GRADUATE STUDENT RESEARCH PAPER COMPETITION

R. L. Henrickson*
Presiding

INTRODUCTION:

R. L. HENRICKSON, Oklahoma: It is an honor to have this opportunity to present the Graduate Student Research Paper Competition program to you this afternoon. I think the Graduate Students will be grateful that you did not go out and play golf or find other activities, but chose this program as being most important. So it is an honor, to preside over this session. We have a great array of talent for you this afternoon. Please recognize Jim Stouffer for his efforts in coordinating this program and extend thanks to Ken Johnscn for providing each student with the necessary information. I am reminded this afternoon of the Phi Kappa Phi motto. "May the love of learning rule mankind." The papers and men you will hear and see today have been molded through many hours of reading, studying, working and thinking. This varied expenditure of energy culminates in the talents that you will see and hear this afternoon. These talents epitomize the efforts of a graduate student. It is with pride that we present this talent to you in the form of five contestants who have worked long in preparing for this particular session.

The purpose of the American Meat Science Association Graduate Student Paper Competition is to encourage high quality, sound, pertinent meat research; to gain experience in the written and the oral presentation of scientific papers; to demonstrate poise and mental agility before their peers; and to develop an appreciation of effective communication for the dissemination of research information; and finally to acquire an appreciation of the role of the association and its members in advancing the welfare of the meat industry through research.

Contestants must hold membership in the American Meat Science Association at the time of their entry, or at least prior to March 15. The contestants must be presently enrolled in an advanced degree program or have been awarded the degree since the last Reciprocal Meat Conference. Only two students can enter from any one institution. A student shall be allowed to compete at the Reciprocal Meat Conference only one time during his or her graduate career. Any basic and applied research conducted by the graduate student in Meat Science will be considered for entry in this competition. We will follow the rules as specified by the Association. These being that each student will have twelve minutes for presentation. Five minutes will be allotted for the discussion. A two minute caution light and the bell will ring after an elapse of 15 minutes. The two minute warning will permit each participant to complete within the allotted time. We will use the lapel microphone, as long as it will work for us. At least we are going to start out with the lapel microphone. We will follow in the order listed in your program. Our first speaker this afternoon will be D. G. Siegel from the University of Illinois. He is going to talk on the Crude Myosin Fractions as Meat Binders. Mr. Siegel.

CRUDE MYOSIN FRACTIONS AS MEAT BINDERS, D. G. Siegel and G. R. Schmidt, University of Illinois at Urbana-Champaign, 124 Animal Sciences Laboratory, University of Illinois, Urbana, IL 61801

Crude myosin fractions extracted from pre- and post-rigor bovine muscle over a short and long extraction time with three different extracting solutions, Guba-Straub, Hasselbach-Schneider and Weber-Eddsall, were measured for their ability to bind pieces of meat after the application of heat. These crude myosin binders were adjusted to the same level of salt, protein, phosphate and pH and were examined for their relative percentage of myosin and actin by scanning SDS-PAGE gels. Measurements of binding abilities were made using a model system designed for the Instron Universal Testing Machine to record the peak force required to separate pieces of meat at a binding junction. Using this system, the binding ability of a crude myosin preparation was found to be significantly greater than the binding ability of either a muscle homogenate free of fat and sarcoplasmic proteins, a total muscle homogenate or a nonprotein control consisting of salt, phosphate and water. When the Weber-Eddsall solution was used to extract the crude myosin, it exhibited a significantly higher binding ability than when either the Guba-Straub or Hasselbach-Schneider solution was used.

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The length of extraction had no effect on the binding ability of the crude myosin. However, it was found that crude myosin prepared from pre-rigor muscle exhibited a slightly higher binding ability than the post-rigor fraction. This was attributed to the higher myosin/actin ratio found in the pre-rigor fraction. The roles these muscle proteins play in the binding phenomenon will be discussed and a theory of the mechanism of binding between meat pieces will be presented.

