ABSTRACTS

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TOXICOLOGY


The effect of 2 : 3-dimercaptopropanol (BAL) in acute experimental iron poisoning was investigated. When iron was given orally, either as the sulphate or as the chloride, it was found that BAL afforded a slight protective action against ferrous sulphate if administered 15 minutes before the iron salt, but made the animals slightly more susceptible if given after ferrous sulphate or ferrous chloride. The animals used were mice, the MLD being as follows: for ferrous sulphate (as Fe) 710 mg. per kg.; when preceded by BAL (100 mg. per kg. given orally) 1,050 mg. per kg.; when followed by BAL 15 minutes after the iron, 440 mg. per kg. The corresponding figures for ferrous chloride (as Fe) were 840 mg., 594 mg., and 340 mg. per kg. When BAL and the iron salts were administered intravenously it was found that BAL significantly increased the toxicity of iron, even though the drug was given before the iron; the MLD for ferrous sulphate (as Fe intravenous) was 13.8 mg. per kg. With previous injection of BAL the MLD was 8.1 mg. per kg. The corresponding figures for ferrous chloride were 18.5 mg. per kg. and 10.2 mg. per kg.

A BAL-iron complex was prepared and injected intravenously. Its toxicity was greater than that of the corresponding amount of iron, and the MLD corresponded to that of an iron salt preceded by BAL. J. D. Judah.


The effects of beryllium sulphate on rats, rabbits, and guinea-pigs, are described.

The lethal dose varied with the species, but for white female rats weighing 175 to 200 g. the LD 50 was about 7.2 mg. per kilo. Petechial hemorrhages and serous effusions occurred when large doses were used. All rats dying more than 3 days after a single intravenous dose developed jaundice. Liver necrosis varying for small mid-zonal foci to necrosis of almost the entire organ was observed. The extent of necrosis and time interval required depended on the dose. The necrotic cells within 2 to 3 days underwent liquefaction and absorption, when phagocytes, granulocytes, and lymphocytes appeared. After a single injection of beryllium, regeneration began on the fifth or sixth day and was complete within 2 weeks, leaving no scar. A smaller dose of beryllium was sufficient to produce renal damage which took the form of necrosis of the epithelium of the distal part of the first convoluted tubule. The most severe lesions were seen in rabbits which had inhaled beryllium sulphate dust. The spleen became enlarged and congested and the number of nucleated cells decreased. Nuclear degeneration was seen in the spleen, lymph nodes, and bone marrow, although smaller doses produced granulocytic hyperplasia.

Local effects were produced by inhalation of the dust for 6 hours daily for 11 days, the concentration used being about 88 mg. per cubic metre of air. Guinea-pigs and dogs showed severe acute conjunctivitis whilst some animals developed keratitis, some with ulceration and hypopyon. In all animals, an inflammatory exudate was found in the terminal bronchi together with desquamation of the epithelium. The exudate became coagulated and contained nuclear debris, and a few phagocytes were seen in the alveoli. Granulocytes were scarce. Although occasional fibroblasts were seen growing into the exudate, pulmonary fibrosis was never observed. R. B. T. Baldwin.


Cases of acute beryllium poisoning have been reported from four industrial processes in the United States. The present investigation was carried out in three plants producing beryllium compounds from the ore, and in a number of laboratories and shops engaged in research on the ceramics and metallurgy of beryllium. Over 500 air samples were collected on filter paper and analysed spectrophotographically. The operations involving beryllium sulphate and beryllium fluoride are associated with a high incidence of pneumonitis, the total of beryllium inhaled daily averaging about 0.85 mg. and 0.55 mg. respectively. The evidence obtained with beryllium oxide is contradictory, for several severe cases of poisoning resulted from a daily inhalation of 4 mg., while in another operation, where the daily inhalation was 300 mg., no cases were reported. There were no cases of poisoning from inhalation of 13 mg. of beryl ore, but there were two mild cases when 1 mg. of pure beryllium dust was inhaled.

The authors studied 3 cases of acute pneumonitis and 5 of bronchitis which followed relatively short exposures to high concentrations of the fluoride and sulphate. In one case the furnace in a big room suddenly discharged a large volume of fumes containing beryllium fluoride. Air samples were collected 10 minutes later, and it was calculated that about 45 µg. of beryllium were inhaled by each of the 8 employees exposed. One developed pneumonitis and 2 bronchitis. H. M. Vernon.


The method described here for the determination of small quantities of thallium in urine is a modification of the methods used by Shaw and Haddock.

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Preliminary investigations at a large mercury plant showed that mercury can penetrate into protective clothing: (a) by being absorbed by the fibres of the material from which the clothing is made or by the dye-stuff used in the dyeing of such clothing; (b) by impregnating, in the form of minute droplets, the interstices of the textile fabric of clothing. Tests showed that the samples of fabric dyed black and blue absorbed greater amounts of mercury than similar samples of another colour or those undyed. It was found that the increased absorption of mercury by the black cotton fabric or by the dark-blue woollen cloth was due to the dye-stuff; a square decimetre of black fabric that the samples of fabric dyed black and blue absorbed greater amounts of mercury than similar samples of another colour or those undyed. It was found that the exposure. In four samples of textiles impregnated with mercury vapour and stored in the open air at 25°C for a month the adsorbed on the fabric was directly proportional to the radius of mercury droplets impregnating the fabric. By heating at 100°C for 2 hours, mercury impregnating the textile material was eliminated.

H. P. Fox.


The halides of selenium and also SeO2, SeO3, HSeO2 and H2SeO4 are particularly dangerous to man, either by inhalation of dust and vapours or by cutaneous absorption. In industrial cases poisoning is generally acute whereas in endemic areas the effects are gradual. Irritation of the skin and mucose, loss of the sense of smell, and irritation of the respiratory and alimentary tract have frequently been observed. Physical injury is generalized. The author is interested in the action on the nervous system and the endocrines. Degenerative changes are recorded in the liver and kidney, and in the reticuloendothelial system of the spleen hypertrophic changes have been observed. Experiments were made on 5 dogs and 5 guinea-pigs, which were given sodium selenide by mouth. The former received a solution of 1 mg. in 20 ml. of water and the latter 1 mg. in 20 ml., dosage varying with weight and 0·5 mg. being given per kilo on the first day; this dose was increased in stages. Some of the animals were finally killed, others died between the 40th and 70th days. Progressive asthenia, loss of weight and appetite, vomiting, and occasional irritability were noted before death.

