

NUTRITION

Fuel for Fighters

New processes revolutionize food industry. Helps solve shipping and storage problems. Strange food forms likely on post-war tables.

By **GLENN SONNEDECKER**

► **BLASTING FOODS** with torrid heat, freezing them in arctic cold, improving and changing them in the laboratory—by these new processes scientists are turning the breadbasket of the nation topsy-turvy to help get fuel to America's most important fighting machines, our men.

Revolutionary changes in the food industry seem certain to have profound effects on American eating habits that will persist even after victory is ours. Millions of men will have new things to eat and new ways of eating them, in camp, on shipboard, and on the battlefield. Added convenience and advantages of new food processes are then likely to result in all sorts of strange food forms turning up in the kitchen of Mrs. America.

Magic of stuffing four gallons of milk into a three-pound paper sack has already received wide publicity. Spraying milk into hyper-heated chambers, most of the 92% of water is gone in a flash and the white snow of nutritious solids drifts down to be collected for shipment overseas. Mixing this product with ordinary water is said to be almost as satisfactory as the more traditional cow to cup method. Better in some respects, as such milk is from tested cattle, and pasteurized to kill the disease germs which may be lurking in milk from home dairies.

Milk Defatted

To prevent rancidity, dried milk is often defatted. In this condition the powder can be stored almost indefinitely in any climate, whether it be subzero cold or tropical heat.

Last year the United States sent nearly 200,000,000 pounds of dried milk to Britain alone. And lend-lease administrators are clamoring for multiplied production in the future.

In order to insure an adequate supply, research is going forward at the point of origin—the cow. WPA is now compiling records on the success of artificial insemination. By this method cattle may

be bred from the very best stock without the costly transportation of the prize animals from one place to another.

Possibilities of artificially increasing the flow of milk by administering sex hormones is also being explored.

The butter obtained from milk has always been difficult to supply to armies in the field. A new type of "butter," already shipped overseas, requires no refrigeration and does not melt even when left in the sun at summer heat. Such stability is obtained by adding hydrogenated cottonseed oil to ordinary butter.

Out of the laboratories has marched a continuous parade of new food forms—concentrated, enriched, dehydrated, precooked, quick-frozen, synthetics, and new plant and animal varieties.

Primitive Drying

But primitive men, including the American Indians, have always been dependent on dried foods such as pemmican and parched corn as part of the diet during war. From war to war its importance has steadily increased. Up until the present primitive struggle, however, the food which resulted felt much to be desired as far as palatability was concerned.

Modern dehydrated foods have now been developed which compare favorably with the fresh product off the tree, vine, or butcher's table. Grinding and high temperature methods are used which differ from the ordinary food-drying process.

Soups, oysters, meat, potatoes, eggs, lemonade, pumpkins—in fact the whole gamut of the menu list can now be obtained in dry form.

Free flow of these foods to the allied armies is dependent on shipping facilities. Twenty-seven million pounds of potatoes, for example, can be reduced to a shipping weight of three million pounds by dehydration—like pulling two big cargo ships out of thin air.

Some vegetables contain as much as 90% water. Thus it takes about 10 pounds of fresh vegetables to make one

pound of dehydrated product. One pound of dried eggs represents the nutritional part of three dozen eggs as harvested from the hens. Plans call for dehydrating 300,000,000 pounds of eggs this year as compared with only 25,000,000 pounds processed in 1939.

Lend-Lease Eggs

More than 17,000,000 five-ounce packages are being sent to England under lend-lease every month plus vast quantities in barrels for commercial use, the U. S. Department of Agriculture announces. These will be used to supplement the British ration of one shell egg per person each month during the winter and four a month in summer.

Great quantities of tin, in addition to transportation and shipping facilities, will also be conserved by the advance of dehydration processes. Perishable foods that formerly had to be carefully canned, are now packed in a variety of fiber and waxed paper cartons.

