been published. Phosphine was found to be non-toxic to the blood-forming system. Workers at the London School of Hygiene devoted themselves to problems of hygiene (ventilation, warmth measurement, dust sampling, and lighting). The most interesting work, with the greatest promise for the future, was conducted at the Applied Psychology Research Unit at Cambridge. Much information was collected on selection, and on the behaviour of the human mind under varying conditions of stress and confusion. The work on display and control, started under the direction of Craik (who most unfortunately was killed in a street accident in 1945) has special application to industry. Industrial psychology, particularly the cause of absenteeism, was studied at Manchester.

The mode of infection of injuries occurring at work was investigated at the Birmingham Accident Hospital. Most infection of wounds of the hand are due to *Staphylococcus aureus* and *Streptococcus pyogenes*, the former entering at the time of injury and the latter later in the history of the wound.

The Report is itself a brief review of activities varying from investigations into high-altitude flying to the conservation of human milk. Unless another review of the same size is to be written, the majority of the activities undertaken by the Medical Research Council cannot even be mentioned. As an account of what can be accomplished under the difficulties of war the Report is unique; as a list of different specialist subjects within the purview of medicine, it cannot be surpassed.

T. A. Lloyd-Davies.

A REVIEW OF THE LITERATURE RELATING TO AFFECTIONS OF THE RESPIRATORY TRACT IN INDIVIDUALS EXPOSED TO COTTON DUST

By B. H. Caminita, W. E. Baum, P. A. Neal, and R. Schreiner

(U.S. Public Health Bulletin No. 297. Washington, D.C. 1947. Pp. 86. No price given.)

This review gives an account of all processes of the cotton industry, from the farm to the finished article when it leaves the factory. These include harvesting, ginning, baling, grading, bale-breaking, carding, combing, spinning, and weaving. The dangers of respiratory disease are greatest in ginning, bale-breaking, and carding. Since 1827, thirty-six surveys of the health of cotton workers in various countries have been carried out. They show that upper respiratory-tract affections, ranging from chronic irritation of the nose and throat to bronchitis complicated by asthma or emphysema, are particularly common among those with the heaviest exposure to cotton dust. These occupational diseases of cotton workers can be divided into four groups: mill fever, byssinosis, weaver's cough, and a disease which the authors believe is related to *Aerobacter cloacae*, a gram-negative, non-sporulating, rod-shaped organism.

Mill fever is characterized by upper respiratory irritation, cough, chills, fever, and at times nausea and vomiting. Onset of symptoms occurs usually in five or six hours, often on Monday after absence from work during the week-end, and hence it is sometimes called "Monday fever." It clears rapidly on removal of the patient from the dusty environment. Tolerance of the dust develops after a few days. Acclimatization may be limited, so that exposure to a concentration of cotton dust higher than that usually encountered may result in recurrence of symptoms.

Byssinosis is the late result of many years of mill fever. The Byssinosis Act (1940) lays down twenty years'

employment in a cotton factory as being necessary before compensation can be granted. The disease is characterized by chronic bronchitis complicated by emphysema and, in the later stages of some cases, asthma. Respiratory irritation, cough, and progressive dyspnoea occur, and some subjects develop right heart failure. Radiographs show only emphysema and slight fibrosis.

Weaver's cough occurs among workers, both old and new, who handle mildewed yarn; examination of the dust revealed *Penicillium*, *Mucor*, *Aspergelli*, and numerous other fungi. The symptoms consist of constriction of the chest, mild dyspnoea, fever, cough, and aching of the limbs, back, and head. Onset usually occurs in four or six hours, and there is rapid improvement in from twenty-four to forty-eight hours after removal from the source of dust.

Exposure to the dust of low-grade stained cotton has been described by the authors of this review as giving rise to an illness which they consider to be due to *Aerobacter cloacae* endotoxin. Both old and new personnel are affected. Headache, generalized body aches, fever, nausea, vomiting, substernal discomfort, and upper respiratory irritation are the usual symptoms. Onset occurs in from one to six hours, while rapid improvement results in from twenty-four to forty-eight hours after removal from the offending environment.

Though the four diseases are described, it seems probable that mill fever and byssinosis are merely stages of the same condition; and weaver's cough and the illness said to be due to *Aerobacter cloacae* are at least diseases which resemble one another closely. It would also seem as though these diseases are closely allied to those which attack workers inhaling the dust of other plant products such as grain, flax, hemp, jute, and bagasse.

The report ends by stating "that investigation of dusts of plant origin from the standpoint of health hazard has hardly been initiated." This is emphatically true of cotton dust. There is need for engineering studies to determine degree of dust exposure and the factors governing dust production in the cotton industry, for complete data on the chemical and physical properties of the dust, for compilation of mortality and morbidity statistics in cotton operatives, and for experimental work on the mechanism of the production of the various disease entities associated with the inhalation of cotton dust.

K. M. A. Perry.

HEALTH OF ARC WELDERS IN STEEL SHIP CONSTRUCTION

(U.S. Public Health Bulletin No. 298. Washington, D.C. 1947. No price given.)

