

PEMMICAN*

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"It was a wild and furious scene, but there was no sign of stampede anywhere in the vast herd. The Indians would kill the number they had in mind and let the remainder of the herd drift away from the fallen beasts, and the squaws would go out, their knives sharp and shining, their throats giving their chilling cry of exultation. God, what a thing to watch the squaws!

"He stared at them in wonder, with astonishment...and the passion in their faces as they...plunge the knife in...and plunge it in again, deep into the throat or against the heart.

"Her skill with a knife few but Indians had. She was rolling the deep hide back, and working inside, through the diaphragm and in--into the guts--smelling steaming depth, toward the liver...She worked behind the mass of intestines, thrusting her arm deep, feeling, drawing the arm out wet and glistening...until she felt the liver; and without seeing it but feeling it only, she went in with both hands and the knife and cut off a deep red slice of it and lifted it to her mouth. She bit in deep, like an animal, and began to chew and gulp it down..."

And that is the vivid, gripping description of the buffalo hunt and the dressing of the buffalo by Vardis Fisher (1956) in his historical novel, PEMMICAN. The locale is early 19th Century Canada--Alberta and Saskatchewan.

In the book, David MacDonald, an employee of the Hudson's Bay Company, watched the slaughter of buffalo by the Blackfeet and the attack by Sunday (a white girl captured by the Blackfeet) on the carcass.

Fisher continues his moving narrative of the narrative of the making of pemmican after the hunt:

"The squaws were at their drying racks. The racks were covered with ribbons of flesh and under them were fires, not to smoke the meat but to dry it, the fires being so laid that the wind drove the smoke out and away. Only the heat went up. A few younger women were digging marrow out of the bones. Marrow was by far the best fat for pemmican, but the marrow pemmican Indians would keep, trading the white man the hump fat or the faintly yellow walls of tallow that hung down over the kidneys or the grease from beaver and bear."

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Fisher (1956) briefly describes the making of pemmican for trading to the white man and how some of the pemmican tasted:

"All the squaws did was pound up old buffalo bull and mix it with any fat they had; and if it swarmed with maggots and with flies and ants, they all got mixed in.

"The pemmican was dry and looked like boot leather. It tasted like boot leather, for this had been taken in trade from Indians, a bag of pemmican for a quart of rum that was chiefly Saskatchewan water.

"He had seen men gag when eating pemmican a year or two old. He had seen them slowly chewing, jaws opening wide, open mouth revealing a grayish mass, eyes wide and popping as a man's eyes might be if he were looking to his hidden emotions expecting to explode. The only time he had seen men eat pemmican as if they enjoyed it was on a portage when, carrying ninety or a hundred and eighty pounds up mountains, they seized a hunk of the stuff and tore at it with their teeth as they climbed. Doing that kind of work a man would eat anything, even his moccasins."

EARLY HISTORY OF PEMMICAN

Origin of the Word Pemmican

The origin of the word pemmican is obscured by time; it probably comes from the North American Cree Indian word pemikkan (Webster's Third New International Dictionary, 1967), bastardized from the French word pimii, meaning "grease, fat." Oswalt (1966) translates the Cree word to mean "manufactured grease." Fisher (1956) states that it simply means, "mixture."

Definition of Pemmican

Webster defines pemmican as "a concentrated food used by North American Indians consisting essentially of lean buffalo meat or venison cut in thin slices, dried in the sun, pounded fine, mixed with melted fat, and packed in sacks of hide" (Webster's Third New International Dictionary, 1967).

Pemmican has been classified with other partially dried products, such as figs, jerky, and pepperoni, as an intermediate moisture food. Most intermediate moisture foods contain 20-50% moisture (Potter, 1973). How well pemmican fits (or doesn't fit) into the intermediate moisture food category is apparent from assays presented herein on a number of pemmicans.

Evolution of Making Pemmican

Stefansson (1956) traced the evolutionary process of making pemmican by the Indian: "The first step...is that the lean is sliced thin and dried. To make drying effective, all fat should be removed. The lean is then what is called "biltong" in South Africa and "jerky" throughout the Americas, except that these (especially jerky) may sometimes have more or less fat adhering."

