ABSTRACTS

TOXICOLOGY


I. Kerateine, obtained by opening up the disulphide groups of keratin to thiol groups by means of potassium cyanide at 38°C, reacts with lewisite in phosphate buffer solution at pH 7 to give compounds containing approximately 0-5% of arsenic and reprecipitable at pH 4-6. Of this arsenic 84 to 87% remains after a second precipitation. Sodium arsenite similarly gives derivatives of kerateine containing 0-4%, of arsenic, but of this only 30 to 35% remains after reprecipitation. Meta-kératin, obtained by atmospheric oxidation of kerateine in neutral solution until the nitroprusside reaction for thiol groups is no longer given, combines with only a very small amount of arsenic, and that probably by absorption. Sodium arsenate gives, as expected on chemical grounds, compounds containing an intermediate percentage of arsenic (mean 0-12%). The thiol groups of kerateine estimated by titration with porphyridin account for some 73% of the arsenic of the lewisite derivative on the assumption that 1 atom of arsenic combines with 2 thiol groups.

II. "Lewisite oxide" (chlorovinyl arsenoxide) and sodium arsenite combine with British anti-lewisite (BAL, 2:3-dimercaptopropanol) to give alkali-stable thioarsenites whose rates of hydrolysis are very much slower than those of corresponding compounds of lewisite with monothiols and proteins. The dithiols are not toxic to the pyruvate oxidase system of brain tissue and can completely abolish the inhibition of this system caused by lewisite and other arsenicals if present in the proportion of 8:5 molecules of dithiol to 1 molecule of lewisite. BAL, when added 15 minutes after the addition of the lewisite, will even completely reactivate a lewisite-poisoned enzyme system. Kerateine also much reduces the toxicity of lewisite, but monothiols such as cysteine and monothioethylene completely failed to protect the enzyme system against lewisite. n-heptane thiol and 5% dimercaptodiethyl sulphide were without significant effect, while pentane-1:3-dithiol showed only moderate protective action. The compound of BAL with lewisite is almost non-toxic to the enzyme. BAL causes almost complete protection against the effects of lewisite on skin respiration, whereas cysteine and 2-mercaptoethanol completely fail to protect. A survival of 100% is obtained by application of BAL to the skins of rats contaminated 30 minutes earlier with lethal doses of lewisite: monothiols were ineffective, and the sample of toluene-3:4-dithiol tried proved to be toxic: hydrogen peroxide treatment was much less effective than BAL. BAL in amounts of 100 to 200 mg. applied to the skin exerts a prophylactic action against a lethal dose of lewisite up to 4 hours later. Similar results were obtained with BAL on lewisite-contaminated guinea-pigs: here treatment of the burn with hydrogen peroxide delayed but did not prevent death. BAL injected intraperitoneally or subcutaneously in saturated aqueous solution also promoted survival (up to 100%) of rats poisoned by intramuscular injection of sodium arsenite or by external application of lewisite. On human subjects BAL prevented vesication by lewisite and phenylidichloroarsine, even when treatment was delayed for 30 minutes after contamination: 2-mercaptoethanol was ineffective. In the rat, BAL is lethal in amounts of 2 to 3 g./kg. body weight applied to the skin, and in amounts of 15 mg./kg. injected intraperitoneally or 113 mg/kg. injected intramuscularly, the symptoms including tremors, severe spasm of the abdominal wall, and death in convulsions. In man 0-5 to 1 c.c.m. undiluted BAL applied to the skin of the arm produced a scarlatiniform slightly edematous rash accompanied by severe tingling, these symptoms disappearing in the course of 4 to 5 hours. No other thiol has been found to be less toxic than BAL. The BAL-lewisite compound injected subcutaneously into rats has a lethal dose of about five times that of lewisite in equivalent arsenic concentration: for the corresponding 2-mercaptoethanol derivative the lethal dose is twice that of lewisite. The absence of late deaths among BAL-treated rats and guinea-pigs lethally contaminated with lewisite suggests that the lewisite-BAL compound does not dissociate in the body with the re-liberation of a toxic arsenic compound.

III. Application of lewisite to the skin of rats led to an excretion in the urine of 2 to 4% of the applied arsenic during the first 24 hours. BAL applied 15 minutes after contamination increased the urinary arsenic excretion fourfold, and applied 1 hour after contamination produced still higher rates of arsenic excretion. No diuresis was observed. BAL did not affect the small excretion of arsenic in the faces, but prevented the diarrhoea caused by lewisite. On subcutaneous injection of the lewisite-BAL compound, 25% of the arsenic administered was recovered from the urine in the subsequent 48 hours. The retention of arsenic in the skin after lewisite contamination was less in the BAL-treated than in the untreated cases. Subcutaneous injection of BAL dissolved in thioglycol gave an extra excretion of thiols in the urine (estimated by titration with iodine) during the subsequent 24 hours, the solvent alone giving rise to no thiol excretion. In
catheterized male rabbits a thiol excretion corresponding to 12 to 14% of the intraperitoneally administered BAL was observed in the 6 hours following the injection. A transient albuminuria occurred, and in the casual blood corpuscles were identified in the urine, but no evidence of serious or permanent damage to the kidney was obtained.

