preparations in 1907 was repeated in 1940 in our laboratory[19] in order to determine whether digitalis tinctures at this time were in fact more uniform than they used to be. In these tests the cat method was employed. The results were rather startling. They

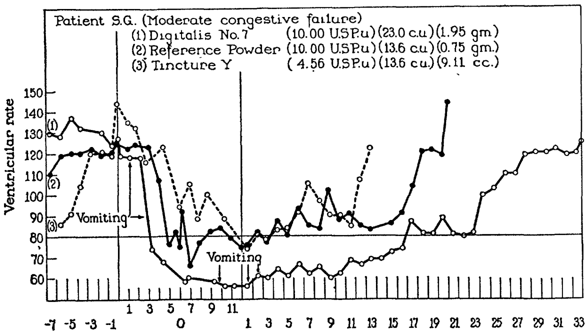


FIG. 3. The cat method reflects the potency of digitalis in man, while the frog method does not. The patient was confined to bed with auricular fibrillation and moderate congestive heart failure. The points to the left of the first vertical line represent the average ventricular rate determined from a count made at the apex three times daily during the control period; the dose of digitalis was given at one time at the point on the first vertical line; the points between the two vertical lines represent single counts at intervals of an hour or less; those to the right of the second vertical line are obtained in the same way as in the control period. Curves 1 and 2, which show different effects, represent the same number of U.S.P. XI (frog) units, but a different number of cat units. Curves 2 and 3, which show similar effect, represent dissimilar doses in U.S.P. XI (frog) units, but the same number of cat units.

showed that the outstanding tinctures at this time varied widely in potency, and that the strongest was still about 3 times as potent as the weakest. These were all labeled U.S.P. XI Tincture Digitalis, hence supposedly of similar potency by the frog method, with the approximately 40 per cent. range allowed by the Pharmacopeia. This brought into focus a fact which had long been known, namely, that the frog and the cat method do not always give similar answers in the comparison of digitalis materials. Abundant evidence accumulated which showed that two specimens may be of the same potency by the cat method, while one may be twice as strong as the other when tested by the frog method. Which method gives results applicable to man?

This was put to the test in a series of experiments in which the two methods of assay were related to humans, in patients with heart failure and auricular fibrillation.[20] Fig. 3 is a typical example of these experiments. The patient was put to bed in the hospital. The apex rate was counted three times daily, and the average recorded as a point on the chart, during a control period of a week or longer until the rate reached a fairly constant level. He then received a single full dose of the digitalis preparation. Apex counts were made at intervals of approximately one hour throughout the day. In the subsequent days the record was made in a manner similar to that in the control period prior to the dose. A period of three weeks or longer elapsed for the elimination of the drug, after which the patient was redigitalized with the next preparation.

*(To be concluded)*

# FOOD AND NUTRITION AS RELATED TO THE WAR[1]

By Dr. CHARLES GLEN KING

SCIENTIFIC DIRECTOR, THE NUTRITION FOUNDATION, INC.

THOSE of us who are working in the field of foods and nutrition these days feel varying degrees of embarrassment when we hear the phrase "Food Will Win the War." It sounds a bit out of balance. War is essentially a fight to the death; and so far as I can see, we have no substitute for the men who face, and fight with, guns and bombs. The first credit is theirs.

I have no quarrel with the phrase "Food Will Help Win the War" or better still, "Food Will Be a Major Factor in Winning the War." We do have a critically important job to do. If we neglect doing it quickly and well, we shall prolong the war and certainly would cause great injury to all humanity.

First, let us look at our No. 1 and No. 2 weapons—the airplane and the tank. To be sure, research and production must not be neglected in either of these fields, but no matter how good the machines may be, there is still need for the utmost protection of the soldiers who run them. In both types of service just referred to, the problem of fatigue is of critical importance. The machines literally wear out the men.

One of our Allies is said on good authority to have practically eliminated a major source of aviation accidents by a surprisingly simple change in food

[19] H. Gold and McK. Cattell, SCIENCE, 93: 197, 1941.

[1] Address given at the National Chemical Exposition, Chicago, Ill., November 27, 1942.

