HUMAN WATER REQUIREMENTS

An interesting paper by Dr. Kenneth Mellanby entitled "Human Water Requirements" was read at a recent meeting of the Nutrition Panel of the Society of Chemical Industry. Dr. Mellanby began by pointing out that the earliest forms of life existed in the sea, being bathed in a salt solution. There was some evidence that the composition of sea water was different then from what it was to-day, and salt concentration in protoplasm seemed to indicate this. Thus primitive organisms were able to get rid of their waste nitrogen in the form of ammonia, which rapidly diffused in the surrounding water. When organisms evolved to a terrestrial existence they were at once in a position in which desiccation took place, and they developed a more or less watertight covering and got rid of their waste nitrogen in a form less toxic than ammonia. The insect had its watertight cuticle and the bird its feathers, which cut down moisture loss from the skin surface, and both had a nitrogen end-product in the form of relatively insoluble purines which required little water. Man had not evolved a watertight body surface, and he excreted his nitrogen in the relatively non-toxic form of urea, which required a certain amount of water.

Water Content of Man

Dr. Mellanby gave the following figures for the water content of an average (70-kg.) man:

	Percentage of Body Weight	Litres
Intracellular (actual protoplasm of cells) ..	40–50	35
Extracellular { Tissue fluid	12–15	11
{ Plasma	4– 5	3
		49

It was usually found that the production of "metabolic" water and the loss of water by evaporation in the lungs ran parallel. The individual at rest lost little from the lungs and produced little "metabolic" water. The amount of water required to prevent loss of body weight under experimental conditions was known, but whether this was sufficient for optimum health was another question. Loss of water from lungs and skin and by faeces could not be greatly modified. Experiments indicated that unless a person had a total water intake from drink and food of over 1 litre a day desiccation would take place, becoming progressively worse and eventually ending in death. In some M.R.C. experiments during the war volunteers went from Tuesday evening to Saturday morning with no water and with a dry diet. With no fluid intake the urine output was 0.5 litre a day. As the experiment proceeded the salt content in the urine fell to 1 g. per day. Abnormalities began to show themselves on the third day of the experiment. As for sensation, thirst was not so evident as might have been expected; irritability and a disinclination for food were shown. The giving of 4 oz. (114 ml.) of water a day had no noticeable effect on urine output; it was more tantalizing than anything else. A little more effect was apparent with 8 oz. (227 ml.), which gave a rinse-out, but not until 1 litre was given was any real effect obtained. With no water intake desiccation depended on loss of weight. The results of German experiments in concentration camps showed that death took place usually after a fortnight, but these had to be taken with reserve, for the subjects were not co-operative. For example, they were found licking the swabs after the floor had been cleaned. In temperate climates death would probably take place in ten days if no water were drunk.

Camel and Desert Mouse

The amount of water lost from the lungs varied with the temperature and humidity of the air. Sweat production in a body at rest under temperate conditions was 20 ml. an hour; with exercise in hot, dry air it might amount theoretically to 21,100 ml. a day. At temperatures of over 97° F. (36.1° C.) death was more likely to result from heat stroke than from desiccation. It had been suggested that under conditions of desiccation it was better to eat fat because of the amount of metabolic water which this produced. The camel stored fat in its hump and the desert mouse in its tail. But it was necessary to consider also the amount of oxygen required to oxidize fats and carbohydrates respectively. To breathe the additional oxygen required for oxidation of fats involved more water loss from the lungs, and this loss would outweigh the extra "metabolic" water produced by oxidizing fats. The reason why desert animals stored fat was because it was the only food they could store conveniently. Dr. Mellanby concluded that man must have a water intake of 500 ml. over his water output in order to excrete and therefore to get rid of his harmful waste metabolites.

THE PUBLIC HEALTH

ANNUAL REPORT FOR 1945

Sir Wilson Jameson's report on the work of the medical department of the Ministry of Health during 1945 was published last week.[1] For the first time the Chief Medical Officer's report is combined with a report dealing with the more administrative and less strictly medical work of the Ministry of Health. There is much to be said for this combining of two reports which have previously appeared separately, but there is the difficulty that all vital and health statistics cover the calendar year whereas administrative figures must be related to the financial year.

An interesting feature of this report is a note on the Comparative Mortality Index (C.M.I.). Dr. Stocks's work on the C.M.I., which now takes the place of the standardized death rate in the reports of the Registrar-General, is the subject of an annotation in this issue at p. 772.

Vital Statistics

The birth rate, which had reached 17.7 per thousand living in 1944, the highest rate since 1926, declined to 15.9. Live births, which reached the low total of 580,000 in 1933, increasing to 621,000 in 1938, and to a peak of 751,000 in 1944, declined to a total for 1945 of 679,937.

The death rate was 11.4 as against 11.6 in 1944 and the *civilian* death rate, which included violent deaths of civilians due to the operations of war, was 12.6 per thousand compared with an average rate of 12.7 for the three preceding years. The principal causes of death were much the same as in previous years. Diseases of the heart and circulatory system and old age took first place—33.1%, followed by cancer (15.2%), bronchitis, pneumonia, etc. (11.4%), and vascular intracranial lesions (10.7%). These figures show again a slight increase in the proportions and numbers of deaths due to diseases most prevalent in old age. This reflects the fact that persons over 65 in 1945 comprised 10% of the population as compared with 9% in 1939.

Infant mortality was 46.0 per thousand related live births, a rate slightly above the 45.4 of 1944 but well below that of any preceding year. Stillbirths comprised 28 per thousand of all births in 1945—the same proportion as that for 1944.

Comparing the corrected notifications with those for 1944, the incidence of scarlet fever decreased by one-fifth. The same applied to diphtheria, and whooping-cough among children aged 1–5 declined by 30%. There were more than three times as many cases of measles at ages under 5 and a fourfold increase in acute poliomyelitis among infants under one year. Dysentery notifications increased by 28% and cerebrospinal fever notifications declined by 9%.

General Epidemiology

Deaths due to influenza (2,686) were the lowest recorded for thirty years. Deaths due to diphtheria (722) were less than one-quarter of those in 1938. By the end of 1945 it was estimated that 58% of the children in England and Wales had been immunized, a figure said to correspond with that reached in the U.S.A. in 1936. There were 40,000 more cases of measles than in any previous year since notification began in 1940. There were, however, only 729 deaths among the

[1] *Report of the Ministry of Health for the Year Ended 31st March, 1946*, including the Report of the Chief Medical Officer on the State of the Public Health for the year ended 31st December, 1945. London: H.M.S.O. 3s. 6d.