T. R. Parsons.


Two years ago the authors (Rev. méd. Chile, 1944, 72) reported 75 cases of manganese poisoning in the San Juan Mine, Northern Chile. It was thought strange that all these were among men at this one mine, although several manganese deposits are now being operated in Chile; but this was explained by the special composition of the ore, the physicochemical characters of the dust, and its concentration in the badly ventilated galleries. The 64 cases considered in the present article appear to be some of those referred to above. Symptoms reported by others have been largely those due to actual organic involvement of the nervous system and to a less degree those of a psychic nature; in the authors' cases the psychic symptoms dominated the picture in half the number. Of the 64, 30 were under the observation of other medical men. The remaining 34 comprised 5 in an early stage, 4 showing mild symptoms, and 25 seriously affected and unable to work. The last 29 are subdivided into: (a) those with acute but transient psychic disorders (5); (b) those with purely organic symptoms (15); and (c) those with mixed organic and psychic symptoms (9). All worked underground, where the risk of exposure to the dioxide is much greater than at the surface. None of the 34 died of the poisoning, so no pathological changes could be recorded, but others have reported degeneration in the basal nuclei with minute hemorrhages, and a hepatitis with jaundice.

Of the authors' patients, 1 was 17 years of age, 9 were in the third decade, 14 in the fourth, 7 in the fifth, and 3 between 51 and 58 years. Alcoholism was not found to increase susceptibility to the poisoning. Analysing the psychic symptoms (15) we found in 34 (53%), and were chiefly of an excitation type (especially in the early stages) such as incessant movement, singing, dancing, working beyond the stated hours; some patients exhibited outbursts of temper, others euphoria or ecstasy with outpouring of words, frequent repetition, and rapid passage from one subject to another. Neurological symptoms comprised in the early stages frontal and occipital headache and either drowsiness or insomnia; the pressure of the cerebrospinal fluid was increased. Sialorrhea was common and sometimes observed first; weakness, muscular pain, tenderness, and tremors occurred; there was hoarseness, with monotonous or explosive speech; a Parkinsonian facies, and “marionette-like” movements with hypertonia, were seen in about half the cases. The gait was often shuffling; the high-stepping “hen walk” described by Jaksch (Wien. klin. Rdsch., 1901, p. 729) was seen only three times, but many patients showed great deliberation in walking and disturbance of equilibrium, particularly evident on turning. Romberg's sign was never seen, but Babinski's response was sometimes extensor, and clonus might be present.

F*
confusion, and then, quite abruptly, came the onset of acute maniacal symptoms with suicidal tendencies, or the occurrence of a convulsion. The diagnosis depends upon the appearance of such symptoms, along with the history of exposure to a severe lead hazard; and the degree of exposure can be estimated by the urinary lead concentration. Tetra-ethyl lead poisoning is unlikely, when symptoms are noted, if the concentration is less than 0.1 mg. per litre. The differential diagnosis is considered. The hazards are well understood, and careful observance of the regulations will prevent poisoning. Treatment is briefly described, and is largely symptomatic. The barbiturates are recommended for sleeplessness.

A. Thelwall-Jones.


High explosive and atomic bombs share the properties of causing injury by what may be classified as air-blast, water-blast, and solid-blast. The additional and characteristic effects of the atomic bomb result from the liberation of much energy as electromagnetic radiation and neutrons, causing what the authors term "radiation-blast" injuries. It is estimated that at Nagasaki 85,000 were killed or seriously injured and at Hiroshima 160,000; most of these injuries resulted from radiation-blast.

The liberated radiant energy is in part thermal and in part ionizing. Flash burns were common, and secondary fires occurred at a distance from the explosion. Ionizing radiation blast is less effective than effects similar to the characteristic effects of exposure to x-rays. The latent period varied, with the weight of exposure, from hours to weeks. In some cases malaise and vomiting were followed by death, attributed to toxic autolysis of tissue, in a few days; with longer survival, signs appeared of selective damage to bone marrow or gonads. The bone-marrow injury was shown by leucopenia lasting up to 4 weeks and accompanied by mucosal or cutaneous infection, by thrombocytopenia and a haemorrhagic state reaching a maximum severity in 3 to 6 weeks, and by anaemia appearing later but often progressing slowly to death. Spermatogenesis was often arrested, but the parietes usually screened the ovaries from radiant energy. Epilation was common. R. Bodley Scott.


Radiation sickness varies in intensity with the part of the body treated and the area of exposure. The author reports 24 cases treated by pyridoxine, and, as regards the radiation sickness, claims good results in 22. The beneficial effect on the leucocytes is also stressed. Young (Amer. J. Roentgen., 1936, 35, 681) strongly recommended injections of liver extract. Pyridoxine is a member of the vitamin B	extsubscript{1} group occurring principally in liver and yeast, which Shorvon found superior in effect to other remedies. Among the 24 cases, a patient suffering from Hodgkin's disease was much distressed by radiotherapy and benefited by pyridoxine. In another case "a female aged 60 with a large abdominal mass and secondary lesions in lungs from carcinoma of the tongue previously treated by radium and x-rays also suffered from radiation sickness, but was promptly relieved by pyridoxine."

[What benefit was expected from radiotherapy is not discussed.]