The meat was dried in the sun and wind or by fire. Drying by fire was necessary in a rainy season or facilitated drying in the dead of winter. Meat was also "frozen dried" in the winter months in the northern latitudes.

The next step was to pound the dried meat into shreds or a powder with wooden or stone hammers. The final step in the evolutionary process was to pour hot suet or other fat into rawhide bags filled with the fluffy "pounded" or "beat" meat.

The hand-sewn, pillow-shaped rawhide bags, with the hair on the outside, and weighing about 90 lb., were sewn shut and sealed with tallow. The packaged product, under reasonable care, was watertight and had a shelf-life of some 5 years, although some lasted for a much longer time.

Before the coming of the white man, one school of thought is that the Indians made only a dried lean and fat mixture of pemmican. According to this theory, the white man introduced berries or fruits as flavoring agents. Whites, historically, have preferred mixed dishes-- and probably encouraged the Indians to make a fruit or berry pemmican. With the passage of time, a kaleidoscopic assortment of other ingredients was included in pemmican, such as cereals, sugar, raisins, pea meal, coconut, peanuts, bacon, apples, flavoring extracts, seasonings, and salt, in varying amounts and combinations. If textured vegetable protein had been available, it certainly would have been added!

When and where the process of making pemmican originated is not known. It may have come by way of the Bering Straits 40-60 centuries ago (Hunter, 1967); it may have developed in the plains area of North America (Stefansson, 1956).

It is known, however, that the making of pemmican flourished long before the coming of the white man to North America. Its production spanned the sun-baked deserts of the southwestern United States, through the sprawling great plains and virgin forests of North America to the frozen reaches of the Arctic.

Early Use of Pemmican

To the Indians, pemmican was the miracle food that sustained them in their nomadic way of life. It was their emergency food, their travel ration, to be hoarded and eaten only in time of famine or feasts and ritual ceremonies. The Indians first ate "...meat that was fresh... recently killed...Next in order came jerky or pounded meat, each supplemented with fat...The longest hoarded, last to be eaten, was the pemmican" (Stefansson, 1956).

Even before the white man set foot on the North American continent, Indian tribes traded pemmican..."sometimes salmon and other fish pemmicans, made on or near the Pacific coast, were exchanged for jerky and for pemmican made of buffalo, elk, moose or caribou farther east. The fish pemmican was a soft paste in bags...We have records of fish pemmican from Lake Winnipeg country, from Hudson Bay, and elsewhere" (Stefansson, 1956).

To the white man--the explorer, the pioneer, the mountain man, the trapper, the fur trader--pemmican was the "bread of the wilderness." It was his travel ration, his emergency ration, his cache of highly-concentrated food to be hoarded and stored in warehouses and on the trail for the return trip and to be used when other food supplies were exhausted. Trading posts even stocked Indian pemmican for future trade back to the Indians in time of famine.

The "First Pemmican War"

In early North American history, the fur trade was big business. The Hudson's Bay Company had extended its posts as far southwest as California and to the northwest to Alaska. A competitive firm, the North West Company, founded in the winter of 1783-84, aggressively established trading posts in the interior, successfully threatening the livelihood of Hudson's Bay. Pemmican was an essential ingredient of the fur trade and in time, the "Northwesterners" were making and trading pemmican in tremendous amounts. The trading post, Pembina, located on the Red River of what is now North Dakota, became the "Pemmican Capital of the Fur Trade" by 1810.

Both Northwest and Hudson's Bay companies were convinced pemmican was essential to expanding their business, not only for their own traders and trappers, but significantly for the fur-trading Indians in time of scarcity.

Fighting broke out between the two companies and lasted for seven years. Peace was restored by amalgamation of the two companies in 1821 into a rejuvenated Hudson's Bay Company (Stefansson, 1956).

