

seven surface workers at Broken Hill. The first group had not been exposed to the action of lead at all; the second group had been exposed to the action of the absorption of a dose between one and two milligrammes per day and the third group had been exposed to the absorption of a much smaller daily dose of lead.

TABLE I.—PERCENTAGES OF MEN EXAMINED, ARRANGED IN AGE GROUPS.

Ages.	Under 40 Years.	41 Years to 60 Years.	Over 60 Years.
Sandstone .. . . .	5.3%	8.8%	16.9%
Broken Hill, Under-ground Only .. . . .	2.4%	12.9%	29.1%
Broken Hill, Surface Only .. . . .	3.0%	7.6%	17.8%

Incidence of arteriosclerosis and nephritis among 716 sandstone workers in Sydney, 1,410 underground workers at Broken Hill and 1,597 surface workers at Broken Hill.

It will be observed that there is an appreciably greater incidence of these diseases among the underground workers. Since the nature of their employment only differs in so far as its known effects upon health are concerned from that of the surface workers in the greater exposure to the dust of the mines, it may be taken that these figures express the effect of lead in the production of arteriosclerosis and renal disease. After a scrutiny of the symptoms and signs presented by each man in the Broken Hill groups, it was apparent that a number of them presented in addition to evidence of arteriosclerosis and renal disease other evidence of past or present definite lead poisoning, such as a history of colic or the presence of *extensor paresis*. Subtracting these individuals from the totals, a second table was constructed.

TABLE II.—PERCENTAGE OF MEN EXAMINED, ARRANGED IN AGE GROUPS.

Ages.	Under 40 Years.	41 Years to 60 Years.	Over 60 Years.
Sandstone .. . . .	5.3%	8.8%	16.9%
Broken Hill, Under-ground Only .. . . .	2.4%	8.0%	16.6%
Broken Hill, Surface Only .. . . .	3.0%	7.6%	15.5%

Incidence of arteriosclerosis and nephritis among 716 sandstone workers in Sydney and among workers at Broken Hill who presented no other evidence of lead poisoning, namely: 1,397 underground workers and 1,594 surface workers.

This expresses the incidence of arterial and renal disease in those persons who gave no other evidence of lead poisoning. It is apparent, then, that there is no significant increase in the incidence of these diseases indicated in the table so prepared. This evidence is valuable and points to the fact that the absorption of small doses of lead does not produce arteriosclerosis or renal disease without at the same time producing other manifestations of lead poisoning. Such evidence as is obtainable,

therefore, from the Broken Hill investigations proves that the absorption of a small daily dose of lead over a long period of years does not produce necessarily any disease or tissue damage to arteries or kidneys.

#### X DISEASE IN TOWNSVILLE.

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DURING April and May in Townsville attention was attracted to the occurrence of cases of a disease characterized by a fairly sudden onset, severe course with cerebral symptoms and heavy mortality. During these two months at least eleven cases were recognized; ten of the patients died. In addition to these eleven cases there was a doubtful one in an adult who recovered, but was left mentally sluggish. All eleven patients were children and all but one males. They ranged in age from two to seven years. One recovered and his condition is reported to be physically normal, but mentally dull.

Of the six patients who were seen at the Townsville General Hospital, two were brothers from the same house and two more uncle and nephew, aged seven and three years, not living in the same house, but meeting one another fairly frequently.

A typical history is as follows. The first symptom complained of is headache. This is followed soon by vomiting. Convulsions usually appear in about thirty-six hours, the temperature at this stage being usually about 37.8° to 38.3° C. (100° to 101° F.). The pulse is correspondingly rapid; respirations are not unduly increased; constipation was noted in all cases. The reflexes are normal; the eyes react to light. The child lies on its back with the eyes open and at first will answer simple questions and perform simple acts, but resists handling or manipulations by stiffening the whole body. The temperature rises fairly quickly (in one case it reached 42.4° C. or 108.4° F.) and coma comes on; the faeces and urine are passed into the bed and death usually occurs in two to five days from the onset. In some cases pronounced neck rigidity and episthotonos during convulsions were noted. In one case hemiplegia occurred. The cerebro-spinal fluid is clear and under increased pressure.

#### Pathology.

The morbid anatomy of X disease in Australia, closely similar to that of acute poliomyelitis except that there is much greater involvement of the brain, has been fully described by Breinl<sup>(1)</sup> and others.

The usual picture was present in these cases.

Pathological examinations of some kind were carried out in four cases.

(1) Male, aged three years; the cerebro-spinal fluid was examined before death and was found to contain ninety cells per cubic millimetre, mainly mononuclear leucocytes:

there without yet appearing in Australia. The figures for infectious diseases in the different Australian States published by the Commonwealth Department of Health for four-week periods, have shown up to April 18 no unusual prevalence of acute poliomyelitis. The figures supplied by the State of Queensland show a few cases through

January, February and March (maximum for any week seven for the week ending February 21) and scarcely any in April and May.<sup>1</sup>

In the earliest of the cases of X disease here reported the patient became ill about April 4. As regards Townsville itself no patients with infantile paralysis have been admitted to the hospital for more than a year.