Geo. Vilvandré


Treatment with "benadryl" (3-dimethylaminoethyl benzhydrol ether hydrochloride) was successful in 18 out of 19 cases of irradiation sickness. The degree of relief varied from one patient to another, but all save one felt well enough to continue their daily x-ray treatment without interruption. The authors assume that the success of the benadryl treatment was due to its antihistamine action, since histamine-like bodies develop in the blood of patients undergoing irradiation. In view of the beneficial effect of benadryl in allergic conditions such as urticaria, the authors suggest that irradiation sickness may be an allergic manifestation. The most dramatic results were observed after intravenous injections of 100 mg. of benadryl. The cerebral depression common in patients suffering from malignant disease and often aggravated by x-ray therapy may be caused by an increase of histamine bodies in the blood. The marked improvement in the morale of the patients after benadryl therapy seems to confirm this. A. Orley.


The paper describes the method used in an Industrial Hygiene Laboratory for the past eight years for the determination of mercury vapour and dust from mercury compounds in the atmosphere over a range of 0.0 to 10.0 mg. mercury per cubic metre of air. The method employs the standard impinger for the collection of samples, followed by a simple colorimetric analysis by a slight modification of Polejaev's method. A solution of 0.25% iodine in 3% potassium iodide is used in the impinger. The amount of mercury collected is determined by adding to an aliquot portion of the sample, usually 5 ml. 1 ml. of 1% copper sulphate solution, and 2 ml. of 3 N sodium thiosulphate solution. The pink colour of the suspension is compared with that of a standard. The overall efficiency of the impinger and analytical method was found to be about 90%.

H. M. Buckell.


In slices of normal rat skin sodium arsenite and lewisite inhibit to a considerable degree the small and additional oxygen uptake brought about by adding pyruvate, but produce relatively little effect on the additional oxygen uptake caused by succinate. Similar effects are observed when the oxygen uptake by normal skin is compared with that of skin previously treated in situ with lewisite. Hence it is concluded that the inhibitory effect in this case is a specific one on the pyruvic acid oxidation mechanism of the skin, and that it is not due to dilution of enzyme systems by oedema fluid.

T. R. Parsons.


ABSTRACTS

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INDUSTRIAL LUNG DISEASE


After a review of the development of aluminium as a therapeutic agent and the mode of action of silica, it is noted that the prevention of silicosis depends on: (a) dust control, (b) medical examination of the workmen, and (c) aluminium therapy to take care of the silica dust that cannot be "removed by a practical economic dust control programme." Aluminium inhalation in the treatment of 46 ceramic workers suffering from silicosis resulted in subjective improvement in 78%; of these, 80% had 20% improvement in pulmonary function. [The statistical data are too vague to be significant.]

T. A. Lloyd Davies.


The purpose of the authors' experiments was to test two questions: (a) whether short-fibre asbestos is less damaging to the lungs of rabbits than is the long fibre; and (b) whether metallic aluminium will suppress any toxic effect produced by either the short- or long-fibre asbestos. The work of Gardner, who suggested a mechanical theory for asbestosis, is discussed. He concluded that asbestos exerts a pathogenic action only in tissues where rhythmic movements take place, and then only if the particles are of sufficient size to produce mechanical irritation. This is in contrast to the effects of quartz and of other forms of free silica.

The lengths of asbestos fibres were 2.5 μ and 15 μ, and 100 mg, suspended in 4 ml. of saline was used for each insufflation, which was performed monthly. Metallic aluminium was mixed with the asbestos in the proportion of 2 mg. to each 100 mg. of asbestos. Survival time of the animals was 3 to 19 months. Group I consisted of 12 rabbits treated with long-fibre asbestos (15 μ). The longer the survival time, the greater was the tissue reaction. It was of two types: first, the foreign-body reaction in which macrophages and foreign-body giant cells were associated with asbestos fibres; secondly, overlapping the foreign-body giant-cell processes, there was a more permanent reaction resulting in the fixation of the asbestos in situ. This reaction was nodular in distribution and consisted of somewhat acicular areas of connective tissue, showing an increase of reticulin. These nodules were strictly comparable to, but less intense than, those produced by quartz. Group II contained 12 rabbits treated with long-fibre asbestos with aluminium. The two groups were strictly comparable, and it seems that the addition of aluminium increases and prolongs the foreign-body giant-cell reaction without inducing any marked inhibition of the second, more permanent reticulosis. Group III included 7 rabbits treated with short-fibre asbestos (2.5 μ). Lesions here were more scattered, and affected the interstitial tissue and alveolar walls more widely. It is suggested as a reason for this that the process of phagocytosis is easier. There was considerable hyperplasia of the bronchial nodes, a feature not seen in the former experiments. There were still, however, some nodular areas of foreign-body giant-cell reaction. Group IV consisted of 9 rabbits treated with short-fibre asbestos and aluminium. The lesions were the same as those seen in group III but more severe.

The authors state that when asbestos is retained in the lung it excites a connective-tissue response ultimately leading to fibrosis. The site of the lesion depends upon the size of the asbestos fibre; the long fibre, being too large for phagocytosis, is not expectorated and the reaction is intra-alveolar, whereas in the case of the short fibre the fibrous tissue is laid down in the alveolar walls and lymphatics. Possibly if fibres shorter than 2.5 μ were used they would be completely removed from the alveolar walls and fail to produce an interstitial fibrosis. The addition of the metallic aluminium appears to be without benefit and serves merely to enhance and prolong the foreign-body reaction.

Richard D. Tonkin.