The Waning Hours of Pemmican

A tidal wave of hunters and settlers was relentlessly pushing westward; railroads and steamboats were built; sod busters strove ever westward; grains and garden produce dotted the lands; the vanishing buffalo were thinned to pitifully small numbers; the numbers of fur bearing animals were being exhausted; Indians were herded into reservations.

All these factors had their impact on the need for pemmican. The last gasps of the use of pemmican by the fur trade occurred in 1872. And, by 1883, the last appreciable quantities of pemmican were sold in Winnipeg.

An era had ended--an advancing civilization had sounded the death knell for "Indian" pemmican in North America. But "pemmican" was to live on--revived for polar explorations!

Explorers and Pemmican

Admiral Robert E. Peary, Earl Parker Hanson, Admiral Richard E. Byrd, Captain Robert F. Scott, Lincoln Ellsworth, Roald Amundsen, and Ray Bearse were intrepid explorers, scientists, strong-willed men who explored, surveyed, and charted the North and South Poles, the Arctic and Tropical areas. All carried pemmican as their emergency ration, or trail ration.

But the foremost, most outspoken champion of pemmican was Dr. Vilhjalmur Stefansson, scientist-explorer whose "laboratory was the Arctic Circle, his experimental subjects, human beings, and his experimental material, meat" (Lieb, 1927).

THE PRODUCTION OF PEMMICAN BY ARMOUR

Production Facilities and Personnel

Records available at the Armour Research Center, Scottsdale, Arizona, indicate that the production of modern pemmican by Armour and Company spanned a period of approximately one-half a century, from the early 1900's to the mid 1950's.

Most of the pemmicans were produced in the Armour Research Laboratory, located during this period in the Union Stock Yards in Chicago. The pemmicans were usually produced under laboratory-pilot plant conditions, though plant production runs were made of Peary's pemmican and the Navy-type pemmican.

Armour scientists, researchers, and other personnel most intimately involved in the production of pemmican included: Col. E. N. Wentworth, Director of the Armour Livestock Bureau during the 30's and 40's and who was the primary driving force behind the many cooperative ventures in pemmican production; Byron Shinn, Head, Nutritional Development Department, who coordinated, supervised and produced most of the pemmican; Dr. John Vollertsen, Chief Chemist, who closely cooperated in the many phases of the planning and production of pemmican; Milt Laing, Chemist; and Ike Jordan, Production Control Division.

Early Pemmican Production--1906-1938

Armour and Company made pemmican for Admiral Peary's 1908 expedition to the North Pole. Peary discovered the North Pole on April 6, 1909, after a 900 mile sledge journey of 63 days.

Our records indicate two types of pemmican were furnished the Peary Arctic Expedition in 1908, a fruit-cake type and a simple beef-fat mixture (table 1).

Table 1. Formulae of Pemmican Furnished Admiral Peary

Ingredients	Formula 1	Formula 2
Dried beef	65 lb.	66 2/3 lb.
Suet	30 lb.	33 1/3 lb.
Currants	3.5 lb.	
Raisins	1 lb.	
Sugar	2.5 lb.	
Salt	5 oz.	
Pepper	2 oz.	

Peary's daily diet consisted of a pound of pemmican, a pound of hard bread, and unlimited tea. The exploring party either munched the pemmican or ate it with their biscuits and tea. They also made a pemmican-biscuit "hoosh," which was eaten with a spoon or consumed by drinking, depending on the amount of water used in cooking.

Peary was convinced of the need for pemmican on polar expeditions. Without pemmican, he felt, a sledge party could not compact their supplies within severely restrictive weight limits. It was the only food, according to Peary, that a man could eat for 365 days, twice a day, "and have the last mouthful taste as good as the first" (Stefansson, 1956).

The saga of pemmican in Peary's explorations is not complete without recounting the finding by Canadian Scientist Geoffrey Hattersley-Smith of a cache of Peary's pemmican in 1953 on Ellesmere Island, the northernmost part of Canada.