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INHIBITION OF STAPHYLOCOCCUS BY LACTIC ACID BACTERIA IN COUNTRY-STYLE HAM, D. T. Bartholomew and T. N. Blumer, North Carolina State University, Department of Food Science, North Carolina State University, Raleigh, NC 27650

Lactic acid bacteria were observed for inhibition of staphylococci prevalent in country-style ham. Observations were conducted in broth and agar media and in a model meat system. Lactobacillus plantarum and Peidococcus cerevisiae were selected as antagonists against a Staphylococcus epidermidis isolate from country-style ham. The staphylococcal isolate was a strong fermenter and grew well in cured meat samples. The model meat system used sections of pork longissimus dorsi muscle. Culture introduction into muscle tissue was more effective using syringe-injection than surface or puncture application. Sucrose was selected as the fermentable substrate in this study. The model meat system was applied by using 27 hams in a 3 x 3 factorial experiment using 3 different equalization times (0, 1, 2 weeks) and 3 sucrose levels (20, 40, 60%). Total plate counts and staphylococci, lactic acid bacteria, and anaerobic counts were made in ham microbiota enumeration. Representative organisms were identified from sampled ham muscles (biceps femoris-semitendinosus and semimembranosus). Clostridia were found in some ham muscles sampled. S. epidermidis was effectively inhibited by L. plantarum primarily due to pH drop from lactic acid production. The nature of lactic acid inhibition of staphylococci was also investigated.

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CREATINE PHOSPHOKINASE ISOENZYMES IN STRESS-SUSCEPTIBLE AND STRESS-RESISTANT PIGS, J. W. Hallberg, D. G. Topel, and L. L. Christian, Iowa State University, 215 Meat Laboratory, Iowa State University, Ames, IA 50011

Sixteen normal and 16 stress-susceptible (SS) pigs were used in the study. Eight normal and eight SS pigs were subjected to a five minute stress four hours before slaughter. The other 16 pigs were not stressed. A catheter was inserted into the vena cava of all pigs and blood samples were collected through the catheter before the stress period and two and four-hour post stress. Blood samples from the non-stressed pigs were obtained prior to slaughter. M. longissimus, Triceps brachii, ventricular myocardium, and cerebral cortex tissue samples were obtained immediately after exsanguination for creatine phosphokinase (CPK) analysis. Total CPK and CPK isoenzymes were measured in duplicate for each sample. Serum CPK levels were significantly greater in the SS pigs as compared to controls for all comparisons studied. Serum levels of the skeletal muscle CPK isozyme (MM-CPK) and the cardiac muscle CPK isozyme (MB-CPK) were significantly greater for the SS pigs when two-hour post stress samples were compared. The total CPK in the Triceps brachii and the ventricular myocardium was not significantly different when the SS pigs were compared to the controls. Also, no significant differences were found in the CPK isozyme composition of the M. longissimus, Triceps brachii and cerebral cortex. Rested SS pigs had significantly (P<.07) more total CPK in their M. longissimus than stressed SS pigs. Rested SS and normal pigs showed significantly more CPK in the cerebral cortex (P<.1) as compared to stressed SS and normal pigs. Stressed SS and normal pigs showed significantly more MM-CPK and MB-CPK in the heart (P<.05) than the rested SS and normal pigs.

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EFFECT OF MICROWAVE COOKING SPEED ON PALATABILITY OF PORK CHOPS, R. C. Himes, C. B. Ramsey, T. L. Hoes and R. C. Kersh, Texas Tech University, Animal Science Department, P.O. Box 4169, Lubbock, TX 79409

Twelve loins from six pork carcasses provided 216 19-cm chops (average weight was 172 g) which were used to study the effects of broiling and four microwave oven speeds (low, medium, roast and high) on cooking and palatability traits. Two Amana Radar Ranges, calibrated to be equal in output, were used for the microwave cooking. Broiling, which served as a control, was done in an electric range oven. Cooking time for sets of three chops was 57.4 min/kg for broiling and decreased from 48.5 to 18.4 min/kg as microwave cooking speed increased from low to high. Drip loss did not differ (P>.05) among cooking methods, but evaporative and total losses were highest for broiling and second highest for the low microwave setting. Sensory panel flavor score was highest (P<.05) for broiled chops but did not differ among microwave speeds. Juiciness score was highest...
for the chops cooked at the low microwave setting and did not differ among the other cooking treatments. Tenderness tended to vary inversely with microwave cooking speed. Broiled chops were comparable in tenderness to those cooked at the low microwave setting. Overall acceptability was lowest for chops cooked at the high microwave setting and did not differ (P > .05) among the other treatments. Pigs from which the chops were obtained were a significant source of variance in all of the traits studied except flavor score and cooking time. Pig X cooking method interaction was significant only for cooking losses. In an overall evaluation, the high microwave setting tended to produce the least desirable cooked product while the low microwave setting and broiling tended to produce the more desirable products.