At necropsy on the guinea-pigs and dogs some pulmonary infarcts were seen. The hearts of the guinea-pigs were of abnormal colour and texture, but in the dogs no cardiac changes were seen. Three out of the 5 guinea-pigs had ulcers on the smaller curvature of the stomach, but the dogs were not thus affected. In all the animals some inflammation of the remaining alimentary tract was seen. Fatty degeneration and cloudy swelling were seen in the liver of the guinea-pigs and in the dogs the organ was enlarged and more firm than usual, while the connective tissue was increased. Some conspicuous or degenerative changes were seen in the spleen and kidneys of most of the animals. The microscopical changes tallied with the macroscopical and agree with those described by Dudley.

G. C. Pether.


Methyl chloride poisoning generally develops after a few hours and the free interval is of diagnostic importance. Digestive symptoms are usual and include nausea, vomiting, and intestinal disturbance such as diarrhoea. Vertigo, somnolence and ataxia may be observed; headaches are common. Convulsions and epileptiform attacks generally precede or accompany coma. Asthenia is not uncommon after mild poisoning. In moderate cases there is some bluish tinge of the skin, and the breath may resemble epidemic encephalitis with hiccup, drowsiness, choreiform movements, and visual disturbance.

Foodstuffs kept in cold chambers in which methyl chloride is the freezing agent may be accidentally contaminated. If exposure to fumes is intermittent it may not be dangerous provided that periods of non-exposure are sufficient and regular. It is thought that the nervous symptoms are due to a capillary vasodilatation and general vasomotor disturbance. Some authors suggest that the compound breaks up and that free methyl alcohol is liberated, but no damage to the ocular nerve has been observed.

The odour of methyl chloride is slight. A special lamp may be used for detection, since the vapour burns with a bluish-green colour. Normally the lamp burns with a pale bluish colour but methyl chloride vapour makes the flame more blue. Safety engineers sometimes add more pungent substances to methyl chloride as a precaution, or irritants such as acroleine. Treatment of poisoning is symptomatic, with oxygen, alkalis, and cardiac stimulants; dehydration should receive special attention. If sedatives are needed potassium bromide is advised but never chloral or bromform.

G. C. Pether.


The authors give a full clinical description of methyl bromide poisoning. In mild cases there is vertigo, drowsiness, and headache, with return to normal within a few days. In cases of average intensity, the above symptoms are more severe and there may be tremor and myoclonic jerks. There is marked asthenia, and painful hyperacusis and transient blindness occasionally occur. All these symptoms take some 3 months to clear up. In severe poisoning, symptoms appear either immediately or after a latent period of 2 to 3 hours. Death may occur within 48 hours in status epilepticus. In other cases the patient recovers from coma but continues to have fits. A peculiar tremor develops, usually unilateral and affecting mainly the arms. There may be other signs of extrapyramidal involvement. All these disturbances are permanent. Less conspicuous are mental changes, signs of cerebello-labyrinthine involvement, and visual disturbances. The authors believe that the
condition may be accounted for by vasomotor crisis leading to more or less permanent lesions.

J. F. Delafresnaye.

Cardiac Stimulation in Carbon Monoxide Asphyxia.


Since death from carbon monoxide asphyxia may be primarily due to cardiovascular failure the authors investigated the effects of cardiac stimulants as an adjunct to other methods of resuscitation. 45 dogs being treated with 0.3% carbon monoxide till the onset of spasmodic gasps of air hunger; 1 minute after the last gasp treatment was begun. All dogs received 100% oxygen, and were placed in 3 groups: (A) receiving no other treatment; (B) receiving 1 mg. adrenaline hydrochloride and 0.65 mg. atropine sulphate in 1 ml. normal saline, injected into the heart; (C) given 1 ml. normal saline into the heart. Each group consisted of 15 dogs. No dog in group A or C survived. Of those in group B, 2 remained comatose till death after 68 and 16 hours; a third died in 36 hours and one survived and was apparently normal 30 days after the experiment. Transient cardiac activity was induced by the needle and normal saline in group C but this was insufficient to maintain the heart beat. The authors conclude that it is probably worth while trying intracardiac adrenaline and atropine as a last resort in cases of carbon monoxide poisoning in humans. As adrenaline shows parasympathetic as well as sympathetic activity on the heart in asphyxia atropine is added to neutralize the former effect. (Danieleopoli and Marcou, Pr. med., 1948, 48, 44).

A. T. Macqueen.

Elimination of Carbon Monoxide from the Blood of Acutely Poisoned Dogs.


The authors investigated the rate of clearance of carbon monoxide from dogs resuscitated by various methods. The dogs were exposed to air flowing at a constant rate and containing 0.3% carbon monoxide; at the first sign of air hunger they were removed from the chamber and treatment began. As it was impossible to keep the resuscitator masks on the dogs after they became conscious, the studies are based on 2 to 4 minutes of treatment followed by a period of 4 hours during which the animal inhaled air.

The dogs were divided into the following 4 groups: (I) Eight exposed to carbon monoxide till death. Average saturation of blood with the gas was 72.8%. (II) 20 dogs removed from the chamber at the first gasp of air hunger, and which failed to survive; blood saturation averaged 73.2%. (III) 41 dogs successfully revived after removal at the first gasp of air hunger; saturation averaged 74.5%. (IV) 7 dogs in which resuscitation failed; in these the blood from splenic was 77.5% saturated, from liver 79.1% saturated, and from the portal vein 68.4% saturated. The differences between hemoglobin concentrations in survivors and non-survivors were not significant. The individual variations were considerable and inexplicable. At necropsy the spleen was found to be hard and contracted and the liver engorged. The latter organ may be a source of carboxyhemoglobin after respiration has started, owing to its large capacity for blood storage.