This paper sets out to establish that pneumoconiosis occurs in dock workers who handle grain, and that the cause of this lies in the dust which they inhale from the grain itself. At a municipal dispensary 35 men were examined as possible cases of pulmonary tuberculosis. Of these, 30 were discarded as suffering from pulmonary tuberculosis; the paper deals with the other 5. The men said they dealt mainly with grain (oats, barley, wheat, and maize), and with seeds (millet, cotton, dahl, rape, and palm-kernel). These are shovelled from the ship's hold, an operation causing much dust, which the workers inhale; the concentration is the greater owing to the confined space in which the work is done. The workers also handle bauxite, iron ore, sulphur, and manganese. The lighter fractions of the dusts were examined chemically, and expressed as percentages as follows:

<table>
<thead>
<tr>
<th>Dust</th>
<th>Total silica in the sample</th>
<th>Soluble silica in the sample</th>
<th>Soluble silica in total silica</th>
<th>Ash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>5-4</td>
<td>1-28</td>
<td>23-8</td>
<td>11-4</td>
</tr>
<tr>
<td>Wheat</td>
<td>3-6</td>
<td>1-33</td>
<td>36-9</td>
<td>7-4</td>
</tr>
<tr>
<td>Oats</td>
<td>9-1</td>
<td>2-80</td>
<td>30-7</td>
<td>15-2</td>
</tr>
<tr>
<td>Maize</td>
<td>1-1</td>
<td>0-92</td>
<td>83-6</td>
<td>6-4</td>
</tr>
<tr>
<td>Barley</td>
<td>8-1</td>
<td>1-60</td>
<td>19-7</td>
<td>14-1</td>
</tr>
<tr>
<td>Barley</td>
<td>5-5</td>
<td>1-05</td>
<td>19-0</td>
<td>12-2</td>
</tr>
</tbody>
</table>

"Silica" included free or combined silica. Soluble silica was estimated by a modification of Matthews' method. Matthews found that the soluble silica in calcined flint dust known to be dangerous varied from 0.45 to 1.21%, according to the fineness of the particles. This suggests that the grain dust is potentially dangerous.

A sample of oat dust was found by x-ray diffraction analysis to contain 5% of free silica. Microscopically, the dust from wheat, oats, and barley contains starch, hairs, and cellular matter, and a large proportion of unidentifiable particles about 5 μ in size. Maize has few hairs. The silica particles were of the order of 1 to 3 μ.

Of the 25 men, 11 showed lesions attributable to inhaled dust; in 14 the films were normal. The pneumoconiosis cases were grouped as follows:

**Age when first seen:** 45 50 52 57 53 52 59 56 47 46 36
**Duration of occupation:** 20 35 23 20 27 20 40 33 30 2 13

The symptoms were cough, sputum occasionally streaked with blood, and increasing dyspnea, but some of the men with apparently normal radiographs had similar symptoms. The general condition was good. The radiographic changes were inconstant and asymmetrical.
but are considered fairly typical of pneumoconiosis. Sputa were negative for tubercle bacilli after repeated tests, but other micro-organisms or moulds were found.

The authors consider that they have proved the connexion between the grain dust and the lesions shown radiographically, especially in view of the lack of history of pneumonia and similar conditions. They note that there is a very fixed relation between the duration of occupation and radiological manifestation. They discuss the possible effects of the silica, the hair structures from the husk, and the chemicals which the men also dealt with. The radiologically normal cases were, on the other hand, rather younger men who had had fewer years of experience, but there were many exceptions. Four men complained of the same severe symptoms, but the x-ray picture was normal. No previous account of pneumoconiotic changes in grain workers has been described, but on the analogy of the occurrence of such changes in workers exposed to vegetable dusts in other occupations it seems highly probable they are, to be seen also in men handling grain.

F. H. Young.

Thrasher's Lung. A Fungoid Disease Resembling Tuberculosis or Morbus Schiöman. [In English.]


Thrasher's lung is a pulmonary disorder associated with inhalation of a large quantity of fungus-laden dust arising from moulidy grain during threshing. The symptoms, which are of rapid onset, are cough, sometimes accompanied by muco-purulent or even blood-streaked sputum, very marked dyspnoea on exertion, occasional vomiting, rigors, and fever. In the subacute and later stages, physical weakness and fatigue leading to incapacitation for work are prominent symptoms. The radiological picture of the chest shows a diffuse fine motting of the lung shadow, most marked towards the hilum and lobar bases and less so towards the apices, strongly suggestive of tuberculosis. Removal from exposure to the dust brings prompt relief of symptoms in the early stages of the disease, and the improvement is accelerated by administration of potassium iodide.

The author gives detailed clinical descriptions of 9 cases of thrasher's lung, and from these it appears that the disease is analogous to the condition known in English as farmer's lung, which is caused by inhaling the dust of moulidy hay. Seven of the 9 cases were tuberculin-negative, and the remaining 2 only weakly positive, which suggests to the author an analogy to lymphogranuloma benigna, in which a state of positive anergy to tuberculin occurs, and he considers that the disease may be related to mycosis. In this connexion, also, he points to the tuberculosis-like character of thrasher's disease, and refers to the work of Reenstierna and of Gullberg and Holstölm on a supposed relationship of the tubercle bacillus to fungi of the genus Candida (Monilia).