Dehydration of meat, especially beef,



PARACHUTE TROOPER concealed behind enemy lines, pulls ration "K" from his pocket for a full meal. Use of the emergency ration is demonstrated in this official Quartermaster Corps photograph.



MILK packaged for shipment overseas is reduced to a powder only one-seventh of the original weight as shown in this official photograph from the U. S. Department of Agriculture. Stored in any climate for an indefinite period, every quart of milk can be reconstituted weight for weight in a fresh condition by mixing with water.

is the most recent development. The process shows great promise for the future. Research is continuing.

At present the Army is using millions of pounds of boneless quick-frozen meat. Adoption of this arctic artifice to stymie the meat-spoiling germs is obviously limited to conditions where subzero storage facilities are available. Such boneless beef not only saves much labor in field kitchens, but is pressed into shape for packaging in 50-pound fiber cartons which save around 50% of shipping space, the War Department estimates.

This quick-freezing process for various foods, the same one which has come into vogue for civilian use during the past few years, is especially adaptable for feeding the armed forces stationed in this country.

Improving Bread

All Army bread is now of the "enriched" type, being fortified with components of vitamin B and minerals. Research results announced by the U. S. Department of Agriculture also point a possible way for making this good bread better. The scientist, Karl F. Finney, broke apart various bread flours in the laboratory into their components of

starch, gluten, and water-soluble fraction. Then by juggling these combinations he put together synthetic flours and baked test loaves of bread.

Gluten Important

"Just like Mother used to make" from the original flour, was the test result. But in some there was a difference which reemphasizes the importance of gluten as the key to bread quality. These experiments will also improve interpretations of probable baking value of new types of flour, Bureau of Plant Industry officials point out.

Similar "breakdown" tests are regularly conducted at the Subsistence Research Laboratory at the Chicago Quartermaster Depot, to develop the best possible rations for the armed forces.

Flying, riding jeeps and trucks and tanks, as well as marching on its stomach, our modern Army receives the best diet which can be supplied under war conditions.

Fresh foods are used when convenient, quick-frozen foods when available, preserved foods when necessary, dehydrated foods when possible under combat conditions — somehow, no matter the ex-

pense, fuel must be furnished the human fighting machines.

With shells screaming, supply lines cut—what then? Emergency rations. Out of his kit, or out of the plane, tank, or troop carrier, the soldier pulls three square meals in a two-pound package. This contains concentrated food so wrapped as to be edible after exposure to jungle heat, arctic cold, vermin, water, poison gas, or other deteriorating influences.

Containing bread, meat, beverage, and dessert or confection for each meal, this constitutes Army ration "K," originally called "parachute ration," since it is used by the paratroopers.

"Pep Pills" Used

Included are the so-called "pep pills" (tablets of quickly utilized dextrose), powdered coffee and powdered lemonade which can be dissolved in water, fortified chocolate bar, "defense biscuits," concentrated bouillon, and even chewing gum—the latter to reduce the consumption of water.

Extensive field tests, under controlled conditions supervised by medical men, showed that after a week on the "K" ration the physical condition of the soldiers was excellent and in many cases even improved.

When engaged in continuous battle with no time for regular eating, the "D" ration carried by the soldier in his pocket will see him through. It consists solely of concentrated chocolate. But in each four-ounce bar there are 600 calories derived from chocolate, sugar, skim milk powder, cocoa fat, oat flour, vanilla, and vitamin B₁. The oat flour helps the bars to remain in good condition in climates ranging from arctic to jungle temperatures.

"C" Is Precooked

Canned field ration "C" employs the modern precooking process. A ration contains three cans of meat and vegetables and three cans of crackers, biscuits, confection, sugar, and soluble coffee. Each unit also contains pieces of hard candy which keep well and have a tart flavor the men prefer to chocolates. All foods in field ration "C" may be eaten hot or cold.