The authors compare the findings of others with their own. The rate of clearance of carbon monoxide from the blood was the same during the first 5 minutes with all methods in which oxygen was used, but the initial rapid rate persisted for a further 10 minutes with the carbon dioxide and oxygen mixture. Four hours after treatment the blood carbon monoxide level was approximately the same in the blood of all dogs. Mechanical artificial respiration with either pure oxygen or a 7% carbon dioxide and oxygen mixture was the most effective method; it is of no advantage in using carbon dioxide. In any case good cardiac function is essential to satisfactory delivery of oxygen to the tissues. It is claimed that by raising the oxygen (in physical solution) level in plasma from 0.5% to 2.5% by the use of pure oxygen the dissociation of carboxyhemoglobin is accelerated and oxygen made available to the tissues in a form in which it can be most readily taken up. Furthermore, the first organ to receive the improved oxygen supply will be the heart itself, a further contribution to increased cardiac output and recovery.

A. T. Macqueen.


Adult rats were given single injections of carbon tetrachloride (0.01 ml. per 100 g. body weight) after being kept for 3 weeks on 20% and 4% casein diets. The severity, extent, and rate of healing of the liver lesions were compared over 7 days. With adequate protein in the diet (20% casein) lesions were zonal, but with a low protein (4% casein) intake such lesions tended to become more diffuse. Females reacted more severely than males. The authors think that these differences are due to failure or impairment of detoxication within the liver cells consequent on reduced protein.

G. R. Cameron.


The author describes 7 cases of poisoning by nitrogen mustard. Lesions are almost identical with those which develop from exposure to the sulphur analogue. Blisters developed more slowly than with the latter substance, in one case after 8 days. The connective tissue round the eyes and the upper respiratory tract was readily affected, and hoarseness was often prolonged. In one patient toxic pneumonia developed.

Nitrogen mustard is damaging because of its effects on enzymes. Increased urobilinogen appeared early in the urine, and all the 5 patients investigated had hepatic involvement. Bilirubin was sometimes increased in the blood, with a positive Takata-Ara reaction. General lassitude was a common symptom. Changes of pigmentation were seen similar to those occurring with mustard gas. Some patients had a yellowish coloration of the conjunctiva, others had articular spots, oedema of the lips, or night blindness. In the skin and mucous membranes an allergic state develops to the irritant as with mustard gas. Bronchial asthma may develop after prolonged inhalation of x, x'-dichlorodiethyl ether, but in contrast the x, x'-dichloroethylexerts only a general toxic effect.

The blisters caused by nitrogen mustard were treated by application of 1 in 3,000 silver nitrate, the chlorine ion being rapidly fixed by the silver. Cod-liver oil ointment has also been useful in treating wounds and conjunctivitis.
The general intoxication may be partly remedied by injections of vitamins including C and B1. Injections of a calcium preparation appeared to benefit the respiratory symptoms, and the unsightly pigmentation of the skin responded to the application of 10% talc in 1:5 varnish.

Prophylaxis is important, and the author does not think that nitrogen mustard has such a selective action as to be free from risk when used therapeutically. Although the workers examined were in fact exposed very little, it appears that more severe contamination would have caused permanent damage. Nitrogen mustard should be listed as a toxic substance so that victims of industrial poisoning may be compensated.

G. C. Pether.


A commission was recently appointed to discover safe substitutes for aromatic hydrocarbons. It is concluded that no general prohibition of the benzene hydrocarbons is possible. Trichloroethylene has many advantages, though some workers dislike it despite medical recommendation. The petroleum solvents are generally complex substances and successive samples of what are alleged to be the same substance are found to vary considerably. It would seem desirable to make exclusive use of Venezuelan oils for cleansing purposes, since these contain low percentages of aromatic compounds. In many cases light solvent naphthas could be substituted for benzene. Benzene should be forbidden and both toluenes and xylenes should be defined and their use controlled.

G. C. Pether.


Investigations were carried out in an accumulator factory to determine the processes involving most risk. It was noted that some production of lead dust occurred in the foundry when plates were being trimmed and that greater risks were present in the process of coating these, especially if this was done by hand rather than by machine. Material shortages made it necessary to recover used plates, a particularly dangerous procedure. Among 50 workers 38 never had punctate basophilia. These men worked in the foundry; the other 12 had slight and transient changes. Six of the 50 men had anaemia with a red cell count between 3 and 4 million per c.mm. of blood. The great danger of the kneading process was countered by giving the men 3 alternate weeks in completely safe employment. Masks were worn and the shop was kept damp. Blood examinations were made every 2 months. Three-fifths of the men had basophil changes. In the coating and assembly shops 13 out of 38 men never had pathological blood changes; 12 had transient and 13 permanent variations from normal. The personnel working on the recovery of old batteries was frequently changed so that only 15 men could be examined at frequent intervals; 40% had permanent basophilia. Some sweepers and cleaners also had blood changes: they took no precautions and were variously employed.

G. W. Csonka.


The relative toxicities of DDT and DDD were investigated by feeding 119 rats, including controls, with the drugs for periods of up to one year, by skin absorption tests involving patch inunction or immersion of 30 rabbits in xylene and triton emulsions and dimethyl phthalate solution, and by inhalation of (a) dust in 12 dogs, 12 rabbits, and 60 rats, (b) "ultrase" spray in 18 dogs and 80 rats, and (c) emulsion sprays in 9 dogs and 50 rats. The toxicity was assessed by the appearance of tremors, the effect on growth, the mortality rate, and the histopathology of the liver. DDD is found to be one-third as toxic as DDT on prolonged feeding and one-quarter as toxic by skin absorption to rabbits; it is much less toxic to rats by dust inhalation. DDT is more toxic than DDD to rats by ultrase spray inhalation, but less toxic by emulsion spray. The first visible sign of chronic DDT poisoning is tremor; that of DDD is diminished rate of growth, a sign which appeared at levels much below the lethal, tremor not being observed. The most characteristic lesions produced by DDD were fatty degeneration and miliary necroses of the liver. Neither DDD nor DDT caused primary irritation or sensitization in patch tests in man.

