1938 some 43% of ...national income comes from wool, the situation in the ...ars to come may well be different. In view of the ...ages to health which such industrialization has produced ...the past in other countries, it was considered essential ...obtain some facts on what had happened in Victorian ...dustry in the immediate past in terms of industrial ...st diseases. Without accurate knowledge of where the ...zards really lie, it is impossible to have industrial ...pansion without a health toll. Without this knowledge ...re can be no planning for the future, and the mere ...licing of regulations leaves much to be desired in the ...ld of preventive medicine. Accordingly, in 1952 a survey ...determine the sources and incidence of pneumonokoniosis ...as commenced by the Industrial Hygiene Division, and ...e various aspects of the findings are now presented.

The total number of cases reported to the division prior ...the survey was 522, which included 343 among miners ...d 179 industrial cases. The figures now read as follows: ...tal 3126, with 2587 in miners and 539 in industry. The ...ray investigations were carried out on full size film ...ches by 14 inches) on personnel who in the opinion ...ivision were employed in dusty trades. The total ...er of individuals radiologically examined was 3523. ...ble I shows the results of the investigation.

...the survey, the number of moulders radiologically ...mined was 1915, and the percentage affected was 4·6. ...ree hundred asbestos workers were examined and this ...mber would cover most of those exposed to dangerous ...mounts of dry asbestos dust; here the percentage was 15.

The most dangerous occupation is mineral grinding, ...rgely of quartz, and here 30% of those radiologically ...amined were affected. In the other categories the people ...rieved were those exposed to the greatest risks in the ...rticular occupation, and not the employees as a whole, ...that any *computation as to the percentage affected in* ...ose industries would be erroneous. In the 560 cases ...und, all the subjects have been examined, their industrial ...istories have been taken and their exposure to dust has ...en confirmed. Apart from those suffering from asbestosis, ...e great majority are silicotics, many of whom are grossly ...abled and many short of breath; others appear to be ...ite well apart from a slowing up and slight shortness ...breath, and some are entirely symptomless.

## Discussion.

### *Silicosis.*

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

1. Moulders are exposed to silica in the moulding sand ...d often in the parting powder. One of the cleanest ...oundries investigated produced the highest proportion of ...ilicotics (10%), owing to the fact that they were using ...lica flour, which is very finely ground quartz, as a parting ...owder. Many moulders with long exposure are grossly ...abled.

...ussers are exposed to moulding sand and to fine ... particles produced when castings are cleaned by ...ry wheels, automatic chisels and swing grinders. The ...ils in general use are now power-driven, and recently ...ethods of exhausting the actual dust are being evolved. ...e of these men have gross X-ray changes which are out ...all proportion to their symptoms, while others with less ...announced changes are gravely affected. In cases in which ...e bulk of the inhaled dust is metal, the symptoms are ...ually slight.

3. Brick, tile and pottery workers are exposed to silica, 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 unenviable 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 Stawell 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 beeswax impregnated with pure silica and known to the trade as "tripoli".

8. Stokers are exposed mainly to coal dust.

TABLE I.

| Subjects' Occupations. | Number Radiologically Examined. | Number of Cases of Pneumonokoniosis Found. | Percentage of Positive Findings. |
|---|---|---|---|
| Moulders | 1915 | 91 | 4·6 |
| Brick, tile and pottery workers | 358 | 51 | — |
| Drivers | 214 | 31 | — |
| Mineral earth workers | 41 | 12 | 30·0 |
| Masons and quarrymen | 171 | 28 | — |
| Boilermakers | 130 | 23 | — |
| Metal polishers | 203 | 34 | — |
| Asbestos workers | 300 | 47 | 15·0 |
| Spray painters | 20 | 7 | — |
| Cleaners | 8 | 2 | — |
| Food workers | 82 | 4 | — |
| Rubber workers | 47 | 9 | — |
| Wool grinders | 13 | 2 | — |
| Cinematograph operators | 17 | 6 | — |
| Dry cleaners | 4 | 1 | — |
| Stokers | 34 | 10 | — |
| Foundry labourers | — | — | — |
| Plaster workers | — | — | — |
| Cement workers | 261 | — | — |
| Odd occupations | — | — | — |
| Bricklayers | — | — | — |
| Road workers | — | — | — |
| Total | 3523 | 560 | — |

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

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

11. A chance X-ray picture of a worker in a dry-cleaning establishment showed nodulation with 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 silicotics affected in three different

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 listed who have graduated from the "mild short of breath" class to the "totally disabled" in periods in all cases less than four years. The use of 35 millimetre film is generally unsatisfactory in the diagnosis of pneumonokoniosis. Many cases, especially early ones, are missed. This could explain the great number of silicotics who are under treatment for dyspnœa, 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 metal. 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 shortness of breath becomes apparent, irrespective of his age. The following case illustrates this:

In 1952 a moulder of twenty years' standing was found to have typical silicotic X-ray appearances with nodulation and mild symptoms. He was earning big money 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 pottery 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 abnormality. Her condition was eventually diagnosed as silicosis after tentative diagnoses of tuberculosis and sarcoidosis were disproved.

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

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

Many incapacitated men could cope with a sedentary job if it were not for the effort of travelling to and from work. In view of the progressive nature of the disease and the limited sum payable as 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, 300 men were examined; 100 had sputum containing asbestosis bodies, and of this 100, 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 kaolin to form lagging materials; sawing, cutting and finishing 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 fibrosis 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 deteriorates, the amount of lung available to carry out functions diminishes and symptoms appear. The condition is progressive and irreversible, and once the stigmata appear 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 chances of recovery when infection does occur. The advent of the sulphonamide 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 asbestosis 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 incapacity, the more one expects to see in the X-ray film. In the well-developed case the bases of the lungs, more especially the right, show a ground-glass appearance, and the outline of the heart is irregular or "shaggy". 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 accepted as asbestosis on English standards. In the others, while it was admitted 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 nothing. Criticism will no doubt be directed at the standards of diagnosis; but if one waits until the stigmata of a well-developed case appear, 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 friend who was supposed to have a weak heart for a long time is actually 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 patients given a course of physiotherapy had 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 pneumonokoniosis were found in industry in Victoria. No doubt there are many more, either symptomless or undiagnosed.

Silicosis 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 carter 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. 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 elimination 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. Quartz 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 gazettal. 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 matches the expansion stride for stride.

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

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When a hollow organ is afflicted 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 lose considerably if this element were neglected. Thus, the nasal and post-nasal discharges, the sputum pot, the urinary testing glass and the contents of the bed pan provide the clinician with valuable information, which helps to truth in diagnosis and to success 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 stricken, its tears are often ignored; the nature of its disease is thus unrecognized, a faulty prognosis is given, and inept 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 mucus 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 unscientific to suppress 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 excess 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 flocculated. An approximate quantitative account of this mucus can be given in terms of filtration time.

Mucus from the respiratory tract occurs chiefly in the fasting 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 floats on the surface of the gastric contents. The discovery of such mucus or mucopus 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 volume, density and multiplicity of nuclei. Eosinophile cells may give the clue to an allergy.

Naso-pharyngeal 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."