But the success of these scientifically balanced and processed meals for the Army is predicated on adequate supply. This means action on the home front. We in America will be called upon to feed, not only ourselves, but to help

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different specimens

This unit of "THINGS of science" consists of materials used in America's packaging industry. These are samples of vegetable parchment, stronger wet than dry; of Kimpak which will absorb sixteen times its own weight in moisture; samples of Fancy Box papers; samples of glassine and grease-proof papers; pieces of velour paper, suede-like in texture.

Not only samples are enclosed, but explanations of the processes of making these highly specialized, and in some cases very colorful papers.

You will find yourself, after studying this Unit, collecting unusual packaging papers to add to this very excellent collection.

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supply the United Nations, and eventually much of the civilized world—if we are to keep it civilized.

All foods and supplies will need to be conserved. Garbage must consist only of completely unusable material. Former waste is now put to good use if placed in the proper hands.

Victory gardens next year may increase production as plant breeders develop improved varieties of vegetables and experiment with hormones and other strange chemicals, such as colchicine, which so change the plant's heredity as sometimes to produce a super-plant. Animal geneticists are conducting similar research.

With the growing shortage of farm labor, these methods of increasing yield from the same outlay may eventually be of real importance when put on a national scale.

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particular direction. But when any of these irregular lumps happened to sink beneath the surface of the nutrient fluid, thus reducing the oxygen supply, it would begin to develop stems and leaves. Brought up to the air again, it would revert to its original formless condition.

Dr. White expressed the belief that there must be other kinds of plant material that would lend themselves equally well to experiments on growth control, leading eventually to information of value in such widely separated fields of research as the growth of diseased tissue and the growth of crops.

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Effects of Plant Germs

➤ DISRUPTING and deadly things done by one kind of germ that invades plant tissues, grimly suggestive of larger-scale invasions with which the world has recently become too familiar, were described by Prof. A. J. Riker, University of Wisconsin plant pathologist, at the symposium of the Society for the Study of Growth.

The germ is known to scientists as *Phytophthora tumefaciens*, and the gnarled and knotty swellings it causes are called crown galls. Crown galls damage any plant on which they occur, and kill many, so that they are one of the really serious sources of loss to agriculture.

When these germs invade plant tissues they do several things. They give off a number of substances, some of which are poisonous or irritating to the host

cells. The bacteria are also very greedy of oxygen, leaving the invaded tissues starved for that vitally necessary element. They produce changes in osmotic pressure and thereby cause the cells to swell. In some way they bring about abnormal production of growth-promoting substances such as hormones and vitamins, and they also provoke the concentration of large quantities of foodstuffs at the invaded spots.

Any of these factors could provoke rapid multiplication and growth of cells, Prof. Riker pointed out; it is therefore no wonder that all of them working together bring about wild growth and an anarchic breakdown in the plant's internal economy. The analogy with the invasion of a peaceful and orderly country by a robber horde is uncomfortably suggestive to even an ordinary imagination.

Laboratory experiments with the same bacteria gave dramatic illustration of the old adage, "What's one man's meat is another man's poison." The germs were robbed of their strength by contact with various amino acids, which are the vital building-blocks of proteins needed in the formation of ordinary, healthy cells. This discovery has no practical possibilities as yet, Prof. Riker explained; it is just an interesting bit of information about the enemy, which may at some future date be turned against him.

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RESOURCES

Shortages Put New Oils In Home Medicine Chest

➤ A VOLATILE oil obtained from cedar leaves has recently been included in the U. S. Pharmacopoeia to replace imported oil of lavender, a perfume which is no longer available. Persic oil obtained from either peach or apricot kernels, likewise relieves the shortage of expressed oil of almond.

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● RADIO

Saturday, September 12, 1:30 p.m., EWT
"Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. E. F. Kelly, secretary of the American Pharmaceutical Association, will discuss "Pharmacy and the War Effort."

Tuesday, September 8, 7:30 p.m., EWT

Science Clubs of America programs over WRUL, Boston, on 6.04, 9.70 and 11.73 megacycles.

One in a series of regular periods over this short wave station to serve science clubs, particularly in the high schools, throughout the Americas. Have your science group listen in at this time.