W. E. Kershaw.
INDUSTRIAL PHYSIOLOGY


Rabbits were exposed to a temperature of −20° C. and the skin and rectal temperatures were recorded until the animals died. The survival time was markedly decreased by restriction of movement. The body temperature of animals so restricted fell steadily from the start of the exposure, while that of the control animals was maintained until shortly before death, when it fell rapidly. Light anesthesia or alcoholic intoxication decreased survival time. When thyroid extract was given for several days before exposure survival time increased; administration of thiouracil shortened survival time. The results are discussed in relation to the survival of military personnel exposed to Arctic conditions.

R. A. Gregory.


Three girls died from cold while on a walking tour in the New Zealand hills. Post-mortem examinations were made 60 hours after death. There was pinkish mottling of the legs and forearms, with pronounced swelling of the parts, which were doughy but did not pit on pressure. The fat was very firm. In the pericardial cavity there was 100 ml. of serous fluid. The blood was brighter red than usual. There were numerous solid dark red masses, ½ inch to 1½ inches in diameter, in the lungs. Around the lower pole of one adrenal in each case there was a hemorrhage in the retroperitoneal fat. Microscopical examination proved that the dark masses in the lungs were infarcts. The small vessels in the internal organs and the retroperitoneal fat were congested, but the skin and subcutaneous fat were practically bloodless, and the spleen appeared to be less congested than the other organs. In various organs the blood vessels, ranging from capillary size to a diameter of about 100 μ, showed striking changes. The red blood cells were tightly packed in the vessels and some of them stained poorly. In a number of the smaller vessels there were eosinophilic hyaline masses which had shrunk away from the vessel walls. These were particularly obvious in the inner zone of the adrenal cortex. There were two small hemorrhages into the lining of the stomach.

The author emphasizes that what happens to the tissues depends on the time they are exposed to any given temperature. If the critical time-temperature level is not exceeded the tissues become normal after return to normal surroundings; if it is exceeded, then local lesions occur or death results. If the chilling has been severe enough, the minute vessels show an increased permeability, plasma passes through the wall, and the red cells are left tightly packed in the vessel, forming a mechanical obstruction to further flow of blood. This in turn produces anoxemia and tissue damage. If the patient survives, various local lesions—such as degeneration of the cells in the vessel walls, foci of cellular and intercellular edema in the skin, degeneration of the sweat glands, muscle necrosis, and degeneration of nerves—result from the circulatory upset.

Experimental work on the cause of death from exposure is reviewed. Death is thought to be due to decreased dissociation of oxygen at low temperatures and diminished capacity of the tissues for utilizing oxygen. Other suggestions made are that death may be due to shock, damage to the central nervous system, or the direct effect of cold on the heart. It is suggested that cold alone may not be a sufficient explanation, but that additional factors—such as humidity, wind, snow, old age, hunger, disease, injury, excessive consumption of alcohol, lowered morale, and exhaustion—may be important.

Gilbert Forbes.


The author examined 47 divers, aged from 22 to 72, who had followed their calling for up to 42 years and who had worked at depths of up to 193 ft. for periods of up to 35 minutes. Fourteen of them had had an attack of caisson disease before examination; in 10 there was radiological evidence of chronic changes in the shoulder-joints, and in 1 case in both hips as well. Three other patients who had not suffered from an acute attack also had changes in the shoulders. [A fine line with x-ray caused an embolism followed by avascular necrosis, sclerosis, and degenerative changes constitute a clearly defined chain of events leading to a type of osteo-arthritis. Although the hip is most commonly affected in caisson workers the shoulder is more often affected in divers.]

L. Michaelis.


Investigations were made in the building trades on 101 workmen who used pneumatic tools varying in weight from 12 to 45 kg. with striking frequencies between 1,500 and 3,000 per minute. Most of them were used vertically. The ages of the men ranged from 23 to 66 years with an average of 43 years. Some had worked for only a few weeks, others for 40 years; most had worked for 10 or more years. As a rule 2 men worked with each tool during an 8-hour day, sharing the work between them. Most of the men were well developed; about a dozen made spontaneous complaint of various pains and many others did so when questioned. Seven men suffered from finger paller, and stiff or crepitant joints were found in 3 others. Of the 101 workers 16 were examined in detail. Radiographs showed various patches of decalcification in bone, usually in the carpus. Some men had exostoses or intra-articular and more commonly extra-articular foreign bodies. Some epiphyses were malformed.

Vaculation of bone was found in 40% of cases. The os magnum was affected most frequently, then the semilunar and the scaphoid. Many of the changes seen in the os magnum are thought to have followed old undiagnosed fractures. Attention is drawn to Böhler's view that Kienböck's disease of the semilunar is occupational and occurs in those who make sudden and repeated dorsiflexion of the wrist. Osseous lesions were
sometimes noted, generally round the elbow. No reference is made to vascular disease, and the authors conclude that most of the workers observed may safely continue their usual tasks.

G. C. Pether.


In an investigation into the effects of high altitudes and resulting anoxia on mental faculties, experiments were carried out on young healthy men; a low-pressure chamber was used and altimeters to indicate the equivalent altitude. The subjects carried out tests involving simple mechanical responses to external visual stimuli. At a simulated altitude of 35,000 ft. the subjects responded to the signals correctly for a time averaging one minute, after which loss of consciousness followed in a few seconds. Similar results were obtained for altitudes between 35,000 and 42,000 ft.

