Evidently the topic of my paper had a different interpretation from the one I chose. From Professor Loeffel, who was a member of the program committee, I heard that the controversial word "current" was meant to refer to recently published articles on the various phases of meat preservation. Inasmuch as I had already sent out questionnaires, I thought that I would interpret the subject according to the information available and which would be of greatest interest to this group.

The replies to the questionnaires exceeded my expectations and I felt that all of you would be more interested in the meat preservation research being carried on at present and in the near future. In the time allotted me, I shall endeavor to call to your attention various individual projects that attracted my attention, and if your particular project is not singled out, it may be more a reflection on my inferior judgment than upon the merits of the study being conducted.

First of all, I shall review the current work being done on meat freezing and related phases. This work seems to be the most popular at present, judging by the number of institutions having current projects. Perhaps there are more studies being made in which the efficiency of various wrapping or packaging materials is being tested. Ten groups reported that they are testing various materials. Cornell lists eleven materials while we at Michigan have worked with 17 materials. In this connection I would like to raise the question of duplicity, as well as seemingly a lack of standardized procedures. If it is the function or duty of our group to do this testing work, the results would be more valuable to all concerned if some uniform method could be agreed upon whereby results from the various stations would be comparable and subject to analysis.

Another phase of meat freezing that is receiving considerable attention might be labeled "Factors Influencing the Quality of Meat and Meat Products in Freezer Storage." Pennsylvania, Cornell, North Carolina and Kansas have paid particular attention to the aging period prior to freezing. Results with beef appear to be varied, but all workers agree that rapid chilling and no aging of pork results in longer freezer storage life.

Retention of food nutrients, and particularly of vitamins, after freezing is being studied at Cornell, Idaho, Utah and the B.A.I. at Beltsville.

In the miscellaneous freezing work, there appears to be a difference of opinion as to the effect of aging meat in the presence of ultra-violet light as well as the effect that seasoning may have on the storage life of frozen pork sausage. North Carolina, Kansas and Cornell are doing valuable work in this respect. Louisiana State has an interesting project under way studying the effect of a carbon dioxide atmosphere on frozen poultry, pork and beef. To quote them, "So far, the results have been promising."

Pennsylvania reports that smoked meats and scrapple have short freezer storage life while hearts, tongues, liver and liver products can be
freezer stored successfully.

The B.A.I. have been, and are, doing some valuable work on the effect of freezing rates on the palatability of pork and beef while Kansas and Cornell are also interested in the same problems. Iowa has done considerable work on defrosting and cooking of frozen meats. Oregon and Cornell have projects on the effect that rations may have on freezer storage life and palatability of pork and beef.

Kansas mentioned briefly a project which is intriguing to me and should have considerable merit. They are doing work regarding the effect that antioxidants in the ration may have on frozen pork storage life.

South Dakota and Cornell are studying home freezer units performance and carcass cutting methods, respectively.

I should also like to mention that Wilson and Company are doing work on cooking meat from the frozen state and quality standards of cooked frozen foods under consumer handling conditions.

Michigan has a packaging project in which such factors as frosting, color changes, handling methods and defrosting conditions may have on the salability of prepackaged frozen meats are being studied.

Considerable interest is being shown in meat curing research by the various stations. Pennsylvania is attempting to find the correct percent and strength of pickle to be used in artery curing hams for farm storage. They have reached no definite conclusions except that the results indicate a low percentage of high salinity pickle is best for farm cured meats. Maryland is doing similar work and plans to compare the stick pumping with artery injection.

Wisconsin is studying various antioxidants and mold inhibitors in connection with the storage life of farm cured meats. North Carolina reports that progress has been made on the following methods: (1) of inhibiting rancidity development; (2) of controlling certain types of bone sour; (3) of producing a quick cure dry ham; and (4) of controlling insect infestation.

The State College of Washington is studying the effect of replacing part of the Na Cl in the cure with Na₂ H₃ PO₄ or Na₂ H₅ PO₄. Results of two trials were conflicting when rancidity development was used as a basis for comparison.

