MR. BERNHOLDT: There were three speakers with their excellent presentations this morning. I'm sure they've provoked a lot of thought, and I hope some discussion. I'm going to call on Dr. J. F. Price of Michigan State University to handle the discussion. Give your name and affiliation when you ask questions.

DR. PRICE: Thank you, Harry. Looking at the sequence of these particular talks, I'm reminded that these are not the only commercial problems that exist in the industry.

We will try to discuss them as they appeared on the program. I've been very interested in this idea of accelerated processing of pork and pork meats. I'll lead off with a question to Dr. Mandigo in regard to the ground products that are processed hot. Have you observed any toughness problem in the formed ground sausage or product?

DR. MANDIGO: The work that I have been involved in has not gotten to ground product yet. Is Davidson here? He'd be the man that would have to answer that question. He's done all the work that I know of, at least with the sausage products. I have had no experience with it.

DR. PRICE: Dr. Mandigo did discuss the possibilities of accelerated pork processings and the problems involved. Do we have any questions to direct to him?

MISS BATCHER, U.S.D.A.: Did you do any flavor studies or compare the flavor of the conventional and the accelerated?

DR. GUENTHER: We didn't really study the flavor. When we got ready to get rid of the hams afterwards, they did sell quite well.

DR. PRICE: Do we have another question? Mr. Hoke reminded us of the interrelationships between our scientific research and the commercial aspects of shipping, handling, and efficient movement of the product. He talked about the refrigeration systems that are needed, and some of the problems that do appear in changes or progress in transportation systems. Do we have any questions for Mr. Hoke?
DR. CAHILL, Ohio State: Karl, are you aware of any work being done on the equipment or procedures for transporting centralized packaged products?

MR. HOKE: Probably in this area, yes. The Transportation of Facilities and Research Division is doing some work in this. This is mainly in the development of systems, that are handling meat efficiently. This is one area where they are doing work. Another area is in the design of equipment. They're not too well satisfied with the present design of the truck-trailer equipment that is available today. So, they're working on improved designs here. This is largely in areas of air flow within a trailer. This is the main reason, we feel, why temperatures vary within a trailer as much as fifteen to twenty degrees. This is not retail packaged products.

DR. PRICE: I think the question involves one similar to one I have. How long, Karl, do you think that the industry can afford to transport quarters of beef?

MR. HOKE: Actually, the transport of whole carcasses, if you really think about it, is an impractical situation. This is particularly true on long-haul shipments. Freight rates I haven't gotten into, because I've only mentioned one. The freight rates are quite varied for different products. I've heard recently that there are something like a zillion freight rates on record at the I.C.C. This, of course, is one of the biggest factors in transport here.

DR. KINSMAN, Connecticut: Karl, has the industry considered the use of air curtains for maintaining uniform temperature while loading and unloading? Has this been attempted?

MR. HOKE: To a limited extent, yes, there are some air curtains available.

MR. HECK, Arkansas: What is the fire danger? Is there a fire hazard or an explosion hazard in using nitrogen or liquid nitrogen in units that way?

MR. HOKE: No, the only hazard would be the lowered oxygen content which you'd be working under. Of course, this wouldn't handicap the activity of the workers. This is the only danger. There is no explosive hazard with nitrogen.

DR. VARNEY, Kentucky: This question is for Dr. Mandigo. In the hot pork processing system, is it adaptable only to those firms that are processing all product or would it be possible to sell some primals as fresh products?

DR. MANDIGO: Before I answer the question, I'd like to make one comment I failed to make when I was talking. This system is obviously one that will not be adapted or adopted, I should say, immediately by any one operation. It's too big to just go out and scrap everything and start over. But there are a lot of concepts I think that will be adapted. In fact some of them probably already have. We don't hear from some of the packers as to what they are
doing. You have to learn it the hard way from them. With respect
to whether or not a packer who is not processing all of the product
could use these techniques, obviously the greatest efficiency is
where you process to a finished product. If you're thinking of a
fresh ham, you still have all the fat on the ham, the bone is in.
It is thicker than it should be for efficient chilling, but you can
chill a whole ham, for example. You can chill, I would imagine,
any other pork product this way, too. You might want to ship
the whole ham without say curing. We've done fresh hams. It takes
a lot more refrigeration to do it, because you've got a 4.5 - 5.0
inch piece of meat. When you go from something three inches thick
like these pressed hams are, up to a bone-in ham, you double
refrigeration time. This would be the drawback. In other words,
it would be less efficient, but you could do it.

DR. HENRY, Griffith Laboratories: Thanks, Jim. Going
back to Dr. Mandigo, did you measure the pH of your finished product
with the two processes, and also did you run ascorbic acid? If so,
did you have any differences in the residual?

DR. MANDIGO: The first question, the pH was done in the
work that Bobby reported in the bacteriological study. Obviously,
the initial pH when you start putting cure in these hams, is quite
different. The final pH of processed ham, when you get down to the
chilled-out ham at the end, is almost identical. As the type of
cure that is being used, obviously, when you put cure in at eight
o'clock in the morning, and the ham in the smoke house at eight-
fifteen, and the smoke starts up at nine o'clock, you have to go to
an accelerated brine. Most all of them have ascorbates in them.
As to whether the color is different and whether this is due to
ascorbic, this might be speculative at this point. We did report
that there was a greater color retention, although not significant.
But it did show up as a consistently larger amount. I don't know
beyond that point.