The time during which the subject could successfully perform the tests was lengthened by blood transfusion and shortened by previous removal of one litre of blood. The transfusions raised the oxygen capacity of the subjects from an average level of 15-4 ml. per 100 ml. blood, to 17-8 ml. per 100 ml. blood. The blood-letting lowered the oxygen capacity from an average level of 15-3 to one of 13-3 ml. per 100 ml. blood. The author considers that the experiments suggest a possible means of increasing tolerance to altitude. R. P. Foggie.


The effect of exercise on renal plasma flow was studied in patients with moderate water diuresis who emptied the bladder by voluntary micturition. The authors estimated para-aminohippurate clearances in 9 healthy male subjects, aged 21 to 32 years, before, during, and after exercise on a motor-driven treadmill. Clearance values were corrected for surface area. Of 59 experiments with a total of 140 clearance periods, 35 were acceptable as having two or more basal values within 10% of each other. In the large series the basal corrected mean for consecutive determinations in triplicate was 61.3 ± 107 ml. per minute. In all cases there was a progressive decline in renal plasma flow as work proceeded. After the subjects had walked for 32 minutes at 3 miles per hour at zero gradient, 3 miles per hour at 5% gradient, and 3-5 miles per hour at 10% gradient, the renal plasma flow was decreased by an average of 15, 27, and 35%, of resting values. Recovery of renal plasma flow to basal levels was incomplete 40 minutes after the exercise and was considerably slower than that of the pulse and blood pressure. If this decrease in renal plasma flow represents a diversion of blood to working muscles, then from these results, during the lightest work noted above, 150 ml., and for the heaviest work 330 ml., of which blood per minute are diverted. J. Maclean Smith.


Recent studies of the effects of breathing air at increased pressures (Barach, et. al., J. Aviat. Med., 1947, 18, 73), have suggested that the tendency towards circulatory collapse which occurs is due to a decrease in circulating blood volume brought about by pooling of blood in congested limbs and loss of fluid into the tissues by increased filtration. In the present experiments the extent of fluid loss in normal subjects during pressure breathing was followed by determinations of hematoctrit, hemoglobin, and plasma protein values. Breathing air at 30 mm. Hg at sea level for 30 minutes caused a calculated loss into the tissues of 4% of the blood volume. Raising the pressure to 53 mm. Hg doubled the fluid loss. Wearing a pressure jacket greatly increased comfort but did not decrease fluid loss. Counter-pressure on the legs decreased fluid loss by about 20%.

R. A. Gregory.


It is stated that heavy exercise causes a definite decrease in the ability to see at night.


INDUSTRIAL LUNG DISEASE


Between 1942 and 1946 a group of physically "substandard" workers was studied by the medical organization of an engineering firm. Only those capable of full-time work were accepted, and no special recommendations as to job were made, except to forbid exposure to silica. The chests of all new applicants for jobs were radiographed as a routine, but old employees who were radiographed only if there were definite indications. At 241,000 examinations made in one area active pulmonary lesions were found in 661 people, and these were considered unemployed; 1,757 others with inactive lesions were accepted for employment or re-employment. Most of those with active lesions were fresh applicants and were not aware of their disease. The greatest number of tuberculous applicants was seen in 1943, because most healthy men had entered the armed forces; some men had obviously left sanatoria against advice in order to do war work.

Of all those with tuberculosis, 8-9% had had sanatorium treatment; nevertheless, one-fourth of them had active lesions and were unemployed. The authors were impressed by the staying power of 21 workers with thoracoplasties and inactive lesions. During the period of study 173 people out of the 241,000 developed active lesions; 39 had known lesions which were considered inactive at the outset; in 51 the films had been normal; 83 had developed lesions but had had no initial radiograph. The 39 with known lesions worked for an average of 21.8 months before activity was discovered. A rate of 1-25% for activation of inactive lesions is suggested. The 51 originally considered normal worked for an average of 28.2 months before the disease developed. In the 5-year period 47 individuals with active lesions were able to return to work after adequate therapy lasting for an average of 15 months. There was no unusual concentration of active disease in any department. The authors conclude that the employment of persons with certain types of inactive pulmonary disease is practicable, that such employment in a highly mechanized industry does not harm these persons or their fellow workers, and that the work record of tuberculous

The authors investigated the effects on 3 healthy human subjects of the dusts of: aluminium, aluminium hydride, willemite, dolomite, calcslch, copper sulphide, and zinc sulphide. The mean size of the dust particles was less than 1 μ, and the authors studied the effects of pneumodilating aerosols on pulmonary volume and type of respiration before and after the inhalation of the dusts. All the dusts produced a reduction in pulmonary volume, nor was there any detectable difference between aluminium dusts (which are used therapeutically) and the others. The authors consider that, since the reduction in volume often exceeded 1 litre, the smaller respiratory passages were probably involved in the constitution. Tachypnea accompanied the reduction in pulmonary volume. Repeated administration of dusts reduced pulmonary volume still more. Pneumodilating aerosols counteracted the reduction in pulmonary volume when given after the dusts; they prevented bronchoconstriction if given before the dust. The aerosols used included 0.2% "aleudrin," a mixture of aedrulin and noesynephrine (0.1 and 0.25%), this combination being found more effective than either drug alone, and procaine 0.1 to 0.2% in a mixture with tincture of lobelia, 0.5 to 1%. The dusts produced no subjective irritation in the 3 subjects used.

In the treatment of silicosis aluminium dusts may be used, but as these produce bronchoconstriction they may not reach the depths of the pulmonary tree. The workman so treated, returning to work involving greater respiratory efforts, will draw harmful dusts more deeply into his lungs than the therapeutic dusts. The authors suggest that the aluminium dusts would be more deeply distributed if pneumodilating aerosols were used before inhalation of therapeutic dusts. Furthermore, pneumodilating aerosols might be profitably administered to "wheezy" subjects at the close of a working day, to relieve them of their respiratory distress.