Cornell has been studying methods of storing hams without refrigeration since 1940. Various treatments after curing and smoking but prior to storage were tested. Palatability, cost, spoilage studies were made after four months storage without refrigeration.

Clemson College has been studying the storage of cured pork products to determine the effect that temperature and/or wrapping may have on storage life. Storage temperature of 36°F was found superior to room temperature regardless of covering or treatment of hams and bacon. In addition to cloth coverings, the cured meat was also treated with raw or refined cottonseed oil.

Louisiana is doing some very interesting work on the curing of pork without refrigeration. They are working with boneless pork cuts as well as
with curing stix on whole hams. They report very promising progress and results. The B.A.I. is studying salt concentrations, high temperature curing, vacuum packed mild cured bacon and factors affecting storage of cured lamb legs.

In the field of meat canning research, Texas has done considerable work on the effect that both processing and storage have on the retention of B vitamins in canned meats. One phase has been completed and the results will be published in Food Research next year.

Louisiana is studying searing versus raw pack, various methods of exhausting, and processing temperatures. They are ready to make a preliminary report soon.

Iowa State is doing chemical, physical and histological studies of the connective tissue of beef in relation to canned meat. They are attempting to find "some means of toughening the connective tissues so that beef will slice after prolonged processing required in canning, without crumbling and falling apart." Sodium chlorides and phosphates have been added in various solutions. The meat is being tested but no data have been compiled to date.

Research in meat dehydration has been confined mainly to the B.A.I. Results of their work can be found in Circular No. 706, "Meat Dehydration, A Report of Research Work for Its Commercial Development."

In summary, it can be said that on a quantitative basis, meat preservation research can be ranked as follows: Freezing, Curing, Canning and Dehydration.

I would like to take this opportunity to express my sincere appreciation for your cooperation in completing and returning the questionnaires. I am certain that some of you may have questions regarding individual projects, and I know that Professor Loeffel will give you an opportunity to present them.

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PROFESSOR BRATZLER: I'd like to present a colleague of mine, Dr. Pauline Hall of Michigan State. She is enough interested in it that she has traveled here at her own expense. (Applause)

PROFESSOR BAZALEUS: I'd like to ask a question of Professor Bratzler. What has been done regarding the storing of curing hams and bacon? Do you recommend that they be stored in a locker, in a patron's own locker, or hung in a separate room?

PROFESSOR BRATZLER: It's the general consensus of opinion that cured meats could be stored in a freezer for a relatively short period of time, three, four months, without too serious deterioration in flavor and quality.

PROFESSOR BRATZLER: It is generally considered deterioration of flavor as near as I could determine from the reports.

PROFESSOR WANDERSTOCK: And color, too. I'd like to ask a question: Have any of you run into the problem of meat after it has been frozen and cooked retaining a red color-- not changing? Now we have run into that problem in beef, and we don't mind it too much in beef; but in frozen pork,
even cooking it thoroughly left us with a red color. We couldn’t seem to get
the color to change.

PROFESSOR BRATZLER: In Michigan we happen to have a lot of that
trouble, and we were lucky at first. I say lucky - it was just a hit or miss
proposition. We took a man’s beef up to the ag-chemistry department with the
wrapper and we examined the meat, cooked it; then we ran a nitrate test. We
found nitrate in the meat. We took the particular wrapper - it was a lamin-
ated wrapper - and found nitrate in the paper. We separated the lamination
and found the inner lamination was a glassine product which contained a ni-
trate, while the outer original paper did not.

In contacting the company who produced the paper they laughed at
first, and maintained they couldn’t produce that particular condition; but
they happened to run across the thing in one of their lockers. They found
out that one of their suppliers, of which they had three that were supplying
this glassine, was using an invert sugar plus sodium nitrate rather than 12
or 15 pounds of glycerine which they were required to use. This particular
company of course realizes what the condition is and the damages that they
may be subject to; and also that they may get in trouble with the Pure Food
and Drug for producing a paper that has nitrate contamination.