The isolation of saprophytic fungi from the sputum of a person recently exposed to inhalation of fungus-laden dust can be accepted only as evidence of dust contamination of the sputum; but, while accepting this view, the author excepts yeast fungi of the genus Candida, which he found in the sputum of 7 of his cases. Although species of Candida are frequently present in the mouths of healthy persons, their pathological significance in the present cases is accepted and the hypothesis is advanced that thrasher's lung may be caused by the simultaneous inhalation of Candida and particles of carbohydrate dust on which the fungus can vegetate. In conclusion, the author states that "everything goes to prove that the ' thrasher's lung ' is a bronchomycosis," but this surprising declaration is followed by the admission: " Monilia often appears as an insignificant saprophyte. Therefore the aetiology of the disease may only be secured after further experimental and clinical investigations."

J. T. Duncan.


During the 1945 harvest in the Appenzell region of Switzerland a strange disorder was observed in those operating threshing machines in poorly ventilated threshing-floors. The symptoms included prostration which forced the patient to take to his bed, unsteadiness on the legs, headache, cough, tightness in the chest, thirst, and anorexia; fever, appearing after a few hours, lasted 1 to 5 days and was followed by a slow recovery without sequelae. Two groups of patients were seen: those engaged in threshing barley and those working with oats. Both crops had stood about in wet weather for some time and were dried for half a day before threshing; the grain in each case was discoloured grey. Mycological investigations showed 29% of the grains examined to be infected with a fungus, identified as Chaetomium (Ascomycetes). This fungus had previously been shown to be the cause of the " Taumelkrankheit " (Gerlier's disease). The different clinical picture in this outbreak is attributed to inhalation of the fungus.

R. Bodley Scott.


The term "pneumoconiosis" originally meant a dust disease of the lungs, but it has become synonymous with fibrosis. Some dusts may be entirely inert in their effect on the lungs. Byssinosis (due to cotton fibre) and probably bagassosis (due to sugar-cane fibre) have an allergic basis, but in the latter the silica content of the sugar-cane fibre may cause cellular reaction. Tobacconis (tobacco dust disease) has been disproved as an entity. Monilia and Aspergillus infections may simulate silicosis or silico-tuberculosis, and as these organisms may normally be present in the sputum and nasopharynx they cause difficulty in diagnosis. Coccidioidomycosis may rarely resemble silico-tuberculosis. " Wheatena," a miliary calcification of the lungs commonly seen in the grain areas of the Middle West of America, may be due to a fungus similar to aspergillus. Other fungus infections, such as blastomycosis, actinomycosis, sporo trichosis, and coniosporiosis, may rarely imitate silicosis.

Inorganic dusts, such as those of carbon, iron, calcium, carbonubronium, barium, tin, and possibly aluminium, apart from minimal foreign-body reaction, do not exert a fibrosing effect. The presence of x-ray shadows resulting from the inhalation of tin has not even been verified. Artificial abrasives (carbonubronium and aluminium oxide) do not result in changes in the lungs which can be demonstrated radiographically. X-ray changes in the lungs of metal grinders are due not to silica but to iron, unless the metal articles which the men handle have been inadequately cleansed of silica. Siderosis, silicosis, and sidero-silicosis can often be distinguished radiographically. Silicatosis (due to tale), sarcoidosis, pulmonary vascular engorgement (due to mitral stenosis and polyehthermia vera), and, occasionally, metastatic carcinoma and miliary tuberculosis may sometimes simulate silicosis.
 Diagnosis of pneuconiosis is not enough; the cause must be identified. Abnormal radiographs and a diagnosis of pneuconiosis do not always carry an unfavourable prognosis; even in nodular silicosis, providing it has developed slowly and is unaccompanied by tubercle, the outlook is not immediately gloomy and does not necessitate stopping work. The diagnosis of silicosis is unjustified unless all three fundamental criteria have been fulfilled: (a) nodular x-ray appearances; (b) history of adequate exposure to free silica dust; and (c) evidence of changes on physical examination and of impaired pulmonary function. The most frequently the wasted factor is the industrial history, but to evaluate the effect of past work and dust exposure the physician must consult the industrial hygienist.

T. A. Lloyd Davies.


This review of coal-miners' silicosis is based on clinical experience and pathological findings. The average survival period of 53 men certified as having silicosis with tuberculosis was only 22 months. In the author's series of 227 necropsies on certified silicotics it was found that 59 (26%) had associated tuberculosis and 41 (18%) had non-tuberculous respiratory affections; 84 (37%) had died from cardiac failure and 43 (19%) from unrelated conditions. Non-tuberculous infection usually takes the form of bronchopneumonia. Cardiac embarrassment is a common sequel or concomitant, especially in men with masses lesions. Only one case of primary lung cancer could be found in records of 400 necropsies. Preventive measures include water spraying, wet drilling, and the provision of an ample ventilating current to dilute and remove such fine dust as escapes. Early headings are not considered safer than the coal face, where it is much more difficult to suppress dust, which is fortunately less harmful here.

Although the amendment of legislation of 1943 does much to prevent the march of silicosis, no person or authority has the power at present to keep the tuberculous man out of the pit, and until this stage of affairs is altered routine medical and radiological examinations can do little to prevent spread of the infection. T. Semple.


The author pleads for the employment of ex-tuberculous patients in sanatoria and hospitals. He quotes the experience of the Maybury Sanatorium, Detroit, where occasionally ex-tuberculous patients have been employed. The sanatorium has 845 beds and normally employs 561 persons, 88 of whom have had tuberculosis previously. These 88 people worked altogether 559 man-years and collectively lost 10 man-years from tuberculosis.