A. T. Macqueen.


An investigation was made into the functional capacity of the lungs in workers exposed to dust and workers whose lungs showed evidence of silicosis. In addition to the usual functional tests the following were measured: vital capacity, tidal, complementary, and reserve air (Krogh spirometer), pulmonary ventilation per minute, length of time for which deepest inspiration could be maintained, reaction of pulse and respiration rate to graded exercise, and oxygen debt after graded exercise. Vital capacity was measured in 431 cases including 98 controls. The results in men and women were the same. The control group had a mean vital capacity of 3,686 ml. With increasing severity of silicosis the vital capacity fell from 3,695 ml. in stage 1 to 2,190 ml. in stage 3 of the disease. The initial increase in the vital capacity in stage 1 compared with the control group was thought to be due to the development of a compensatory emphysema in the initial stages of the disease. There was a fall in the tidal air only in stage 3; the reduction in vital capacity was mainly due to a fall in the complementary air and to a lesser extent to a fall in the reserve air.

In 51 controls and 164 cases of silicosis pulmonary ventilation rate per minute was studied. A steady rise was observed in the cases of silicosis compared with normal subjects. Graded exercises led to a normal response (pulse and respiration rate returned to normal within 3 minutes) in 84% of the healthy control group (253 cases) whereas in the silicosis group (705 cases) in stage 3 there was a normal response only in 3%. Oxygen debt after graded exercise was investigated in a small group of people; no definite conclusions were reached. It is suggested that some of the functional investigations may be of value in the diagnosis of an early silicotic process in the lungs.

N. Chatelain.


The authors found that certain blood changes may occur early in silicosis. The raised erythrocyte sedimentation rate found in a high percentage of cases of early silicosis is explained by the presence of secondary infection, bronchitis, pleurisy, and slight toxemia which are known to occur, even in the early stages.

The viscosity of the blood was studied in 249 cases—31 healthy controls, 103 subjects exposed to dust but without signs of silicosis, and 59 with stage-4 silicosis, 29 with stage-2 silicosis, and 27 with stage-3 silicosis. The viscosity of the blood was over 4 in 45% of controls, in 37% of those exposed to dust, in 50% of stage-1 cases, in 70% of stage-2 cases, and in 91% of stage-3 cases. In order to eliminate the possibility that tuberculosis had increased the viscosity of the blood the same investigations were carried out on a group of patients free from tuberculosis but with silicosis; the same results were obtained. When investigating the viscosity of the blood in relation to the haemoglobin value the quotient of Hesse was used (haemoglobin percentage). It was found that in early cases of silicosis the quotient was higher than 17.8 (normal). The rise in the blood viscosity was thought to be due to a rise in the mean corpuscular volume of the erythrocytes of up to 92.2 µ², found to occur in a group of 160 cases of silicosis. It is possible for the rise in the mean corpuscular volume to be discussed.

Experiments in vitro showed that the addition of silicon dioxide to whole blood raised the viscosity of the blood.

N. Chatelain.


The authors report an analysis of 40 cases in which asbestosis was found at necropsy. Cases are divided into minor, medium, and advanced grades, the advance of the disease and the prominence of asbestosis bodies showing a direct relation to the duration of exposure. In 4 of 14 cases of advanced grade, pulmonary tuberculosis was the primary cause of death. Only in cases of recent exposure was recent fibrosis found, this providing support for Gardner’s belief that fibrosis does not progress indefinitely after cessation of exposure (J. Amer. med. Ass., 1938, 111, 1925).
Presence of asbestosis bodies is not invariable in experimentally-produced asbestosis but is more typical of human asbestosis. Lung damage occurs before the formation of asbestosis bodies, which may represent an attempt by the tissues to segregate the particles; they persist in the lung indefinitely. Pleural fibrosis is an outstanding, though not invariable, feature of asbestosis; the reason for this is not clear, as the particles do not reach the pleura.

The occurrence in asbestosis of nodular fibrosis of silicotic type, which King et al. have produced experimentally (Thorax, 1946, I, 188), was confirmed in 8 cases. Carcinoma of the lung occurred in 3 out of 40 cases—an incidence of 7.5%, which is 7 times greater than general incidence—all in cases of medium- or advanced-grade asbestosis. This figure is in accordance with the experience of other workers, and calls for further study. Tuberculosis occurred in 6 cases, but it is suggested that this incidence is not significant; this is not quite convincing. Gardner stated that experimental asbestosis does not predispose to tuberculosis. [Unfortunately the occupational histories of these cases are often incomplete.] L. W. Hale.

SKIN DISEASES


A case of chronic progressive gangrene of the skin of the abdominal wall is described. As the infection was accompanied by leucopenia, and the patient was a hairdresser, it is suggested that thioglycolic acid, an ingredient of "cold-wave" solution, was responsible. The patient, aged 33, had for the past 2 years shown signs of unusual susceptibility to infection. The gangrenous area, which eventually involved the whole right lower quadrant of the abdominal wall, started in two operation scars. A high temperature, a high pulse rate, and leucopenia were observed. Investigations for syphilis, actinomycosis, brucellosis, and amebobiosis were negative. There was no response to sulphonamides or penicillin, or to activated zinc peroxide. The whole affected skin was removed and new skin grafted; the patient was cured.

F. B. Cockett.


A granulomatous lesion with the clinical characteristics of blastomycosis arose on the back of the hand of a farmer aged 56 in the site of an injury from a barbed-wire fence. Staphylococcus aureus and Candida albicans were cultured, but organisms were demonstrated with difficulty in stained sections of tissue, where they were seen as yeast-like bodies in large macrophage cells and stained with methylene blue. It was not possible to demonstrate blastomyces. The lesion was a granulomatous mass with a reddish, thickened border from which beads of pus could be expressed. Intrapleural inoculation of a subculture into a mouse produced visceral abscesses of similar character from which the fungus was recovered. A variety of treatments over 6 months failed to effect a cure, though some healing occurred in the centre of the lesion. John T. Ingram.


A classification of contact dermatitis of the hands is worked out from the characteristic patterns made by objects in contact with the palmar aspect of the hands. Clearly defined patterns are only rarely obtained in contact dermatitis of the dorsum of the hands. The pattern varies with the shape of the hand, strength of grip, and size and consistency of the object. The classification includes such varieties as the finger-tip type due to touching plastic knobs or buttons, the finger and palm types due to grasping objects such as ropes, golf clubs, bicycles, or car steering wheels, and the palm types due to holding objects in the palm of the hand. G. A. Hodgson.