Our thanks are due to Dr. Breinl for his kindness in supplying pathological material and to Dr. Taylor, Superintendent of the Townsville General Hospital, for the clinical histories.

#### References.

(1) A. Breinl: "Clinical, Pathological and Experimental Observation on the 'Mysterious Disease,' a Clinically Aberrant Form of Acute Poliomyelitis," *THE MEDICAL JOURNAL OF AUSTRALIA*, March 16 and 23, 1918, pages 209 and 229.

(2) *THE MEDICAL JOURNAL OF AUSTRALIA*, December 8, 1923, Report of the Proceedings of Congress, pages 594 and 614.

(3) G. H. Burnell: "The Broken Hill Epidemic," *THE MEDICAL JOURNAL OF AUSTRALIA*, August 25, 1917, page 157.

(4) G. H. Burnell: "The Broken Hill Epidemic," *THE MEDICAL JOURNAL OF AUSTRALIA*, April 6, 1918, page 278.

### SOME NOTES ON A SERIES OF CASES OF BLACKWATER FEVER IN THE TERRITORY OF NEW GUINEA.

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The following notes on three cases of blackwater fever and the circumstances surrounding their occurrence appear to be interesting on account of the very special conditions which led to the ultimate result.

<sup>1</sup> Since the date of writing the epidemic has died out. Only one other patient was sent to the Townsville Hospital on June 1, 1925.

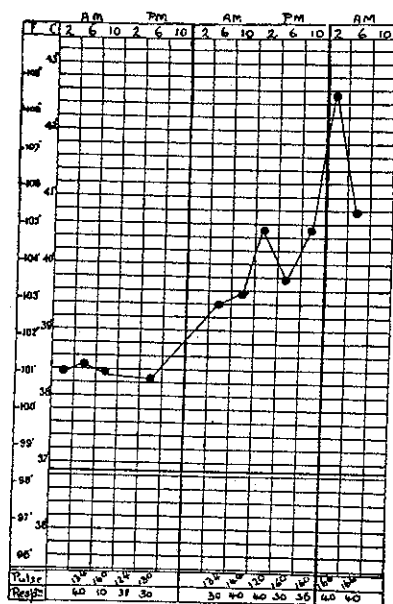


FIGURE II.  
Typical Temperature Chart.  
From the Second Day to Death.

Here were practically all the conditions usually quoted as predisposing to blackwater fever. In none of the cases, however, was there any history of a precipitating dose of quinine.

It is not intended to discuss here the several theories of the causation of blackwater fever, but the evidence provided by the cases under review rules out the quinine theory (now practically discarded in any case) and appears to point more strongly to a malarial than a specific cause, despite the absence of malaria parasites in the blood of the three cases dealt with.

During the year 1924 a small steamer was wrecked off the coast of Tabar, a little island situated about 2° 50' south latitude and 152° east longitude, mountainous in the interior and with swampy coastal lowlands. Its annual rainfall is heavy and there is a frequent cool or cold evening breeze.

Five Japanese skin-divers were engaged in salvage work on the wreck during the months of August, September, October, November and December, 1924, under conditions ideal for the epidemicity of malaria fever. (i.) They were living in a small building situated in the midst of anopheline breeding places on the lowlands; (ii.) the jungle was only partially cleared for quite a short distance round their residence, while several large trees were left standing, (iii.) their native labourers and a portion of the local native population lived near by; (iv.) they carried out their arduous duties while exposed alternately to chilly rain and burning sun, during the evening they were inadequately protected against what was to them as old residents in the tropics a cold evening breeze; (v.) the latter half of their stay on the island was during the rainy season.

Thus were provided a non-immune population of lowered resistance through constant exposure and fatigue; anopheline mosquitoes and adequate shelter for them in proximity to the residence of the non-immunes; a native population, many of whom habitually carry in their peripheral blood the sexual forms of the malaria parasite.

With such conditions and in the absence of quinine prophylaxis frequent malarial attacks were to be expected and actually each of the Japanese suffered frequently. In this regard it might be noted that the Japanese in this territory have a particular aversion for taking quinine while the fever is high, as they have the impression that at such times quinine is very apt to precipitate an attack of blackwater fever. The consequence is that when the fever subsides spontaneously, quinine is taken probably in inadequate doses and eventually forgotten or neglected altogether. This procedure is not without its irony when the subsequent results of the Tabar cases are considered.

After being subjected to numerous recurring attacks of malaria, one of the five contracted blackwater fever during the month of December and died. The efforts at salvage of the wreck had failed and the remainder of the divers then returned to Rabaul, arriving about the middle of December.