To dispel the belief that this group of ex-patients was more than usually liable to absenteeism from conditions other than tuberculosis the author compiled the records of 58 of them, covering 152 man-years, or an average of 2·6 man-years each, and found a total loss of 1,527 days' work, or 10 days per person per year. This was compared with records of 10 able-bodied employees, who were found to have lost 2,300 days from non-tuberculous ill-health, or 9·4 days per person per year. The records also showed that 26 employees who had no sign of tuberculosis on entry developed the disease while at work and between them had spent 30 years in hospital in consequence. Thus three times as much absenteeism was experienced by 26 people who contracted tuberculosis while at work as was lost by the 88 employed ex-patients. This conclusion was deduced without any relation to the total number of employees involved or the number of years worked. The author admits the weakness of this when he adds that "these ratios are . . . only suggestive, because the numbers of able-bodied employees who did not develop tuberculosis are unknown but large." The group of 88 ex-patients proved more stable than the average, with less turnover.

It would be unwise to assume from the author's figures that the time lost by fresh cases occurring in the able-bodied would be three times that lost by relapses in a staff wholly composed of ex-patients. The ratio might be the other way round, and experience with mass radiographic surveys suggests that it would be. But the problem is not a mathematical or even entirely an economic one; it is largely one of therapeutic rehabilitation. The environment and amenities of the sanatorium are frequently ideal for the person with arrested or quiescent tuberculinosis, and the author is probably right when he says that better work is often obtained from these than from the healthy. In Great Britain those who have tried the experiment have so far no reason to be displeased.

N. Lloyd Rusby.

INDUSTRIAL PHYSIOLOGY


Heat rash, known also as prickly heat or miliaria rubra, is due to excessive heat. The dry-bulb temperature below decks is always 7° to 10° F. above that of the weather temperature. During naval operations in the Pacific, ships were forced to spend long periods when no ventilation equipment was in operation, and at sunset ships were darkened and all weather accesses closed. On a modern well-ventilated battleship 70% of the crew were sleeping in spaces in which the temperatures were high enough to produce heat rash. The pricking, burning, and itching of the skin which accompany this condition cause insomnia, and man-hours are lost when men report several times daily to the medical officers to have lotions applied to their skins. Approximately 40% of personnel reporting sick complained of heat rash.

Experiments were designed at the Naval Medical Research Institute to study heat rash. In the first of these, 10 volunteers (the 'hot group') were selected at random to live under conditions simulating those aboard ship in the tropics. The group worked 7 hours a day in a room maintained at 108° F. dry bulb and 83° F. wet bulb—an effective temperature of 90° F. and spent the remaining 17 hours of the day in another room maintained at 95° F. dry bulb and 83° F. wet bulb—an effective temperature of 87° F. The work for each man consisted in walking on a treadmill. A similar group of 10 volunteers (the 'cool group') was selected for the second part of the experiment. They worked 7 hours a day in the hot treadmill room, but the remaining 17 hours were spent in an environment of 85° F. dry bulb and 71° F. wet bulb—an effective temperature of 78° F. Each group continued its programme for 10 days without interruption. All the subjects in the 'hot group,' but only 1 in the 'cool group,' developed heat rash. A further similar experiment lasting 30 days was undertaken. All except one
subject in the "hot group," and none in the "cold group," developed heat rash.

The conclusion to be drawn from these experiments is that spending as little as 12 hours a day in an atmosphere in which one does not sweat at rest (78°F. effective) will give rise to heat rash. The investigators found no correlation between the pH of the sweat, sweating rates, and the incidence of severity of heat rash. Formalin electrophoresis, taking or abstaining from shower baths, and pressure bandages over certain areas, did not affect the course of the disease. Exposure to ultra-violet light ameliorated the condition in some cases and aggravated it in others. The pathological changes found by biopsy in one case of experimentally produced heat rash were: (1) the epidermis is hyperplastic; (2) a blister forms in the stratum lucidum and is unrelated to the sweat gland or hair follicles; (3) the dermis is edematous; (4) some of the inflammatory cells infiltrate the epidermis. Heat rash represents a serious problem aboard ship in the tropics and can be prevented by short periods of cooling.

Geoffrey McComas.


An experiment was carried out on men well acclimatized to heat who were walking on a treadmill at a high temperature for periods of 6 hours. The men retained their water balance by drinking saline. The average rate of sweating in the first 2 hours was 1,400 g. per hour; the rate declined thereafter by from 10 to 80% by the sixth hour. The decline depended on extent. It was greater in humid atmospheres when the initial rate was high, and when the men wore clothes.

Raymond Greene.


Men nearly nude were exposed on the roof of the laboratory to different temperatures ranging from uncomfortably hot to bitterly cold. Their reactions were tested over periods of 1 to 4 hours by measurement of their pulse rates, arterial pressures, rectal and surface temperatures, urinary flow, oxygen consumption, respiration rate, blood concentration, and blood sugar content. Over a wide range, skin surface temperatures were proportional to air temperature, whereas rectal temperatures were nearly constant, falling only to 96°F. (35-6°C) after 4 hours' exposure to air at 46°F. (7-7°C). The temperature of the extremities was close to that of the dry-bulb temperatures of the air. As might be expected, wind had an obvious cooling effect on surface temperatures.