One can of the pemmican was sent to Armour in 1953. The label read, "No. 1 PEMMICAN, Manufactured by Armour and Company. Chicago, USA, U.S. Inspected and Passed, Under the Act of Congress of June 30, 1906. Establishment 2A"

C. A. Pope of the Canadian Defense Board, quoted Hattersley-Smith in a letter to Armour in 1953, "The pemmican is still palatable and its taste is equivalent of any I have eaten although it is somewhat granular, or lumpy, probably due to its age." Results of chemical assay of the pemmican reported by Laing on November 9, 1953, are in table 2.

Table 2. Results of Chemical Assays
of Admiral Peary's Pemmican (Formula 1)

Item	Amount, %
Moisture	3.5
Protein	56.0
Fat	32.0
Sugar (sucrose)	7.2

Earlier, in 1906, Armour had made an emergency ration for the Army, consisting of cakes of a bread and meat component and chocolate. The ration, sealed in cans weighed 1 1/2 lb. Armour, fortunately, had a sample of the ration available 55 years after it was produced.

On January 3, 1961, Clarence Wiesman, who was then Technical Director of Food Research and Quality Control for Armour, presented this item to the Quartermaster Museum, Fort Lee, Virginia, for display in their Military Subsistence Collection.

The label* identified the product as:

"U.S. Army Emergency Ration
Prepared by Armour and Company,
Kansas City, Kansas

* See References for copy of entire label.

During World War I, Armour and Company made an emergency ration that was essentially identical to this "Emergency Ration." Some of these emergency products were still in sound condition when examined some 25 years later during World War II.

This was a pemmican-like product produced by mixing ground dried beef from closely-trimmed lean beef "hams" with ground wheat flour and salt. The product was pressed, wrapped in parchment paper and packed, three cakes per can, with small envelopes of salt and pepper and three cakes of wrapped chocolate.

In October of 1928, Armour furnished the Admiral Richard E. Byrd expedition to the Antarctic a pemmican similar to that made for Admiral Peary in 1908, except for a minor difference in physical composition (table 3). In this expedition by air, Admiral Byrd established a base camp at Little America.

Table 3. Formula for Pemmican
Furnished Admiral Byrd in 1928

Ingredient	Amount (lb.)
Dried beef	65
Suet	35
Fruit-seasoning mixture ^a	5

^a Made from 3.5 lb. currants, 1 lbs. raisins, 25 lb. sugar, 5 oz. salt, 2 oz. pepper.

Dana Coman, Johns Hopkins Medical School, and U.S. Antarctic Service, U.S. Department of Interior, had accompanied Admiral Byrd on his first expedition to the Antarctica. On August 8, 1934, Dr. Coman wired Armour requesting 50 lb. of a "new pemmican" he had designed (table 4). Dr. Coman planned to accompany Lincoln Ellsworth to Little America. Lincoln Ellsworth was a renowned explorer, engineer, and scientist who led the first transarctic (1926) and transantarctic (1935) air crossings.

I suspect Dr. Coman may have had a little Cree or Blackfeet blood in him, because he left out only the maggots!

Actually, Armour furnished two types of pemmican for Ellsworth's 1935 expedition: the earlier Byrd type and the Coman formula. According to Dr. Coman, in an April 1, 1936, letter to Vollertsen, both types of pemmican were successfully used on the Ellsworth transantarctic expedition.

Table 4. Dr. Dana Coman's Pemman Formula

Ingredient	Amount, %
Bone marrow	20
Beef suet	12
Desiccated beef	7
Desiccated beef liver	4
Powdered whole milk	26
Oatmeal, quick cooking	9
Green pea meal	10
White potato flour	9
Dehydrated vegetables	2
Equal parts of salt and black pepper ^a	1

^a Used at 0.75% iodized salt and 0.25% black pepper in a later 1939 modification.

Dr. Coman used pemman in his exploration of certain central Pacific Islands. Writing to Armour on April 1, 1936, Dr. Coman said, (the pemman)... "was well liked and very convenient, even for equatorial work where concentrated and emergency rations were needed."