PROFESSOR COLE: I address this to Mr. Bratzler. If you were to
get a letter from a farmer, well say, who would like to have the plans for a
smoke house that he could keep meat in the year around, how would you answer
that letter? (Laughter)

PROFESSOR BRATZLER: I'll never forget Mr. Ken Warner. He was al-
ways embarrassed when the question was asked by the farmers in any meeting on
how to store cured meats - and that's one of the least welcome letters I get.
I would answer it, telling them to have a building that was well ventilated,
screened so that it would be protected from insects, and of course - dark.
A smoke house wouldn't come under that classification, I don't believe. I'd
like to hear some of the others on this. Dan Brady there - I think he knows
more about this, and some of these southern gentlemen have that trouble more
so then we do. We at least have a few days that are cool.

PROFESSOR BRADY: Of course we are primarily interested in all our
cured meat going through the locker plant; and in connection with lockers,
you must have your cured meat storage. The most promising storage is a room
about 45 degrees, humidity 70 per cent. That's not a cheap storage, but it's
probably worth the price.

As contrasted to that, you have your Smithfield type of fumigation.
which requires a room separate from your plant, because of danger to fumiga-
tion of hydrocyanic acid; probably it is not too practical for a locker plant.

You need a temperature about 45 degrees to keep insect control, and
a relative humidity of about 70 per cent, for mould and slime control. I be-
lieve that just about covers it. Of course, we are thinking in terms of
about a ten per cent salinity ham; that is 40 per cent moisture and 5 per
cent salt.

PROFESSOR WANDERSTOCK: We have been working on the problem of
keeping cured hams during the summer months without refrigeration, and as
Lyman mentioned, we have been working on it since 1940; we have tried dozens
of methods. We still haven't arrived at anything actually satisfactory. The
principal trouble we ran into was mould, and until we find a way of keeping the mould spores down, we will not have met with success. If you have suggestions, we'd like to try them out.

PROFESSOR SNYDER: I'd like to ask Dan: What do you say about lights, ultraviolet?

PROFESSOR BRADY: We think light certainly has a place. Where you can't control slimes and so forth by other means, and if you have the money, you had better put them in.

PROFESSOR BULL: That being the case, how come the big packers haven't installed them?

PROFESSOR BRADY: That's their privilege, Professor Bull, I don't speak for the packers.

PROFESSOR ANDERSON: Mr. Chairman, I'd like to ask Roy Snyder a question on that. You use cottonseed oil for storage of some smoked meat, don't you, Roy?

PROFESSOR SNYDER: Yes. That idea originated among a bunch of Germans in a certain county down there, and we picked the idea from there, because I really made a pretty exhaustive study among those people - they had been using it for 60 or 70 years. They said they used oil of that nature, and we went to the refinery. We didn't find out there was an antioxidant in it unrefined; we shifted over to that.

But those folks are just immersing it in oil. Now, it works up to about 12 months. It certainly controls mould, and it controls shrinking, and there is a slight flavor change.

PROFESSOR OLIVER: Can you buy that raw oil on the market?

PROFESSOR SNYDER: Oh, yes, you can get that down through our country; you could through the war. It takes four gallons for a hundred pounds of meat.

PROFESSOR OLIVER: When you get out of the Cotton Belt, you can't find it, can you?

PROFESSOR SNYDER: Well, I think you could have 50-gallon barrels of oil shipped just like you'd ship some of these oil compounds that are made commercially.

PROFESSOR BRADY: Roy, there is one consideration with that oil. That is, any time you start on labeling, Interstate Commerce, and so forth, you have a problem with the Food and Drug Administration. So you can see how you can use it yourself; but when you try to get into distribution, labeling it for use, you have a problem.

We have quite a few folks that are using it very, very successfully, except that our method is a little different than yours. We just paint it or dip it with oil, instead of putting it down into the tub, I believe, like you folks do. And that way you get away from this off-flavor that develops in an anaerobic condition.
PROFESSOR SNYDER: One ham will spoil the works. She goes through it fast.