In order to maintain internal heat various mechanisms are employed. Of those tested in this series of experiments the most important was shivering, during which oxygen consumption increased as much as fivefold. Vasocoonstriction naturally occurred and was accompanied by the other well-known sympathetic phenomena. Haemococoncentration took place, the blood volume being diminished by extreme cold by as much as 850 c.cm. The blood sugar was not significantly changed during chilling, but rose rapidly during subsequent warming. In extreme cold the subjects became stuporous and mentally confused. After rewarming they were sleepy and fatigued and usually lost their appetites for some hours. Acclimatization was not observed.

[It must be pointed out that the experiments continued for only 3 months and were, moreover, intermittent.]

Raymond Greene.


A report on "the evaluation of vibration syndrome in industry," presented to the Industrial Health Conference at Chicago in April, 1946, referred to 114 persons who were exposed to vibrations of 12,000 per minute. There was pain in 68%; numbness in 41%; stiffness in 28%; paraesthesia in 9%; dropping of objects by 8%; sensation of cold in 7%; cramps in 7%; and weakness in 7%. The objective signs were mainly swelling, erythema, and cyanosis, but 55 of the group showed no objective signs. A method of taking the temperature of both hands was described, including immersion of the hands in water at 35°F. (1.6°C) for 5 seconds and periodic temperature-taking afterward. Lantern slides were shown of normal and abnormal tone (basomotor tone) and also of hands which did not return to normal after 15 minutes.

All but 43 of the 114 persons showed pathological changes. The age distribution was comparable in the controlled groups; in the groups studied, 78% were females. Apparently there was no correlation with the type of job. There was much seasonal variation, the difficulties occurring in the colder weather. The right hand was the one which showed the symptoms most, though there was a delay in the cold response in both at times. The position of the tool seemed to have some significance. Two conclusions were reached: (1) peripheral vascular disturbances may be present without demonstrative changes; and (2) the vital tissues react differently at different speed ranges (for example, there are differences in the 4,000 vibrations per minute as contrasted with the 10,000 vibrations per minute).

From the Official Report.

ACCIDENTS AND ORTHOPAEDIC SURGERY


A cream was needed to guard against flash exposures of high temperature. It had to be quick-drying, nontoxic, removable with soap and water, unaffected by sweat or salt water, and yet permitting normal skin excretion. A major problem was to determine the efficacy of experimental products. Thirty-seven basic experiments with very many possible constituents resulted in the following formula:

Bleached dewaxed shellac ........ 13-70
99% isopropyl alcohol .......... 28-45
Bodied linseed oil—Zol viscosity .... 3-50
Triple pressed stearic acid .... 0-15
Triethylene glycol di-2-ethylhexoate . 0-80
Diethylene glycol monooethyl ether ... 1-10
Titanium dioxide—cosmetic grade ... 37-00
Sodium bicarbonate .......... 2-25
Magnesium stearate .... 8-00
Methyl salicylate .... 2-50
Sulfonated alcohol wetting agent ... 0-30
Iron oxide (lemon shade) .... 1-60
Mineral black .... 0-62

(All percentages by weight) 100-00

Tests were made by igniting charges of 5 g. of potassium chlorate, sugar, and magnesium powder in a "gun" made of a metal tube with a sparking plug. Later a
smokeless powder or cordite charge ignited by a fuse was used instead. The flashes were directed at 20 cm. range against filter paper coated with the protective creams. An unprotected paper was charred or perforated, whereas an adequately protected paper was only slightly browned. Live rabbits were sufficiently protected by this cream, and later men who had been swimming in salt water were exposed experimentally to flashes and suffered only very mild burns. The cream must form a non-rigid, finely reticular film in order not to limit the movements of the wearer or to flake off; this one passed successfully a test of 30 hours’ wearing to determine its lasting properties. Discomfort was minimal. Details of large-scale manufacture and the costs are given. The product was filled by positive displacement into flat 4 oz. (113 g.) tins, and later into collapsible tubes. The cost was 23 cents per tin. 

[There may be many post-war uses for such a cream in industries when there is a risk from heat or an open flame.]  

J. N. Agate.


The immediate reaction of the eye to caustic soda, lime, strong alkalies, and strong acids is a ground-glass appearance of the cornea with considerable pain. The pupil is contracted and does not react to atropine. Fragments of solid caustic cause corneal injuries, while solutions cause conjunctival injuries, particularly in the lower fornix. In mild cases the conjunctiva is turgid and red, but in severe injuries it is pale and whitish, with petechial hemorrhages. After 6 hours or more, pain becomes severe. The epithelium desquamates, leaving the cornea bare. Large, deep ulcers appear, without inflammatory reaction. Healing is slow. A superficial lesion is followed by an ill-defined opacity, without the surrounding blood vessels usually seen around opacities from other causes. Minor conjunctival injuries leave the conjunctiva edematous and congested, secreting mucus and slow to recover. In severe cases a slough forms which is slow to separate, leaving indolent granulations. Symblepharon is inevitable unless the lesion is confined to the palpebral fissure. The author has treated altogether 200 cases which  