World War II--1939-1945

A flurry of activity surrounded pemman during World War II. This was the time in history labeled by Stefansson (1956) as the "Second Pemman War." The "Second Pemman War," charged Stefansson, was precipitated by "...a revolt of modern dietitians against the traditional dominance of pemman as an emergency ration and was in defense of the right of laboratory technicians to prefer the results of their experiments to the testimony of experience." Much of the opposition to pemman crystallized from the slogan, "Fat burns only in the flame of carbohydrates." Too high a fat content in pemman, it was said, would lead to acidosis, or ketosis. Dietitians of this era estimated no more than 30% of the calories should come from fat, others going as high as 50%. Pemman opponents insisted it was a tasteless, unattractive, unknown food, and set out to dispel the Arctic myths about pemman (Stefansson, 1956).

Dr. Stefansson had strong opinions on the use of pemman. He felt it should only be used as an emergency ration, never when standard army (or service) food is available. It was a food which men were expected to eat in lesser amounts than they would like to eat. Hunger was the "adequate sauce" in such circumstance, since pemman was often judged unpalatable. Plain pemman was the best, according to Stefansson,

and the ideal degree of palatability desired would be slightly agreeable rather than a tantalizingly agreeable flavor, such as in "fruit cake" pemmican. Dr. Ernest de Koven Leffingwell, an explorer-geologist of Stefansson's era, wrote Stefansson on January 5, 1949, "I hope I have made it plain that I consider fruit cake pemmican...an invention of some pantywaisted dietitian. It is a wonder they don't tie it up in a pink ribbon and add paper or napkins to make it more dainty." The ideal pemmican, maintained Stefansson, was made with fat supplying 70-80% of the calories and the balance of 20-30% from the lean; a simple mixture of only fat and lean was the best. Stefansson suggested a gradual adjustment to pemmican; not more than 1,000 calories the first day and divided into at least four meals. He preferred eating pemmican slowly only when hungry, and then ending his meal when still hungry. And the more liquid consumed, the better.

The clouds of war were darkening in Europe and the Far East in 1941. Interest by the service arms of the U.S. in emergency rations intensified and, because of the use of pemmican by explorers, the various services turned to industry for the production of pemmicans for various tests.

In March, 1941, the Navy Department requested pemmican, an emergency ration, be prepared according to their specifications for evaluation. Three types were prepared by Armour and subsequently were referred to as "U.S. Navy Aircraft Emergency Rations, Classes I, II and III" (table 5).

Table 5. Pemmican Prepared for the Navy During World War II

Ingredient	Type of pemmican		
	Class I	Class II	Class III
Rendered kidney fat, lb.	9	9	9
Prime oleo oil, lb.	6	6	6
Seedless raisins, lb.	30	30	30
Evaporated apples, lb.	15	--	--
Crisp-fried bacon, lb.	--	15	--
Peanuts, lb.	--	--	15
Dextrose, lb.	15	15	15
Shredded coconut, lb.	25	25	25
Vanilla extract, lb.	1.5	1.5	1.5
Salt, lb.	<u>1</u>	<u>1</u>	<u>1</u>
Total, lb.	102.5	102.5	102.5

A report by Shinn and Vollertsen, dated May 19, 1942, provided analytical data for the three types of pemmicans (table 6).

Table 6. Results of Chemical Analyses
of the Navy Pemmcians

Item	Type of pemmican		
	Class I	Class II	Class III
Moisture, %	14.05	16.05	10.70
Protein, %	2.30	3.20	6.15
Fat, %	20.15	25.85	27.15
Crude fiber, %	4.90	6.75	8.20
Ash, %	1.20	2.90	2.30
NFE, %	57.45	45.25	45.50
Calories per pound (calculated)	1900	1940	2100

Interestingly enough, a can of the Class II pemmican was evaluated 25 years later in 1967 by the Armour Food Research Laboratory. In a June 12, 1967, memo, Dr. J. G. Heck, Head, Microbiology Section, reported, "Our findings indicate that the product...was bacteriologically sterile, had no effect upon the animal organism (as represented by white mice) and that the swollen condition of the can was most likely the result of a chemical reaction upon the tin plate after an extended storage period of some 25 years."