ACCIDENTS AND ORTHOPÆDIC SURGERY


Hydrofluoric acid destroys all living tissue with which it comes into contact, its effects varying with the concentration and duration of contact of the acid and the thickness of the epidermis. Solutions under 60% act only after a latent period and 10% solutions if quickly and thoroughly washed off may do no damage, but even 1% solutions over a long enough period will lead to deep necrosis, sparing, however, the stratum corneum. The vapour from 2 to 3% solutions irritates the eyes and if inhaled may produce temporary and occasionally permanent anosmia. Strong solutions splashed on the skin produce excessively painful necrosis of tissues down to and including bone; even when treated adequately the lesions may take months to heal. The epidermis may show only bullae, but usually a thick, tough, yellow coagulum of epidermis and corium forms, under and around which there is an area of black gangrene with a reddish edge. Pain, sometimes not controllable with morphine, is present when the corium is involved and colliquative necrosis may go on for days.

Adequate, and prompt, treatment is essential. Prophylactic measures for workers include wearing of rubber gloves, boots, and aprons, and good ventilation of rooms. Thorough washing with weak alkali is advocated, assisted by the application of ice-cold alcohol to constrict the lymphatics. Eyes should be washed out with saline solution, and 3% sodium thiosulphate drops should be instilled every 5 minutes. The essential part of the treatment, however, is the injection of 10% calcium gluconate into, around, and deep to, the affected area.
(The volume required is not stated, but 40 ml. was used for a hand.) Equal parts of magnesium sulphate and glycerin are massaged in as a salve at once and fresh compresses are afterwards applied twice daily. This method gives good results if employed in the first 8 hours and is helpful up to 4 days after injury. The calcium rapidly controls the spread of necrosis and stops the pain almost at once. With immediate treatment burns heal in about 6 weeks; with a few hours' delay healing may take months. In cases of eye burns, as well as instillation of cocaine and atropine, injections subconjunctivally of 1% calcium gluconate may be necessary.


GENERAL


The Oak Ridge National Laboratory employed 452 (11.1%) people with physical limitations. The performance of 300 of these is compared with that of 300 normal controls. The disabled men had all manner of abnormalities: 32.6% had hernia. An assessment of emotional adjustment, based on the answers given to significant items in a questionnaire consisting of 200 queries (Cornell Index), was made for comparison. Accident rates were also compared. The average scores of the two groups did not differ as regards punctuality, attendance, or attitude, but the quantity of work done appeared to be greater in the "impaired" group, despite the variety of jobs, while scores for ability and quality of work were rather better in the unimpaired. The impaired workers had a slightly greater tendency to neuritis. The physically normal group had a significantly higher accident rate, but the number of injuries per worker was the same in both groups. The total scores suggest no significant difference between the job performance of the normal and impaired groups, nor between the larger subgroups of the impaired, for example, those with cardiovascular disease, hernia, or tuberculosis. There was a low correlation between the Cornell Index scores and the supervisors' ratings; the former gives little indication whether or not a man is adjusted satisfactory to his job.

The author concludes that these performances reveal the fallacy of applying rigid physical standards in industry, and that disabled persons are valuable, productive, and safe employees. [Physical impairment and disability are confused. The former was determined at pre-employment examination, and all varieties seem to have been included, regardless of whether a worker was handicapped in the job he was given. Measurements of job performance take no account of individual workers' problems. Many workers left before their performance could be studied.]

J. N. Agate.


In a random sample, 1,902 workers in Birmingham factories were examined by the author, an otologist; in 2.6% there was otitis externa, in 1.6% dry perforation of the tympanic membrane, and in 3.3% active suppurative otitis media. A factory examination and treatment service was established and the author records the experiences in a group of factories employing 51,900 persons. Some 389 patients with otitis externa presented themselves: in the acute diffuse variety application of 0.5% gentian violet in 50% spirit, after scrubulous cleansing of the meatus, was the treatment of choice. In chronic otitis externa, moist conditions were treated with a similar gentian violet preparation; dry conditions by oil preparations. Treatment required in 200 cases of furunculosus and chronic otitis externa. The variety of otitis externa with granulations on the surface of the tympanic membrane or mental walls is discussed.

With chronic suppurrative otitis media 274 patients attended and received treatment: granulations or polypli (present in 28.6% of cases) were removed, application of trichloroacetic or chromic acid; epithelial debris or cholesteatoma (the last diagnosed in only 6 of the 274 patients) was removed by forceps or probe and spraying of the attic. Routine daily treatment consisted in removal of pus by spraying, followed by instillation of 50% spirit or light dusting with a powder, usually of sulphathalid or boric acid in equal parts. Treatment of any infection in the nose, mouth, or pharynx causing spread through the Eustachian tube was regarded as essential. Of 215 ears completely treated there was no recurrence. The average duration of treatment being 5-2 weeks (limits 1 week to 7 months). Examined by the otologist 6 to 18 months later 17 of 37 such cases of "immediate cure" showed relapse.

T. A. Clarke.


This article describes the treatment of 380 cases of infected hands with systemic penicillin. It is difficult to summarize, but the following are the main conclusions reached. A single daily dose of 200,000 units was given, which in severe cases was raised to 300,000 units. The present tendency would be to give 300,000 units, preferably of the procaine preparations. Penicillin cream was used locally in superficial infections. Saline baths were not employed, and physiotherapy usually proved unnecessary. Cases of paronychia and terminal pulp infection were compared as far as possible with similar cases treated before the introduction of penicillin. In both groups the rate of healing was accelerated and complications were fewer. Twenty-seven cases of terminal pulp infection were treated conservatively. Five infections resolved without surgery; the remainder had to be operated on, but a delay in operation did not result in complications and healing was slightly more rapid than average. [This is an important observation as in the past the teaching has been that pulp infections should be treated by immediate surgery for fear of bone necrosis. It now seems that in certain cases the condition will subside without surgery and that delay in active treatment will not endanger the underlying phalanx.] Four cases of acute tenosynovitis were treated, all with perfect results. In one of these the infection subsided without operation. [Such cases are rare but important. In the past the results were uniformly bad.] Admissions to hospital of cases of infected hands fell by over 50% despite the fact that attendances at the clinic rose considerably in the period under discussion.