DR. PRICE: At this point we'll entertain questions for
Dr. Webb. Does anyone have any questions to direct to him?

MR. SULZBACHER, U.S.D.A.: This year at the I.F.T. Meeting,
Karl Norris from the Instrumentation Development Laboratory in the
Department, reported on the use of infrared spectrophotometry to
determine fat and moisture in meats. I just wanted to add to what
Neal said that this is a very promising method. It gives you an
immediate figure on both fat and moisture content. Mr. Norris has
used this with sausage emulsions with very good results. He's
presently building a machine that can be applied industrially for
controlling moisture and fat in sausage emulsions.

DR. REDDISH, Florida: This question is to Dr. Webb. Do
you feel that the problem of variation in moisture in meat products
is due to the variation in the moisture of the meat such as abnormal-
ity or pathology, as some people call it?
DR. WEBB: Well, Bob, I don't know whether I exactly follow you or not. Of course, the moisture varies in the basic meat component we put into the product. But in the formulation of products we always account for this in the moisture added to make the product. Do you want to come back at me with a little more?

DR. REDDISH: The reason that I asked the question is some officials in State Meat Inspection Service feel that it is.

DR. WEBB: Are you speaking of the moisture-protein ratio?

DR. REDDISH: Yes, and the moisture by itself. Both.

DR. WEBB: Well, I don't know whether I clearly understand what these people are driving at at the present time. I believe Harold Hedrick reported earlier on variations in protein-moisture ratios. As to how this would fit into the problem, I'm not quite sure. What I'm saying is, I'm not so sure that there are not other ways that we can approach this and not use the protein-moisture multiplier.

DR. PRICE: Do I hear another question?

DR. HENRICKSON: I'd like to ask of Neal if the thought is to measure moisture content of each ham as it goes through the in-line processing, and are you thinking of measuring the moisture content of each frank and each stick of baloney. Is this what you are thinking?

DR. WEBB: We still use the basic class of statistical techniques. Maybe we can read this moisture on a larger number of hams or a greater amount of product in the cooking chamber. Possibly there are some techniques which you can work out, where we don't have to wait four or five days for the result and then take action on the product that has been subsequently processed. I will say this, that on some products such as peas and grain, they are using flow-through system such as you might use when you put franks on a belt and run them down. My thinking was that we control a product in a cooking chamber by the in-temperature. We might use here both temperature and moisture to determine our end point.

MR. BERRY, Washington State: Karl Hoke: Is your department doing anything in the freezing of prepackaged cold cuts in liquid nitrogen chambers?

MR. HOKE: We haven't done any freezing with liquid nitrogen. Just transportation.

DR. PRICE: There seems to be several questions. We'll take one more question.
DR. COOK, University of Missouri: I'd like to direct a question to Dr. Webb. If we look over his list of different appliances and instruments which he suggested to use for detection of water, it's obvious that some of these will measure free water and others total water. How does he envision that some correction can be made in variations in water-binding capacity?

DR. WEBB: I don't know as I envision it. Really, if we're interested in the total water, then we may have to set some new standards. In other words, some of these instruments will measure total water. The thermogravimetric method or the thermo-volumetric methods certainly do not measure total water. One method, whether you use a circulating oven or whether you use a contact plate oven, you are going to get a different reading. So, I think the same is true here. We may not have real close agreement with some of the present analytical methods, but I would hope that we would have good correlation.

DR. COOK: It just came to my mind that some correction has to be made for some of the physiological and physical properties of the muscle -- correct some of these variances.

DR. WEBB: This I think certainly gets into the quality aspect of the product. If you measure total moisture, then during the cook, if one is bound better than the other, you're going to lose less in the cook probably. So, your meat mass that you are measuring will vary considerably, I'm sure. This is why we are in trouble, frankly, with some of our products today.

DR. PRICE: I'm going to ask the speakers to stay in this room for a few minutes, because there were some other questions. We will now take our break.

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MR. BERNHOLDT: At this time I'd like to introduce to the group a great speaker, although I feel that he is a good friend to the industry, one that many of us here know and have worked with for many years. Dr. John Silliker, who holds a B.A., M.S., and Ph.D. from the University of Southern California, is a member of several scholastic organizations including Theta Xi, Alpha Epsilon Delta Honorary, and Sigma Xi Honorary. He's held a post-doctorate with the U. S. Public Health Service as a Research Fellow at Hopkins Marine Station, Stanford University. He's been employed as an assistant Professor of bacteriology at Rochester University, School of Medicine, as a bacteriologist with the Gooch Laboratory in Los Angeles and for eight years was an associate of mine at Swift and Company. From 1957 to 1967 he was a consultant to the Laboratories at St. James Hospital and also a research associate, Department of Preventive Medicine, University of Illinois. In 1965 he was a visiting professor in the Department of Food Science, University of Illinois. Although listed as coming from St. James Hospital on the program, actually, John now is president of his own Silliker Laboratories also located in Chicago Heights. It gives me great pleasure to introduce at this time Dr. John Silliker who will talk on "Problems Related to Salmonella Contamination in Meats."

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