Three test lots of three types of pemmican were made in February, 1943, at the request of the Quartermaster General for Army tests (table 7).

The three basic types of pemmican, in which fat supplied approximately 80, 70 and 60% of the calories, were field-tested for 3 days by troops on maneuvers at Land-O-Lakes, Wisconsin, in March, 1943.

The pemmican in which fat supplied 80% of the calories appeared too high in fat and not acceptable to the American soldier; the 70% pemmican was preferred. Observers felt the lowest fat product would be the most popular if compressed into bars.

The results of the Army tests at Camp Hale were severely criticized. It was pointed out that the Lieutenant in charge assigned to Type 1 pemmican disliked fat and told his men it was not fit to eat.

The Office of the QMC judged results of the tests inconclusive, and on the basis of the data, pemmican could be neither recommended nor ruled out as an emergency ration.

Interest in pemmican by the Quartermaster Corps continued throughout the duration of World War II. Armour furnished a number of pemmicans for examination; they were mostly the simple dehydrated beef-suet-salt types with fat supplying about 70-75% of the calories. Their evaluations were generally favorable.

Table 7. Physical and Chemical Composition of Three Types of Pemmican Made for the Army in 1943

Item	Type of Pemmican		
	Type 1	Type 2	Type 3
Physical composition			
Dehydrated beef, %	57	76	91
Rendered beef fat, %	41	22	7
Salt, %	2	2	2
Chemical composition ^a			
Moisture, %	3.2	7.4	5.3
Protein, %	35.6	45.5	54
Fat, %	58.4	46.4	39.8
Salt, %	1.7	1.6	1.7
Calories from fat, %	78.8	69.6	62.3

^a Report of assay by Laing on March 8, 1943.

Toward the waning days of World War II, a field study was conducted by the Fatigue Laboratory, Harvard University (Consolazio and Forbes, 1946), to determine the effects of pemmican on test subjects.

The pemmican was made by grinding closely-trimmed beef through a plate with 1" orifices; cooking to 165°F internal for 30 min.; grinding through a plate with 3/16" orifices; drying in a vacuum tray drier for 20 hours to a moisture content of 1.8%; mixing with oleo stock and salt according to the formula in table 8.

Table 8. Pemmican Made for Harvard Fatigue Laboratory

Ingredient	Quantity
Dried beef	70 lb.
Oleo stock	30 lb.
Salt, added	1%

The field trial was held near Woods Hole, Massachusetts.

Results of this study supported the contention that pemmican as a sole item of the diet was unsuitable as a field ration. Acceptability of the pemmican appeared to be a serious problem with an average daily caloric intake of 1380 calories. Biochemical abnormalities induced by the all-pemmican diet included ketosis and changes in water and salt balance, liver function and glucose and insulin tolerance tests.

Post World War II--1946-1954

Results of military field trials during World War II with pemmican were controversial. The failure of the military to accept and adopt pemmican as an emergency ration was puzzling and disappointing to men of long experience with pemmican, such as the explorers Stefansson and Hanson.

To help provide some answers to the controversial nature of pemmican, Dr. L. L. Savage, of the University of Chicago, started eating an all-pemmican diet on April 28, 1947, in a 40-day trial.

The pemmican supplied Dr. Savage contained 1.7% moisture, 41% protein, 56.5% fat, and 75.6% of the calories were furnished by fat; salt was not used in the formulation.

Ketosis was evident shortly after the start of the experiment and did not diminish with time. However, Dr. Savage's usual caloric intake was 3000 calories per day. After 15 days on the all-pemmican diet, his caloric intake dropped to about 1700; at the close of the study, he consumed from 870 to 310 calories per day. Therefore, starvation may have contributed to the ketosis.

