REFERENCE PAPERS

WARTIME INFORMATION BOARD, OTTAWA

No. 37 April 2, 1945.

CANADIAN ARMY MEDICAL RESEARCH

One of the least publicized directorates of the Canadian Army is the Directorate of Medical Services, which has initiated and conducted a great deal of medical research on problems particularly related to the needs of fighting men. Much of this has been organized through an Associate Committee on Army Medical Research, comprised not only of army men, but of scientists from civilian institutions as well as from the National Research Council. The Council has provided facilities, and both private and military hospitals have co-operated.

From studies inaugurated by this Committee, some new discoveries of civilian as well as military importance have resulted. Information about many of them cannot be released at present, but three of them of permanent significance have been chosen for description in this REFERENCE PAPER. It is hoped that others now under investigation will be described in future REFERENCE PAPERS.

IMPREGNATED BANDAGES

Discovered accidentally during the Spanish Civil War, the encasing of infected wounds and fractures in plaster casts has now become standard practice; but there has always been a serious disadvantage to this procedure - the foul odor emanating from the wound.

For more than six months a Canadian Army scientist working with the National Research Council prepared various kinds of bandage impregnated with substances that would provide absorption, with the idea of using these bandages by winding them right into the plaster cast.

Eventually he developed a formula that combined carbon and micronized silica. Bandages are impregnated with this formula and then wound into the plaster bandage. In its first test in a Canadian military hospital it worked successfully, as reported by the medical officer who tried it out. He said:

> "These cases before application of the deodorant had previously been treated by plaster alone, and the odor was very disagreeable, especially to the patient himself. When the deodorant bandage was used, practically all odor disappeared."

The impregnated bandage has already been distributed to active combat areas for trial in the field.

VITAMIN C FOR ISOLATED AND FAMINE AREAS

Scientists all over the world have increased their efforts to find some cheap, reliable method of supplementing nutritionally poor diets with needed vitamins. The needs of troops stationed in isolated

areas and of civilians living under famine conditions have stimulated this research, and Canadians working under the director-general of medical services of the Canadian Army have found one method of supplying half the needed daily quantities of Vitamin C.

The solution is, of course, to add fresh vegetables to the diet; but how to get them to remote or devastated areas? The answer: take them as seeds and grow them, not for weeks or months, but for a few days. The dried seeds which can be transported anywhere and stored indefinitely have no Vitamin C, but when they are soaked and kept moist until the seeds begin to sprout, the seedlings contain a considerable amount of this vitamin as well as a certain amount of riboflavin.

The problem was to find, first, what seeds contained the highest amount of Vitamin C while at the same time remaining readily acceptable as food, and, secondly, to develop a method of sprouting them that could be duplicated anywhere by anybody.

Cereals and legumes were chosen for the tests, including field peas, soy beans, broad beans, navy beans, common vetch, wheat, rye, oats and barley. Discarded for practical purposes were soy beans, which have to be cooked so long that they lose much of the Vitamin C content and even when served as a vegetable with tomato sauce are tough and tasteless. Navy beans were discarded because it was difficult to produce sprouts of a quality which might be used as food, and the vitamin content of the finished product was low. Oats, barley and rye were not practicable because they were low in Vitamin C throughout their early growth which was the only stage at which they might be used as a palatable food. Corn sprouts developed a strong and disagreeable flavor and were therefore also eliminated.

That left field peas, broad beans, vetch and wheat. While none of these contained sufficient riboflavin to be considered an important source, they all were found to be good sources of Vitamin C -- so good that one serving will supply one half the daily Vitamin C requirement, and that amount is sufficient to protect against scurvy. Peas were found to be best for eating after nine to 10 days' sprouting; vetch after four to five days, and broad beans after five days. They are economical; for instance, 12 pounds of dry beans yield 22 pounds of one-inch sprouts, sufficient to supply 100 servings of thick soup or 200 servings when added to stew. Eight pounds of dry peas grow enough six-inch sprouts in nine days to serve as salad for 100 men.

Palatableness has been one of the main concerns of the scientists, for, while starving people may not be fussy, it is more difficult to please troops accustomed to the best that money can provide. Recipes that use these sprouts, were developed and the food was served to a group of Canadian Women's Army Corps officers who were invited to be free with their criticism. On the basis of their reactions it was decided that pea shoots are acceptable in the form of a tossed salad with french dressing. Sprouted broad beans can be used in many ways - in soups, stews and meat loaves and as a vegetable with a sauce or in a casserole or as chile con carne. Vetch sprouts have a flat taste and are best with the addition of meat or tomato. Wheat sprouts can be used along with rolled oats to make porridge or eaten fried with onions and rice or in soup. They get very hard with overcooking; five to 10 minutes is enough for frying; 20 minutes the limit for boiling.

All sorts of different methods of sprouting the seeds were tried, including wooden tubs, shallow screen-bottomed trays and open bags. For use in mobile camps or emergency food centres an open bag was designed which is satisfactory for all types of seeds. It was found that the best temperature for sprouting was not too high, about 21 degrees to 25 degrees centigrade. Growing the seeds in light and in darkness was tried, and it was found that, while more sprouts grew in the dark, Vitamin C production was stimulated by light. A combination of light and dark was thought best; although the great importance of using sprouts for vitamins is that peas, beans and vetch do not require hot-house management for growth, but will grow almost anywhere and without much attention.

