Members of the Emergency Committee of Atomic Scientists at a meeting in Princeton, 17 October. The Committee is considering means of raising $1,000,000 to conduct an educational campaign on the social implications of our new knowledge of nuclear energy.

Left to right, seated, Harold C. Urey, University of Chicago; Albert Einstein, Institute for Advanced Study; Selig Hecht, Columbia University; standing, Victor F. Weisskopf, M.I.T.; Leo S. Szilard, University of Chicago; Hans A. Bethe, Cornell University; Thorfin R. Hogness, University of Chicago, and Philip M. Morse, on leave from M.I.T.

Calorie Intake and Industrial Output
H. A. Kraut and E. A. Muller
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By R. RUGGLES GATES
Emeritus Professor of Botany, University of London

This comprehensive and authoritative work approaches the subject from a broad biological point of view, and makes use of embryology, morphology, physiology, biochemistry, and anthropology in explaining the development and inheritance of both normal and abnormal conditions. Throughout the chapters in which various physical and physiological abnormalities are considered, experiments, especially with mammals, are referred to whenever they throw light on any problem of human genetics.

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Calorie Intake and Industrial Output

H. A. Kraut and E. A. Muller
Kaiser-Wilhelm-Institut für Arbeitsphysiologie, Dortmund, Germany

In the field of the physiology of nutrition the energetic side of metabolism had the primitivity for many years. M. Rubner, R. Tigerstedt, F. G. Benedict, and others studied thoroughly the calorie consumption of man in various kinds of activity. Afterwards, the interest in the energetic problems dropped, since it was not difficult to produce enough calories for the majority of men. Heavy work was reduced more and more by technical devices, and the progress of world economy and world trade made famines uncommon. Since in most parts of the world there was no calorie problem, interest was directed to other fields of the physiology of nutrition, especially vitamins.

This situation was entirely changed with the beginning of war, which induced a nutrition experiment of the widest range. It generally was possible to prevent the occurrence of avitaminoses with the help of scientific knowledge. The requirements for calories, however, could not be satisfied in many parts of the world. At the beginning of the war rations were graduated in order to economize as much as possible, this graduation becoming more and more elaborate as want increased. In the summer of 1943 rations in Germany had to be decreased far below the actual requirements. A man without supplements could do little to adapt himself to the decreased rations. The worker with his extra allowance, however, could lower his caloric consumption by lowering his output and restore the balance between intake and industrial output. This situation in Germany provided an opportunity to study in many cases the connection between calorie intake and industrial output.

In the description of our observations the calories contained in food are separated into two groups according to their role in metabolism. The first group includes calories necessary for the metabolism of the body during strict rest and those required for digestion, which together amount to 1,600–1,800 calories per day according to size, weight, and food intake. The second group consists of work calories, needed for muscular activity of every kind.

In 1942, 20 workmen, fed entirely by their factory, were occupied with the erection of an embankment inside the works. Their task was composed of dumping debris out of railway cars and changing the rails to advance the points of dumping. A measure of the work done was given by the number of tons of debris dumped per hour and man. At the beginning the workmen did not receive the rations for heavy workers. They had, besides their calories for resting metabolism, 820 work calories per day and dumped 1.5 tons per hour. Our observations, results of which are given in Fig. 1, started after several months of work of this kind. Neither the workmen nor the personnel charged with the supervision and inspection of the workers were informed about our investigations. Three weeks later the workmen received the rations for heavy workers except when difficulties in transport made this impossible. This resulted in unequal nutrition. The output of the workmen changed parallel to these enforced variations in available work calories. After one year 2.2 tons per man and hour were dumped with an average of 1,300 work calories. The body weight of the workers increased about 4 kg. during that year, proving that the capacity for work, given in the rations for heavy work, was not fully utilized. Since the termination of the embankment was urgent, the workers were promised cigarettes for greater production. At first, 2.5 tons per hour was the minimum production for which this premium was awarded; after several weeks the premium was graduated, the maximum being given for 3 tons and later on even for 4 tons. This induced a considerable in-
Concentrations of penicillin much higher than those required for therapeutic efficacy could be safely inhaled by man.

These investigators were instructed by the Chief, Technical Division, to publish their findings at once because of the general importance of their data (6). The Chief of the Technical Division, Brig. Gen. Kabrich, thereupon instructed Lt. Col. Abramson to organize and preside at a meeting of interested agencies and to have the Cold Spring Harbor group report their findings to these agencies so that proper coordination of interested research organizations could be made. This meeting, on “Generation of Aerosols for Therapy of the Respiratory Tract,” was held on 22 May 1944 at Edgewood Arsenal, with representatives from the following organizations attending: Professional Service, Surgeon General’s Office; Preventive Medicine, Surgeon General’s Office; Bureau of Medicine and Surgery, U. S. Navy; Camp Detrick, Maryland; Office of the Air Surgeon; Chemical Warfare Laboratory, Ottawa, Canada; Medical Director, Macy Foundation; Biological Laboratory, Cold Spring Harbor; Aerosol Laboratory, Columbia University (Division 10, NDRC); Medical Research Laboratory, Edgewood Arsenal; and Medical Division, Office of the Chief, Chemical Warfare Service. At this meeting the chairman, Lt. Col. Abramson, pointed out that the Technical Division had, through its own researches and through the Biological Laboratory, found that two types of aerosol therapy of the respiratory tract were possible: (1) where low-quantity effects were desirable, and (2) where high-quantity effects were more important. For the first part, it was pointed out that suitable commercial nebulizers had been studied and that further studies of nebulizers were in progress. For the second type, the ordinary atomizer, with a proper tip, could be used directly to the trachea and bronchi. After discussing the various items connected with aerosol therapy of the lungs, the following action was taken: “Study of penicillin aerosols will be undertaken at Columbia University in the Department of Medicine by Dr. Barach, with the support of the Macy Foundation, in cooperation with the Technical Division and the Cold Spring Harbor group.”

**Clinical Phase**

Dr. Barach and his co-workers at Presbyterian Hospital, New York City, collaborated with the Technical Division and with the Biological Laboratory. Their paper (3), which was closely followed by that of Olsen (7) and others, showed (1) that experimental peritonitis in animals with penicillin-susceptible organisms could be prevented or cured by penicillin aerosol, and (2) that penicillin aerosol could be applied to many clinical entities without damage to the patients.

In addition, evidence was presented which indicated that penicillin-susceptible organisms would disappear from the sputum of certain types of nontuberculous lung infections.

Other papers which appeared in 1945 have shown that penicillin aerosol therapy, as initiated and organized by the Technical Division, its coordinating agencies, and collaborating groups, has become a standard and useful feature in medicine. While there is some controversy as far as technique and dosage are concerned, the outstanding fact is that it is now widely applied, especially in hospital practice to control supplicative diseases of the lungs of all types. It is also being applied in addition to other antibiotics, such as streptomycin (8) and hydrogen peroxide (2), in an attempt to improve the pathological processes due to the primary and secondary infections of tuberculosis.

**References**

1. **Abramson, H. A.** *Arch. phys. Therapy, 1940, 21, 612*; *Science, 1942, 96, 258*; **Abramson, H. A., and Demerec, M. J. Allergy, 1945, 16, 184.**


4. **Bodansky, O.** *Science, 1945, 102, 517.*


**Scanning Science**

Invitations have been sent for the opening of the new halls of ethnology and vertebrate paleontology of the American Museum of Natural History, New York. The reception will be held from two to three o’clock on November 30.

At midnight on November 15th the electric power generated at Niagara Falls was transmitted to Buffalo where it will be used to operate the trolley cars of the street railway.

——27 November 1896