Two months after the study was initiated, Dr. Savage pointed out that pemmican came as close as any to the ultimate idea of a concentrated "pill" diet. He never felt any need for additional salt and he never felt any distaste for pemmican. He did note that smaller and smaller amounts satisfied his hunger as the experiment progressed. He lost 24 lb. of body-weight from his original weight of 214 lb. during the 40-day trial.

On June 20, 1947, 20 cans (26 oz. each) of pemmican were sent to Dr. R. H. Sinclair, Queens University, Kingston, Ontario, for physiological experiments with Eskimos. The Canadian group was especially interested in learning why Eskimos did not develop ketosis on a high fat dietary regimen. The geographical area of study proposed was the Eastern Arctic, possibly Baffin Island. The pemmican furnished Queens University was similar to that tested by Dr. Savage. In this study, an aged man and his wife and their son and his wife were the test subjects. They ate an exclusive pemmican diet in addition to coffee or tea for 6 days. The aged Eskimo claimed he had eaten pemmican years ago on the west coast of Hudson Bay. To the chagrin of the aged Eskimo, he experienced nausea and gastric distress on the first day of the trial. His distress grew worse with each succeeding day and he was unable to consume enough pemmican to supply his daily nutritional needs. A marked ketonuria was noted on the third day of the trial, which continued to the end of the study.

Later it was learned the aged Eskimo had had stomach problems for years. Consequently, the researchers felt this result was abnormal and unrepresentative. The remaining three test subjects ate the pemmican in adequate quantities. For example the younger subjects ate over 900 grams per day of pemmican on one day of the trial. These three subjects felt a slight nausea the first day of the trial, but this feeling soon disappeared. The young man showed a slight ketonuria the first day; one of the women had a slight ketonuria on the fifth and sixth days, whereas the other woman had a slight ketonuria on the sixth day only.

According to Dr. Sinclair, in a letter to Shinn on November 19, 1947, these test results indicate that the maximum amount of calories that can be supplied by fat in the Eskimos' diet is 75% without developing a pronounced ketonuria.

During the years 1948-1950, a number of lots of pemmican were made for various organizations or individuals. One lot was of special interest because men, such as Stefansson, had raised the question of possible superiority of Indian pemmican over modern pemmican.

The Indian method was simulated by drying suspended strips of lean beef about 1 inch thick in a smokehouse. The "house" temperature was set initially at 160°F and over a 3-day period lowered to 120°F. The humidity of the smokehouse was held at 30%.

The dried beef was ground and mixed with rendered beef fat. The proportions of fat used in the three pemmicans made supplied 40, 60 and 80% of the total calories.

Col. Wentworth related that the pemmican in which 80% of the calories were furnished by fat was too greasy. The 40% and 60% pemmicans were considered similar in organoleptic properties. Shinn concluded there were no differences in flavor between the "Indian" pemmican and other pemmicans with somewhat similar formulae produced by Armour.

In spite of military unacceptance of pemmican as an emergency ration, and adverse results in other trials, explorers retained an unbridled faith in pemmican. The romantic era of the explorer was, however, rapidly drawing to a close.

One of the final exploratory-scientific expeditions to Labrador, in a combined aircraft-dog team operation, was commanded by Mr. David C. Nutt, Arctic Specialist at Dartmouth, in 1953. The type of pemmican furnished Mr. Nutt is described in table 9.

The pemmican, packaged in clear Saran casings, contained 3.6% moisture, 45.2% protein, 47.3% fat, and supplied 2600 calories per pound.

Table 9. Physical Composition of Pemmmican
Furnished the Nutt Expedition in 1953

Ingredient	Quantity, lb.
Dehydrated beef	100
Extra-oleo-stock	70
Salt	1.5

Mr. Nutt conveyed his impressions of pemmmican in an April 17 letter to Col. Wentworth. (I am) "...pleased to report the pemmmican lived up to our highest expectations as an efficient, light, and palatable ration." The pemmmican diet, stated Nutt, was well received by all; the first day or so they thought they might tire of the pemmmican, but thereafter looked forward to every meal.