Except in cases of paronychia, penicillin-sensitive organisms were isolated in every case save one, in which penicillin-resistant staphylococci were found. In 15 of 94 cases of paronychia there were penicillin-resistant organisms, and in the cases healing took slightly longer than in the others.
ABSTRACTS

The main conclusion is that systemic penicillin is of considerable value in the treatment of infected hands because it greatly diminishes the incidence of severe infections, decreases the period of disability, and cures the more serious types of infection with a perfect functional result.

E. C. B. Butler.


In 2 years 723 patients at Oxford lost the equivalent of 5 months' work for 100 men from infections of the hands. The results of a method of treatment used during the last 6 months in 69 consecutive unselected cases are analysed. Instead of incision and drainage, excision and suture were carried out wherever possible, with full use of penicillin.

Cases are classified according to the site of infection and in four degrees of severity from throbbing and tenderness to discharge. In only half the cases was there a history of trauma. Bacteriological examination shows that pure Staphylococcus aureus was responsible in 87% of cases; in the remaining cases Staph. aureus and 5-haemolytic streptococci were grown on one or other culture. Most organisms were penicillin-sensitive. Treatment consisted of immobilization, elevation, rest in bed where possible, and administration of 50,000 units penicillin 3-hourly with vitamins A, C, and D. Operation was performed usually within 24 hours of admission under general anaesthesia with full aseptic precautions and application of a tourniquet. Incisions follow the line of skin creases, the infected area is exposed, and necrotic tissue is excised. After light dusting with penicillin powder the incision is closed by interrupted skin sutures. Where necrosis of skin has occurred a graft is used to effect closure. In the early stages of tendon sheath infection the sheath is irrigated with penicillin solution after opening, but later infections are treated by excision of necrotic tissue. After operation immobilization in plaster is continued until healing has occurred. Results show that of the 69 lesions 38 without skin necrosis healed in an average time of 7.3 days while the other 31 with some degree of skin loss healed in 19-6 days.

G. Blundell Jones.


Analyses of data collected on 35 men chronically exposed for from 2 to 33 years to hydrofluoric acid fumes in a production plant, and on 11 non-exposed office and warehouse workers, revealed a lowered incidence of caries as a result of exposure. Significant differences between exposed and non-exposed groups of individuals were obtained for the number of carious and filled teeth, number of fillings, and number of tooth surfaces involved by fillings and cavities. Active carious lesions among the exposed individuals were encountered infrequently.

Radiographs revealed a change in the trabecular pattern of the osseous structure of the maxilla and mandible in 13 of 15 workers exposed for 10 years or more, and in 10 of 20 employed for less than 10 years. The bone changes were characterized by an increase in the number and thickness of trabecule and a corresponding decrease in the intra trabecular or canalicular spaces. Sclerosis and general disease of bone were not encountered. However, more recent radiographs revealed in one case a marked radio-opacity in practically all the bones of the skeleton without subjective manifestations of fluoride toxicity.

The fluoride excretion of 34 workers in contact with hydrofluoric acid varied considerably, with a mean of approximately 10.78 (#177#3) mg. of fluoride per litre of urine. This contrasts with the fluoride output of 0.67 (#177#3) mg. of fluoride per litre for 7 non-exposed males.

On the basis of this single urine analysis there was no apparent correlation between urinary fluoride excretion and age of the employee, years of exposure, or bone changes.

R. Robertson-Ritchie.


The author describes anosmia as seen in perfume workers. The materials employed are leaves, flowers, and roots of plants, which yield oils and essences; certain animal products such as musk or ambergris, and synthetics of various kinds. The essential oils are often extracted with spirit or some other volatile solvent. These components are then used in order to retard evaporation of the scent. Colouring materials are added to some perfumes.

Headache, vertigo, neuralgia, sweating, vomiting, asthenia, or digestive disturbance may be encountered. Some disturbance is generally noted in workers engaged on extraction processes with ether or petroleum spirit solutions, which are partly responsible for the symptoms though the matter extracted is likewise involved. Older operatives develop tolerances to many materials; Epistaxis and rhinitis, or swelling and inflammation of the eyelids, may develop. Dermatitis is seen, sometimes as an eczema, erythema, or papular or papulopustular eruption. Some oils, such as oil of geranium, act on the nervous system and may have a narcotic effect. Oil of aniseed causes excitation with spasmodic movements, fibrillary tremors, and irritability followed by drowsiness. The oils of lavender and rosemary have a similar effect, presumably from their content of terpenes. Irritation of the urinary tract has been attributed to some of the materials used in scent manufacture.

In the first section of the factory dentifrices were made, both in powders and pastes. Natural essences were used to give taste and aroma. In the second section bottles were filled with the base forointments, and in the third beauty preparations were made. Marked hyposmia was observed in only a few of the workers in the first section. Loss of sense of smell was more frequent in the second and somewhat less common in the third. There appeared to be some direct relation between length of employment and loss of the olfactory sense.

G. C. Pether.


The frequency of diseases due to flour allergy was investigated among 130 bakers and millers. Allergic symptoms when working with flour were reported by 42. In 14 asthma was the main complaint, in 13 vasomotor rhinitis; 8 had eczema, 6 urticaria, and 1 hemicrania. When intradermal skin tests were made on 93 of the 130 bakers, 39 gave positive reactions to flour or flour-improving substances, though only 26 of these had allergic symptoms. Ammonia persulphate, on account of its tendency to cause eczema, is not used in Denmark as an "improver."

A. W. Frankland.