[20] H. Gold, McK. Cattell, N. T. Kwit and M. Kramer, *Jour. Pharmacol. and Exper. Therap.*, 73: 212, 1941.

practice. The fatigue of the aviator is a special kind of fatigue, quite different from the physical exhaustion of a soldier operating a tank. We know enough about feeding ground troops in a temperate climate to do the job fairly well; but apparently no one knows very much about feeding a man who must be ready on a moment's notice to shoot his plane seven or eight miles into the air where he can scarcely survive either the mechanical stress of low pressure or the lack of oxygen. Breathing pure oxygen will scarcely prevent anoxia, let alone surviving and fighting in case a bullet tears through his oxygen mask anywhere down to an elevation of about 3 miles.

We should know more about what the aviator should eat to best fortify himself against such conditions as these (1) the sudden temperature drop to minus 50° F. or lower (if the gunner has an attack of shivering about the time that the enemy plane comes within his gun sights, his chance of survival for another round is at least lessened); (2) the strain of staying at high altitudes with a constant demand for keenness of vision (this may or may not be part of the general fatigue); and (3) retention of maximum alertness and judgment in active combat with changing degrees of anoxia and mechanical stress. You have probably heard of the classical case in which the pilot, engaged in a dog fight at high elevation, had skillfully maneuvered his plane into position for his gunner to fire at close range. To his surprise there was no firing. When he looked back quickly to see what had happened, there was his gunner, giddy from anoxia, waving a cheerful greeting to the enemy plane.

Those of us who stay comfortably on the ground surely owe it to these men to find the answers, not at the expense of better planes and more bombs, but in addition to all these.

Just for a moment, let us visualize the man in a desert tank. His physiological problems are in stark contrast to those of the aviator. Instead of struggling against anoxia and a peculiar mental fatigue in the bitter cold, he will face hard physical work in the scorching desert, from before dawn to the point of physical exhaustion and on into the night, day after day on stretch. His chow and water supply must be kept with him in a greasy, smoking, roaring hot steel box. Often he dare not light a fire even at night for fear of being detected and caught helpless in the open desert. What kind of food and drink should he have and how much, and what kind of a package should be used? Whatever he has is likely to have been planned and possibly packed here in Chicago several months or a year before, followed by shipping and storage under the most severe conditions. The problems are not simple ones to solve, but it seems to me that we must get the answers as quickly as possible.

Colonel Isker illustrated one of his difficulties at a recent meeting of the Nutrition Foundation when he mentioned a report from a test group in the Army. Although the ration was of high nutritional value, a member of the squad commented after a three day trial that "I think men would survive longer on this ration than they would care to live."

Another major problem that worries nearly every one who works with foods, either in the Army or in civilian life, has to do with the nutritive value and edibility of dehydrated foods. Many freshly dehydrated foods are good to eat, but from there on you have trouble. The enzymes must be destroyed and the moisture content must be kept very low, or they will deteriorate rapidly. In parallel with loss of flavor and color goes an indefinite loss in nutritive value. Vitamins A and C can at least be followed or measured with respect to loss fairly satisfactorily, and we know that these losses are great in most products, but we have little information concerning the rate of loss of vitamins in the B group or the deterioration in protein value. Neither can we predict satisfactorily what is going to happen to feeds when new processes are used. Consideration should be given also to the fact that at least one of the newer, unidentified vitamins is very sensitive to heat and exposure to air. The health and nutrition of our fighting forces is clearly a matter of serious and primary concern.

It is interesting to note that many of the laboratory and large scale problems relative to the dehydration of meat were worked out first in order to meet the demand for a tin-saving dog food. The tin-saving dog food gave us a valuable start toward a man-saving army food. We stand to benefit immensely because of the care with which industry had "tried it out on the dog." I believe you will agree that a 90 per cent. decrease in shipping space, along with fairly complete protection from spoilage, for a meat that is nearly as good as fresh meat, represents a major accomplishment. Such problems as rancidity and partial destruction of vitamins need to be studied much more extensively, however.

Two other nutrition problems should be cited as we face the many emergencies arising from the war. The first of these is feeding our own civilian population for the protection of health and for maximum war production; the second, is meeting the government plans for distribution of foodstuffs through lend-lease.