The last lot of pemmmican made by Armour, according to records available, was sent to a Mr. Edward F. Rice, East Syracuse, New York, on July 14, 1954. Mr. Rice had been previously sent two 2-lb. cans of hand-made pemmmican the latter part of June for evaluation. Mr. Rice acknowledged receipt of the pemmmican samples (July 1, 1954, letter to Armour), stating, "After a search of about four years, I finally had a taste of real pemmmican and I like it very much." A report on the use and evaluation of the pemmmican by Mr. Rice is not available.

SUMMARY

Pemmmican has vanished. Its use is a long, fascinating, intriguing story and a vital part of our history. To the North American Indian, pemmmican was an emergency food, a ceremonial food to be used at feasts, and a food to stave off famine and hunger in time of scarcity. To the hunter, trader, trapper and explorer, pemmmican was "the bread of the wilderness," to be used on the trail for long journeys in the wilderness, to the uncharted ice-covered wastelands of the polar caps, and to steaming tropical jungle areas. For these diverse peoples, pemmmican was a high energy, high protein, emergency and trail ration that could be easily compacted, stored for remarkably long periods of time, and eaten with or without further preparation. Pemmmican ruled supreme on the North American continent until a tide of advancing civilization crisscrossed the lands, and in the process, a "First Pemmmican War" had been fought.

Armour and Company's known interest and involvement in pemmmican spanned a half-century--from 1906 to 1954. Many types of pemmmican were produced, with the favored type being quite similar to Indian pemmmican--a simple mixture of dried beef and fat, and with or without a small amount of salt.

The "Second Pemmican War" was launched in the shadows of World War II. The "battle" swirled between the results of military studies and the opinion of famed explorers. The defeat of the thin line of pemmican-supporters assured the demise of pemmican.

The romance of pemmican barely survived for another decade after World War II. And, in 1954, Armour and Company made its last, final lot of pemmican to close a fascinating page of our heritage and our history.

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The following is a copy of the label on the can of the
U. S. Army Emergency Ration:

U. S. ARMY EMERGENCY RATION

NOT TO BE OPENED EXCEPT BY ORDER OF AN OFFICER OR IN EXTREMITY

DIRECTIONS

BREAD AND MEAT COMPONENT MAY BE EATEN DRY; OR STIRRED INTO COLD WATER; OR ONE THIRD MAY BE BOILED FIVE MINUTES OR LONGER IN THREE PINTS OF WATER AND RESULTING SOUP SEASONED TO TASTE; OR, ONE THIRD MAY BE BOILED IN ONE PINT OF WATER FOR FIVE MINUTES, MAKING A THICK PORRIDGE, TO BE EATEN HOT OR COLD; WHEN COLD, MAY BE SLICED AND FRIED, IF BACON OR OTHER FAT IS AVAILABLE.

CHOCOLATE COMPONENT MAY BE EATEN DRY; OR MADE INTO LIQUID BY PLACING THE CHOCOLATE IN A TIN CUP HELD IN HOT WATER. AFTER MELTING, POUR IN SLOWLY ONE PINT BOILING WATER TO EACH CAKE. IT MAY BE BOILED AFTER MIXING.

PREPARED BY ARMOUR AND COMPANY

KANSAS CITY, KANSAS

U.S. INSPECTED AND PASSED BY DEPARTMENT OF AGRICULTURE.

Larry Borchert: Thank you very much, Bink. We appreciate that. Again, we ask you to withhold your questions until the question and answer period at the end of this presentation.

Our next speaker, Mr. Warren Tauber, is unable to be here. He informed us yesterday that he's been placed under doctor's care and he sends his regrets. He has asked me to read his paper, and I will attempt to do that. In Warren's usual thoroughness, he has gone to the original Greek literature, and Greek is not my native language. So I may slip up on a number of these names, but I'll do my best.

As you know, Warren has a long time interest in the history of sausage. He has written numerous articles in trade journals, in house organs for Union Carbide while he was employed there, on the history of sausage. It was a unanimous choice by the members of our committee to research and put together a paper on the history of sausage from its prehistoric beginning up through to the Renaissance period.