PROFESSOR ZIEGLER: Does anyone here use Micaban?

PROFESSOR WANDERSTOCK: We use it. It does a pretty good job, except the outer layers of the ham directly in contact with Micaban are a little on the brittle side after the ham has been out.

PROFESSOR ZIEGLER: I suppose I was one of the first men to try that out, and our results were very favorable. We didn't get the drying-out when they were wrapped. You know, when you put anything in contact with meat so that you get a place where moisture can develop, there the mould will start. So, the question that was asked about using the smoke house for a storage place for meats - if that smoke house is properly constructed, I'd say it's an ideal place, because generally we use hollow tile or some material that is pretty well insulated. Our own smoke house, for instance, carries a varied temperature during the summer; and if you keep the flies out and rats and mice, and have your hams suspended, unwrapped, good circulation of air - you have got to take a licking in shrinkage, fellows. If you want to keep down moulds, you don't have so much difficulty; but just as soon as you put paper around them, you are going to have mould develop.

We took hams and bacons and rubbed them in Micaban, and we wrapped them, as compared to others untreated, and hung them up in our regular meats room that has a temperature around 60° through the summer. They hung there all summer, and I put them down at the Pennsylvania Farms Show and Exhibit in January. We had a number of visitors there who stopped and inquired about it. Of course, we weren't advertising Micaban; but here were these hams and bacons just as nice as you want. They weren't hard; there was not a bit of mould; and the others that were wrapped untreated were just like green rugs.

Now, you will find that if you are using stockinettes and you have the shank down, butt end up - that's the way to hang your hams - you can take and sprinkle this micaban, whether it is potassium or sodium propionate (either one) and sprinkle it on the face, and it will also catch in, in the crotch where you have mould development. You don't get much mould, you know, in the outside; it is only on the lean, and it will hold there.

You can put it an eighth of an inch on there, and you will find that you have very good success with the use of micaban. The trouble is, that the county agents say: "Where do you get micaban?"

"Well, you have to write to So-and-So" - duPont's. No druggists handle it; it is hard to get. You have to get it in 25-pound lots, and 25 pounds will last a farmer a lifetime. And then they come to me and say, "Well, now, listen, the Pure Food Law won't let me use that." Okay, we are not recommending it for commercial hams. It is your own problem, if you want to hold down mould.

PROFESSOR WANDERSTOCK: I just wanted to ask: Have you ever cooked those hams?

PROFESSOR ZIEGLER: Oh, yes, you see, micaban is odorless, tasteless, non-toxic, and has been used in the baking industry for a number of years to control mould in pastries where they are going to keep them for about a week or more. So far as its use in pastries is concerned, it is okay
with the Pure Food Administration.

PROFESSOR SNYDER: I was going to ask Mr. Hankins: The Peoria Laboratory - it is not released - is working on something on this mould obtained from citrus rind. Are you familiar with that?

MR. HANKINS: No, I am not.

PROFESSOR SNYDER: It is sort of a semi-plastic.

PROFESSOR LOEFFEL: Well, I think we had better proceed with the program.

CHAIRMAN TOMHAVE: We have come to the last speaker on our program. When the Committee was working up this program, they figured that up to the present time everyone that was scheduled to talk would talk on something that had happened or from personal experiences, but the program would not be complete without somebody looking into the future.

When it came to the selection of that man, the Committee was unanimous in thinking that there was just one man who could come and tell you what the future had in store. So that is the man we will hear from now. Because new problems are always confronting any important industry, I think we are all agreed that meat is no exception; as a matter of fact, I feel that the meat field has probably as many problems ahead of it as have been solved, I am sure that all of those who are equipped to do research work in meats are thinking about some of the new problems that are ahead.

I do not know of anyone better qualified to present the views of the problems in the future than Dr. O. G. Hankins, Washington, D. C., who will now discuss: "New Horizons in the Field of Meat Research."

Dr. Hankins.

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