The fact that arc welding became very important during the war has led to this report on the health of welders in steel ship construction. It is based on a survey carried out in 1944 on 4,650 men and women working in seven shipyards on the Atlantic, the Mexican Gulf, and the Pacific coasts. The fume to which the workers were exposed was analysed. It was highest in the most confined welding spaces, but it contained more than 30 mg. of ferric oxide per cubic metre of air for all welding locations and more than 15 mg. of zinc oxide per cubic metre in several. The fume consisted mostly of ferric oxide 50 per cent., titanium dioxide 15 per cent., silica 8 per cent., and a mixture of acid soluble metals such as magnesium, calcium, aluminium, manganese, chromium, copper, and sodium. More than half the samples of gas were found to contain fewer than five parts per million of nitrogen oxide.

Since the length of exposure was short, welders siderosis was found in 61 cases only (3 per cent.). Other diseases found in the group included metal-fume fever, chiefly among men working on galvanized metal and piping. Conjunctival irritation was prevalent and, though actin conjunctivitis was found infrequently, many workers reported having been affected at some time in the past. Nasal congestion, pharyngitis, and upper respiratory symptoms were more prevalent among welders who used tobacco than among those in a control group. There were 371 (8.1 per cent.) shipyard workers who showed evidence of calcified primary tuberculosis, while the incidence of reinfection tuberculosis was 1.3 per cent.; possibly a selective influence kept people with tuberculosis away from welding. Rheumatic heart disease was found in 1.6 per cent. of the male shipyard workers, and the incidence of arteriosclerotic hypertensive heart disease was 5.4 per cent. in white male welders compared with 17.9 per cent. in a similar group of non-welders. As welding fume may potentially produce anaemia, full blood examinations were carried

out, but the result showed no difference between welders and non-welders. However, there was some evidence to suggest that people doing galvanized welding and exposed to zinc fume are more likely to have abnormal sedimentation rates than those not so exposed; this sign may be a prodrome of zinc chill.

Slag burns or scars were characteristic occupational stigmata. They were most commonly observed on the antero-lateral aspect of the elbow just lateral to the cubital fossa. Right-handed welders showed the lesion on the left arm; left-handed welders on the right. They were also found around the ankles, along the belt line of the abdomen, and in the episternal region. The burns were often in a stage of indolent ulceration showing a dirty granulating base. A recent small burn often looked rather like a doughnut, for the lesion was a ring of vesiculation enclosing a tiny area of seared skin. Dressings were not often applied, and severe secondary infection was rare. These burns were commonest in the most experienced welders doing overhead work.

K. M. A. Perry.

ABSTRACTS

(This section of the JOURNAL is published in collaboration with the two abstracting Journals, *Abstracts of World Medicine*, and *Abstracts of World Surgery, Obstetrics, and Gynaecology*, published by the British Medical Association. The abstracts are divided into the following sections: toxicology; industrial physiology; industrial lung disease; industrial dermatitis; accidents and orthopaedic surgery; industrial ophthalmology; environment; general.)

TOXICOLOGY

Further Experience with the Range Finding Test in the Industrial Toxicology Laboratory. SMYTH, H. F., and CARPENTER, C. P. (1948). *J. industr. Hyg.*, 30, 63.

This paper is an extension of one published in 1944, which indicated the magnitude of some of the health hazards due to new chemicals. Most of the tests were carried out on rats, which were used in groups of 6 at dosages differing in a ratio of 10 (or less). In the tests on subacute oral toxicity now described doses were administered to groups of 10 rats for 30 days. The sample was incorporated in a diet of 1,000 g. ground whole wheat, 500 g. dried milk, and 20 g. iodized salt. Three or four dosage levels differing by a ratio of 2 or 4 were administered. The criteria of injury were the effects on growth, appetite, fatality rate, and the micro-pathology of liver, kidney, and other organs. Dosages were selected so as to allow at least one group of rats to survive without apparent injury. An elaborate table of the results obtained with 29 chemicals is given. A second table records the effects of 36 chemicals in respect of oral toxicity in rats (single dose), penetration of rabbit skin, inhalation of vapour by rats, and eye injury from fluid. In the skin absorption tests a 1-day rubber cuff was applied to rabbits. In the vapour exposure-tests

concentrations were aimed at which would produce fractional mortality during a 4-hour exposure. The concentrations used differed by a ratio of 2. The eye-injury tests have recently been described by the authors in another publication, and are not further referred to. References to the tests on skin sensitization, which were made with 40 chemicals, are likewise omitted, as the results obtained were disappointing and offered no advantages over those carried out on human beings.

H. M. Vernon.

Liver Injury in the Dog following Use of 2-3-Dithiopropinol (BAL). MACNIDER, W. de B. (1947). *Proc. Soc. exp. Biol.*, N.Y., 66, 444.

In dogs which were given 5 mg. per kilo of BAL intramuscularly twice daily for 4 days the response to the bromsulphalein liver-function test was normal and there was no certain microscopical evidence of liver damage. When the dose was 15 or 30 mg. per kilo twice daily the liver-function test indicated a variable amount of liver damage, and biopsy or necropsy examination of the liver showed fatty degeneration. The damage was most severe with the highest dose and 1 animal died on the fifth day with extensive liver necrosis. It is suggested that heavy metal salts which would combine with BAL might reduce this toxic effect.

Derek R. Wood.