The author stresses the importance of careful selection of men engaged in heavy work such as loading and unloading. The hernial orifices and the arches of the feet need attention, while radiography of the spine to exclude abnormalities or old injuries is advisable. Old injuries are important for future evidence in compensation cases. When the workman is engaged he should receive instruction in the use of protective equipment. The work done by these men, and the lesions discovered, are varied. About 10% have a lipomatous swelling on the shoulders, attributed to repeated pressure of the loads carried. Spondylitis is common, especially in the dorsal region; it is probably of traumatic origin and is often first discovered when a radiograph is taken because of lumbago. Associated radiculitis is common. Over 50% of the accidents in these men are described as lumbago, and the author thinks that in many there is actual tearing of muscle fibres. A radiograph should be taken in any case of lumbago lasting more than 10 days, because often some bony abnormality is found. Many of the substances handled by these heavy workers are in powder form, e.g. cement, which is irritating to the nasal mucosa, especially if there is deformity of the septum or turbinates. Ulceration may occur in the nose. Some authorities believe that the addition of powdered aluminium to cement lessens its irritant properties. In Spain the advice to use masks meets with some resistance. Calcium cyanamide, used in agriculture, is difficult to handle. On contact with water it liberates calcium hydroxide which burns the skin and mucous membranes. Complete protective clothing is necessary but is uncomfortable to use. It has been observed that men who take alcohol within

ABSTRACTS


GENERAL


The author stresses the importance of careful selection of men engaged in heavy work such as loading and unloading. The hernial orifices and the arches of the feet need attention, while radiography of the spine to exclude abnormalities or old injuries is advisable. Old injuries are important for future evidence in compensation cases. When the workman is engaged he should receive instruction in the use of protective equipment. The work done by these men, and the lesions discovered, are varied. About 10% have a lipomatous swelling on the shoulders, attributed to repeated pressure of the loads carried. Spondylitis is common, especially in the dorsal region; it is probably of traumatic origin and is often first discovered when a radiograph is taken because of lumbago. Associated radiculitis is common. Over 50% of the accidents in these men are described as lumbago, and the author thinks that in many there is actual tearing of muscle fibres. A radiograph should be taken in any case of lumbago lasting more than 10 days, because often some bony abnormality is found. Many of the substances handled by these heavy workers are in powder form, e.g. cement, which is irritating to the nasal mucosa, especially if there is deformity of the septum or turbinates. Ulceration may occur in the nose. Some authorities believe that the addition of powdered aluminium to cement lessens its irritant properties. In Spain the advice to use masks meets with some resistance. Calcium cyanamide, used in agriculture, is difficult to handle. On contact with water it liberates calcium hydroxide which burns the skin and mucous membranes. Complete protective clothing is necessary but is uncomfortable to use. It has been observed that men who take alcohol within

This paper discusses 373 R.A.F. personnel from 18 to 47 years of age but mainly between 20 and 30, chiefly ground staff, who, between October, 1944, and September, 1945, were found unfit for duty in South-East Asia, although not necessarily unfit for further military service in the United Kingdom. Most had been in the R.A.F. between 2 and 5 years and over 18 months of service overseas. The principal causes of invaliding were: injuries, 50; organic diseases—excluding pulmonary tuberculosis, which, 90%, not dealt with at this centre—176; psychological abnormalities, 147. The majority of the invalided were fit to travel by normal troopings arrangements, only 60, of whom 18 had injuries, requiring transport by hospital ship. Only 5 injuries were directly due to enemy action. Disorders of the urinary system, particularly calculi, were frequent. Fifty patients had skin diseases (epidermolysis 12 and seborrhoeic dermatitis 12), of whom 10 had trouble before going overseas. Tropical diseases accounted for 59 invalidings (spine, 34; amoebiasis, 3; amoebic hepatitis 1; acute relapse of bowel infection, and the development of a "pre-sprue type of condition"—15; only 2 patients were invalided with malaria, a low figure thought to be due to the efficiency of mepacrine. Anxiety state was diagnosed in 86 patients, hysteria in 33, psychoses, mostly schizophrenia, in 15, and psychopathic personality in 11. The principal precipitating factors of the anxiety neuroses appeared to be family or financial worries, infidelity of the wife, or discomforts of overseas service, but in 15 cases an outstanding factor could be discovered. In those suffering from hysteria, the precipitating cause appeared to be a subconscious desire to return home, while the principal symptoms were headache, depression, dizziness, or dyspepsia. A feature of the psychotic patients and those diagnosed as being of psychopathic personality was the length of time that they were able to serve overseas before requiring invaliding; some carried on for more than 2 years. F. Mugatroyd.


Laboratory tests are important in diagnosis, but their value should not be over emphasized. The physician must know the limitations and facilities of the laboratories in his area, and must realize that the procedures involved in his requests often require such elaborate equipment and technical knowledge that the ordinary clinical laboratory cannot provide reliable results. Three types of test are discussed: (1) specific tests which determine quantitatively the amount of a toxic agent present in biological fluids or materials; (2) tests which measure a metabolic or conjugated product of the toxic agent; and (3) tests which measure physiological disturbances or detect structural changes in organs and tissues. These are presented in three comprehensive tables which show at a glance the normal levels of toxic agents or their metabolic products in the biological materials used for analysis, and the upper limit of safe absorption or figures indicating abnormal absorption. The author condemns routine demands for tests on a "hit-or-miss" basis in the hope of an early diagnosis and appeals to industrial physicians to make proper use of laboratory procedures. A. Lloyd Potter.


Examples of the part played by the industrial hygiene laboratory in solving the problems of differential diagnosis of occupational diseases are given. Among the functions of the laboratory are the following: to differentiate between occupational and non-occupational diseases; to rule out erroneous occupational causes and determine the proper hazard; to give a qualitative and quantitative basis for engineering surveys and recommendations for control; to recommend the substitution of less toxic materials; and, as a result of routine analyses, to reveal unsuspected hazards. A. Lloyd Potter.