The report of the Committee on Nutrition in Industry of the National Research Council has made it clear that much should and can be done to improve the work output of industrial plants by means of better food practices. It was interesting to hear recently of one Canadian firm that found that it actually paid, in terms of increased production, to provide a highly nutritious lunch free of charge to their employees. Few firms would want to go that far, but I think it is clear that the whole problem of industrial feeding has been sorely neglected. Good food has a direct equivalent in more airplanes and tanks, in addition to better health.

One may quarrel with the philosophy of government subsidies, but in Britain they are reported to be spending 125 million pounds per year in food subsidies and they believe that the expenditure is well justified. Sir John Orr has recently given us some very interesting figures concerning what is being done in England, Scotland and Wales with the problem of food supplies, and he urged particularly the need for a world-wide food policy that is based upon the physiological need of the individual person, rather than upon more superficial considerations, such as convenience and temporary economy. He was on solid ground, was he not, when he suggested that item No. 1, in applying and clarifying the Atlantic Charter, might well be to free every nation from the fear and the physiological handicap of an inadequate food supply?

By making special provision for feeding children and pregnant or nursing mothers, and assuring them first call on such items as milk, eggs and citrus fruits, the British have accomplished the remarkable feat of lowering the infant death rate in the midst of the war period. During 1939, 1940 and 1941 the infant death rate rose steadily, but as a result of their nutrition program, primarily, the rate has fallen sharply in 1942, so that it has now reached a level about 20 per cent. better than in the pre-war period. Accomplishments like that, in behalf of the civilian population, merit our attention, even in the midst of war.

I doubt whether any of us here realizes how far the government is planning to go in directing and modifying our civilian food supply. Such changes as restriction of meat, milk, butter, cream, coffee, canned fruits, canned vegetables, canned fish, dehydrated fruits and vegetables are already apparent. In so far as each step is clearly contributory to winning the war, I think there will be hearty cooperation all along the line. It may sound trite, but it will bear repeating, that by far the most critical point in the entire picture is the care and common sense used in setting up the plans in Washington.

In July alone, nearly 600,000,000 pounds of food were dispatched to the Allied nations by the Agricultural Marketing Authority.

During the summer quarter of the year, three and a half tons of vitamin C and two and three quarter tons of vitamin $B_1$ were sent to our Allies.

Ninety per cent. of the dehydrated skim milk has been removed from the American general supply.

Such changes call for careful planning, both in the government offices and in industry, and they will call for increasing patience on the part of our civilian population.

In conclusion, I would like to suggest first, that we have an unfinished and very serious job ahead of us in providing food that is adequate for the armed forces; and second, that if we could adopt for ourselves, in our own way, and then work with the rest of the world along the lines that were suggested by Sir John Orr, and by Dr. Frank Boudreau of the National Research Council, in planning a food supply adequate for all physiological needs, the gain from this program alone would go a long way toward winning the war and toward ridding the world of war in the future.

# OBITUARY

## MAX HARRISON DEMOREST

ON November 30, 1942, according to a brief notice from the War Department, Max Harrison Demorest lost his life in Greenland, as the result of a motor-sled accident. The details have not been revealed. Demorest, in order to serve his country, had given up the glaciologic research in which he had been engaged at Yale University for several years; he was commissioned a First Lieutenant in the Army Air Corps and was stationed at a remote outpost. His previous experience in Greenland, as assistant meteorologist and aerologist with the University of Michigan Greenland Expedition of 1930–31 and as glaciologist and assistant meteorologist of the Pan-American Airways Polar Year Expedition of 1932–33, had fitted him, one might say, directly for the specialized work he was called upon to do for the armed forces. He is survived by his wife, Rebecca Humphreys Demorest, and their young daughter.

Demorest was born in Flint, Michigan, on February 18, 1910. In 1934 he received the degree of B.A. at the University of Michigan; in 1936 he received the degree of M.S. at the University of Cincinnati, and in 1938 Princeton University conferred upon him the degree of Ph.D. In that year he became assistant professor in geology at the University of North Dakota, but in 1939 he went to Yale in order to avail himself of its laboratory facilities for the research on glacier ice which he wished to undertake. This research he carried on during the succeeding years with financial aid from a Sterling Fellowship in geology, from a National Research Fellowship, and,