CONVALESCENT DIETS

Great progress has been made in the nutrition of ill and wounded persons during the war as a result of the efforts of medical and nutritional experts in Canada and in the United States in the army and in civilian life. Research and its findings have been shared co-operatively, and the entire theory of feeding convalescent patients has been revised.

The most radical departure from generally accepted procedure is the complete reversal of the theory that patients should be starved both before and after operations, during fever and throughout confinement to bed. It is now established that the old idea that a man in bed needs less to eat than a man at work is often fallacious. The man is in bed because he is suffering from some kind of damage, and his needs are therefore greater; not only does he need enough food to maintain a healthy man but also something extra for repairs. Energy requirements are increased after damage.

One of the most serious bio-chemical aspects of damage -- which includes burns, fractures, wounds and various surgical operations and infections -- is the loss of nitrogen from the body. This lost nitrogen may be restored either from food or from body protein. If the patient is being starved it necessarily derives from body protein which is used to supply calories to the body. Body protein is being lost in other ways: Protein tissue is being lost from the atrophy of disuse, particularly in bones and muscle; from ordinary wear and tear; from toxic destruction through such complications as infection, tissue damage, etc., and from hemorrhage. The loss of body protein results in loss of weight, slow healing and convalescence and increased liability to complications.

Loss of body protein is reflected by a negative nitrogen balance; that is, the body excretes more nitrogen than it absorbs. This is called by medical men the "Protein Catabolic Period," when protein is being burned up faster than it is being replaced. After a period the excretion of nitrogen falls much lower than the intake, and gradually a positive nitrogen balance is arrived at. This is known as the "Protein Anabolic Period." Nitrogen loss usually reaches its maximum in the first week after damage; as lost weight is regained and the wound heals an even balance is achieved.

The duration and degree of negative nitrogen balance depends on the nature and extent of the damage, including complications such as infection, and the age, sex, constitution and state of health of the individual at the time of damage. An interesting point here is that a healthy and well nourished patient requires much greater amounts of protein and calories to cause a positive nitrogen balance than someone who was run-down or chronically ill before his accident, wound or operation. The marked increase in nitrogen excretion after special protein diets does not occur in the depleted person.

The usual treatment has been to allow about four days for a surgical patient to return to full diet. Bland, usually tasteless foods are offered first. In studies made by the Canadian Army medical research unit, which has pioneered in research on nutrition in convalescence, it was found that patients in the hospitals surveyed were receiving from 45% to 55% of the calories and 35% to 47% of the protein content of the full ration laid down for them. One-third to one-half of their food was under-drawn or wasted in the kitchen; the remainder of the unconsumed food was found left on the plates, partly because it was unappetizing, partly because the patients had poor appetites and partly because no extra effort was made to persuade them to finish. It is safe to assume that under the old procedure patients were often receiving much less than their nutritional needs.

To remedy this situation an educational campaign and special lectures were provided for medical officers, nursing sisters, dietitians, quartermasters and cooks in the army hospitals, for the only way to combat loss of nitrogen is to take in large amounts of proteins and calories.

Diets providing 150 to 200 grams of protein and 3,000 to 4,000 calories were devised, and patients are started on them right away after injury. It was found that the best way to supplement the regular diet to achieve high protein, high caloric intake was by adding "Casec Milkshakes" to the diet. The ordinary milkshake (containing milk, ice cream, sugar, cocoa and lactose) is worth 112 calories and 10 grams of protein. By adding two eggs and 20 grams of "Casec" (calcium proteinate) the value of the milkshake is raised to 637 calories and 41 grams of protein. The patient is given two of these drinks a day, one for "afternoon tea," midway between lunch and supper, and the other at bed-time. In this way 82 grams of protein and 1,274 calories can be added to the regular diet.

When patients are unable to drink these milkshakes they may be administered by gavage or stomach tube; by this method the milkshakes or other liquid formulas can be dripped into the stomach over a long period. This is usually necessary for the first few days after injury, but after that the patient can usually drink the rich milkshakes themselves.

First formulated by a United States doctor, "egg-noggs" of a special kind have proved beneficial in burn cases. Each egg-nogg, containing six egg whites, a quart of milk, orange juice, brewer's yeast, "Casec," lactose and ground raw liver, has a value of 2,300 calories and 153 grams of protein.

These discoveries have made a radical change in both pre- and post-operative treatment and are of lasting importance in Canadian medical development. They have been put in practice long enough for a considerable amount of experience to have been gained and they have shown results.

Patients given high protein, high caloric diets have been protected against general physical deterioration and loss of weight, against metabolic upsets and against complications; their convalescence has been shortened by as much as 50%; and local wound healing has been improved. When the patient is ready to leave hospital he should be ready to go back to work, instead of having to take several weeks or months to "build himself up" again.

In some cases of severe burns patients have committed "metabolic suicide," as one doctor puts it, through diet deficiencies. The old practice of starvation and smaller-than-normal diets for persons suffering the effects of accidents, wounds and operations has been scrapped.