FRAGMENTATION INDEX OF RAW MUSCLE AS A TENDERNESs PREDICTOR OF STEAKS FROM U.S.D.A. COMMERCIAL AND UTILITY CARCASSES, C. R. Calkins, G. W. Davis and W. L. Sanders, University of Tennessee, Food Tech. & Science Dept., P.O. Box 1071, McLeod Food Technology Building, Knoxville, TN 37916

A total of 80 bovine carcasses of unknown tenderness were selected from two commercial meat packing firms and aged for 10-14 days in a 2°C cooler. Each carcass was assigned a marbling score (Practically-Devoid to Abundant), a maturity score (C, n=60; D, n=20), a U.S.D.A. quality grade (U.S. Commercial, n=38; U.S. Utility, n=42) measured for fat thickness opposite the 12th rib (1-40 mm), weighed (173 to 327 kg), and assigned a U.S.D.A. yield grade (1.2 to 5.9). Steaks containing the *longissimus* muscle were obtained from the anterior end of the short loin, cooked to 70°C and measured for tenderness by the Warner-Bratzler shear (WBS) and a trained 8-member sensory panel. Fragmentation index (F.I.) was determined on fresh and frozen raw *longissimus* muscle at three (10 min, 40 min, and 24 hr) drying times. Sarcoma length, water holding capacity and proximate analysis were also determined. Simple correlation coefficients relating F.I. to WBS and tenderness rating were: fresh muscle F.I. (10 min), .60 and -.60; frozen muscle F.I. (40 min), .75 and -.69, respectively. U.S.D.A. grade factors and simultaneous consideration of all measures of fragmentation accounted for 14.1% and 61.1%, respectively, of the observed variation in WBS force values. Laboratory determinations, when applied after U.S.D.A. grade factors and F.I. measures, increased the explained variation in WBS and tenderness rating by 3.40 and 3.66%, respectively. Fragmentation index determined from frozen *longissimus* muscle accounted for 18.6% to 23.8% more of the variation in cooked meat tenderness than F.I. of fresh muscle. The best two variable regression model for fragmentation (frozen *longissimus* muscle) accounted for 56.6% of the observed variation in WBS force values. The magnitude of the relationship between F.I. of frozen muscle and WBS force value suggest the possibility for use of this procedure in a commercial firm as a means of segmenting beef carcasses according to cooked meat tenderness level.

R. L. HENRICKSON: The last paper has been withdrawn so this gives us a little time to talk about the competition. I have the opportunity to belong to a businesswoman's group and when a speaker gives a program that the group recognizes as being rather outstanding one of the things they do is stand and give applause. I just wondered how you felt about this program today. We know you graduate students have been under stress, but from here on you can relax and take it easy. I think it is only fair that we tell you more about the competition. Your judges were Don Naumann, University of Missouri, this is his second year so he's the old-timer of the group. Then we have Professor Ned Parrett from Ohio State, representing the Department of Food Science. From the University of Georgia at the Russell Laboratory is Dennis Campion. To complete the representation, we went to Peter Eckrich for Dr. William Schwartz. We have Professor Dennis Stiffler from the Animal Science Department, New Mexico State University. This was your group of judges and we owe them a round of applause for a difficult task.

In order that all of you recognize how the scoring is done, we have a set of guidelines to follow. Each judge was given an opportunity to read the abstract and the full paper before coming to this session. In fact, they had it at their home office and had ample opportunity to read each of the papers in detail and actually scored them before they arrived here. All that they were doing at this session was to score the presentation. We will now go from here to the little room across the hall and assemble the scores and unanimously agree on the winner. We think this is a fine, worthy program and urge each Faculty Advisor to enter some of your talent in next year's program to make the competition grow. This is the third year we've had competition papers and we would like to see it expand. Jim Strouffer, if there's anything else I should say or do, now's the time. If not, I relinquish the podium to the Chairman.