REVIEW OF TECHNOLOGY OF MEAT FREEZING

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In a weak moment I agreed to begin this thing with a discussion or review of the technology of meat freezing and then when I sat down to think this problem over I decided there really was not a great deal I could say about it.

You have all heard the story about the explorers who are supposed to have found the Siberians eating frozen mastadon encased in a glacier. And from what I know of the people who are sent to Siberia, it may be this is all the meat they have to eat, but I doubt this is a significant comment on the freezing technology of meat. I really don't think anyone ate any mastadons that were several decades or times ten to the third old.

However, this story does illustrate the fact that meat freezing is not a development entirely of the modern technologist, but an old product. The Eskimos freeze meat, of course, and the people in northern China have known that frozen game and frozen birds could be eaten. So it was perfectly natural that with the development of artificial refrigeration, that when freezing was applied you might say in early times to meat, it could be kept. And during the 1930's I can well remember that people bought ice cream cabinets and put meat in them. And when the locker plant industry began to spring up in the United States, the lockers were just naturally used as repositories for frozen meat. And this has continued to the present time and presents, I think, the principal paradox in meat technology.

That is that this is a very well recognized, very standard form of meat preservation among those people who freeze meat for themselves, among householders or persons who rent locker plants or persons who deal with locker plant owners.

But among our large, commercial meat packers meat freezing is still relegated to what is referred to as a young line. That is, we can buy a few frozen patties and a few chip steaks, but by and large you don't buy on the general commercial market any frozen meat cuts of any quality.

Now there are some notable exceptions to this. There are some businesses that specialize in freezing meat and there have been a few efforts by large packers to get into the frozen meat field. One of those that we particularly remember of a couple or three years ago turned out to be rather disastrous.

So you wonder, how is this? How can it be almost everybody knows from his own personal experience that he can freeze meat at home and it is a very excellent product but you can't go to the store and buy it? Meat experts have been saying for the last ten years, at least to my personal knowledge, that within the next three years or within the next five years, X per cent of the meat sold in the United States will be

frozen. It will be centrally boned, packed and frozen. And they have gone on to make estimates of what savings this will make in the retail cost of meat. I have heard well documented estimates of this sort and they sounded very reasonable.

Now I first heard them ten years ago and they said it was sure to happen within the next five years. Now it is ten years and just about nothing has happened.

So there are various problems that exist even though I am possibly unaware of them all, and I suppose you fellows are in the same boat. But I would like to emphasize those problems that I am aware of and then throughout the discussion by our panel this morning you will hear a little more of these problems.

The principal problem in preserving frozen meat is the problem of oxidative rancidity. At the temperatures at which frozen meat is held, enzymatic activity is slow, with one exception that I will mention in a few minutes. The growth of micro-organisms is not a serious matter. In fact, if the temperature is maintained there should be no growth of micro-organisms at all and if the meat is very well protected from air there will be no rancidity.

This is the main crux of the thing, it must be protected, and to have it protected you have to have absolutely an oxygen impervious package material and a package that contains no oxygen in it. This has not been attained in any commercial packages I have seen. The obvious method is to use a vacuum sealed can. I don't know that it has ever been done commercially.

We have done it in Beltsville. Dick Heiner was putting vacuum meat in cans when I came to Beltsville in 1945 and I know he had been doing it for some time before that. Other people have done it experimentally and I think the results are uniformly good.

Of course, tin cans are expensive. But if we can afford tin cans for frozen citrus juices, it is hard to understand why we can't afford them for meat. But it seems the thinking of marketing people, and I don't mean as much marketing research people as those people engaged in practical marketing, that when they have a good thing that makes money for them, they don't like to penalize it any more than they absolutely have to.

This has been a factor also in the development of new packages. One of the great aims of the technologist would be to devise an automatic scheme by which meat cuts would come off the cutting line and go through a machine that would package them in a good package and go into the freezer. Or it might be frozen first and then packaged, whichever the particular kind of mechanism demanded.

Well, the Dow Company and a few others, I think notably Dow, have come forth with materials that could be used for this purpose.

We have experimented with it at Beltsville. Professor Bratzler has experimented with it. It is a plastic material with which the meat may

be covered and one would hope that a machine could be developed so it could be coated by machine. However, it is rather expensive and one of the principal objections to it has been the expense.

There happens in this case to be further objection to this material because of its composition. But the greatest problem is the problem of getting something which will adhere tightly to the meat which will not leave oxygen between the packaging material and the meat and will exclude the efforts of any oxygen from the air. This is the primary technological objective, an objective we are not particularly close to reaching at the moment unless we would go to tin cans or aluminum cans or some type of metallic film.

The problem is largely compromised with in the locker plant and home. We use flexible films because we want to see through them. These flexible films have an unlimited capacity to exclude oxygen. I think you fellows know this story as well as I do and I won't dwell on it any further.

Now assuming we could develop this perfect package or that we knew of some anti-oxidents which could help us with a perfect package, and at the moment we don't, we would still have a sort of three-fold problem that our panel is going to deal with this morning. We would have the problem of what would happen to bacteria which happened, as they always will happen, to be on the meat at the time we freeze it, when the meat is thawed and cooked and generally handled in commerce. We would want to know what happens to these micro-organisms that might find their way into this package. And when we speak of pathogenic micro-organisms it will include all the organisms of public health significance even though they may not be from the medical sense pathogists. And we would want to know how, we control people who are responsible for safeguarding the consumer, to deal with these matters.

Of course, we want to know how the consumer is going to accept this all to begin with. And so, we are going to discuss it first from the consumer's standpoint by turning to the largest single consumer we have, which is the Army, or the Armed Forces. And Al Savich is going to tell us about the Army's attitude towards prefabricated frozen meats.

Then we had scheduled a discussion by Roman Kulwich of the U. S. Department of Agriculture, but Roman consented to having himself promoted from discussion leader to projector operator. So he is going to project the slides by Al Savich. So at this point we will not have any discussion.

And then Dr. Allen Kitchell of the low temperature research station in Cambridge, which is one of the few groups in the world that has paid close attention to the growth and development of micro-organisms at low temperatures, is going to tell us about the micro-biological aspects of meat freezing.

And Dr. Davis Mossel of the Central Institute for Nutrition Research in the Netherlands is very fortunately with us today and he is a man who probably knows as much as anyone in the world about the public health significance of micro-organisms that might be found in food.

We are fortunate because the National Academy of Sciences held a meeting last week on this very subject. That is the significance of bacteria in foods and meats, the control of them. And we asked Dr. Mossel if he would come to this country and discuss it at the National Academy, so I kidnapped him and brought him, I will admit with his consent, to Chicago and we have him here to answer our discussion.

And finally, Dr. P. J. Brandly, who is Biological Control officer for the Meat Inspection, who will tell us what the Inspection Services methods of dealing with these problems are likely to be.

So we begin with our mutual friend from the Quartermaster Corps, Al Savich, who will tell us about the Army's New Look at Pre-Fabricated Frozen Meats, Al.

MR. SAVICH: Thank you, Bill, and members of the Conference:

Yesterday you heard about the problems related to producing beef type carcasses and some of the problems that the packer is having in evaluating the meat type carcass. What I would like to do this morning is mention what the military as a consumer wants.

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