

# UPDATE: The Hatch Act Centennial

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1987 makes a century of research support from the Hatch Act. As a consequence, the agricultural professional societies are devoting time at their annual meetings this year to document the importance of Hatch Act funds toward the furtherance of research in our land grant colleges – in our case, meat science and muscle biology. At the national level, a number of plans are being made for the celebration. They include a commemorative postage stamp, a video film and slide tape enumerating the benefits of Hatch funds, an update of the history of the Agricultural Experiment Stations, a yearbook dealing with the centennial, an exhibit in the Smithsonian Institute in Washington, DC, a research update bulletin and lectureships. The total effort is very considerable and is indeed something special for this significant act that has led the way in agricultural research and development.

## Early Beginnings

The early architects of this country – Thomas Jefferson, Ben Franklin, and others – recognized the importance of establishing a strong agricultural economy. It was also recognized that a strong agricultural economy would provide a base for the development of an industrial economy. Indeed, the development of this country to its present status in the world's economy indicates the wisdom of these early government leaders and also of those who have followed.

Some of the most significant enabling legislation to underpin agriculture development was passed during President Lincoln's presidency. 1862 was a significant year because:

(1) The Homestead Act was passed, which encouraged land settlement, enhanced the development of the family farm and furthered the development of a strong agricultural economy.

(2) the USDA was established, but it was not until November 1953 that agricultural research became a unit within the USDA.

(3) The Morrill Act established the Land Grant Colleges which led to the development of education and research in agricultural colleges in land grant universities.

## Hatch Act Passage

Twenty-five years later, in 1887, the Hatch Act was passed which provided appropriations to the states that

established an Agricultural Experiment Station in connection with the land grant colleges established under the Morrill Act of 1862. The purpose of the stations was to engage in systematic scientific studies of problems relating to agriculture of each state. Subsequent acts were passed which broadened the scope and support for agricultural research. The matching requirement of the Hatch Act built in research support from the states; and I believe it fair to say that the present base of state dollar support for research in Colleges of Agriculture can still be credited to this federal legislation. Hatch Act dollars come to the states on a formula basis and are regarded as hard-dollar support, along with state funds. These funds are administered by the Cooperative State Research Service in the USDA, Washington, DC.

The administration of Hatch funds in the states is in the hands of the Directors of the State Experiment Stations; and the way in which they are administered varies among states. In some instances, the funds are used primarily for salary support; and in others, primarily for research project support, such as for salaries of research assistants, supplies, etc.

In any event, Hatch funds have provided good solid base support for agricultural research. Although nationally these funds represent only about 18% of the total funds in Experiment Stations, the funds are extremely important in the continuation of the research programs. Where they are used for salary support, the continuation of research is obvious. Where they are used for base support for projects, in most instances, the funds are supplemented by industry and other government agency dollars.

## Importance of Hatch Act Funds

Now I would like to talk more specifically about the importance of Hatch funds in the development of meat science and muscle biology research. In thinking back, I recall that when I was a young staff member in the late 1940's and early 1950's, Hatch funds were funds that a few of the faculty members had access to, and no one explained to me how one joined this select group. Perhaps it was because meat research and food research in general were so new that our station director did not appreciate them as worthwhile areas to support. In general, the major support from Hatch funds at our station went to production research, economics and agricultural chemistry. I dare say that this was also the case in other Agricultural Experiment Stations during this period, with the possible exception of three or four midwestern states. Hatch support for meat research came with the recognition of meat science as an identifiable and important area of research and this has only been during the past 35 years – 65 years after the passage of the Hatch Act. It became obvious that meat researchers were needed to

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serve meat animal producers, processors, food distributors, government agencies and, especially and finally, consumers.

Prior to the first Reciprocal Meat Conference in 1948, meat research involved carcass evaluation in terms of grading and the development of cutting data – because the receipts from sales from genetics and animal nutrition experiments were so important in financing animal husbandry departments. Too many experiments were conducted to make money, or at least not lose any. With the involvement of meats men (so-called in the 1950's and 1960's) in the evaluation of carcasses, a number of questions were raised about the use of certain indices for estimating carcass composition and the importance of muscle characteristics in determining eating quality. This was then the beginning of meat research per se in the place of tag-along research or data collecting on management, genetic and nutrition research projects. At this time, meat research was already moving along in foreign countries, such as England, France, Germany and Australia. In my opinion, this provided further stimulus toward the development of meat research in the U.S. The First Reciprocal Meat Conference in 1948 reviewed the lamb, pork and beef carcass research. Carcass research was primarily directed toward establishing correlations between linear measurements and cut-out data. At that conference, it was stated by O.G. Hankins, USDA, that there was great need for better methods in meat research and that programs in meat research would depend, to a large extent, on improved techniques. We are still working in this direction; fortunately, we can now say that very considerable progress has been made since that time. Physical, histological and chemical methods were discussed in the 1952 Reciprocal Meat Conference with essentially all of the references coming from investigators outside the meat science area. Dr. Hall of Kansas State was essentially the only meat chemist at the time and he summarized the available chemical methodology at the conference.

### Meat Science Development

The infusion of Hatch funding during the 1950's for meat research along with additional matching funds from state sources, newly authorized funding through the National Science Foundation and National Institutes of Health (U.S. Public Health Service) and industry brought on a major initiative in the development of meat science. With the advent of Ph.D.'s in meat science, great interest soon developed for the training of graduate students, which helped quickly expand research programs. Fortunately, they found readily-available employment in newly-created meat science positions at universities and in industry. In a summary of techniques and their application to meat research authored by Bray, Briskey, Cassens and Kauffman and published by the American Society of Animal Science in 1965, research cited covered gross carcass composition, biochemistry and physiology of muscle and adipose tissue, histology and histochemistry of muscle and adipose tissue and physical and sensory measurements of palatability. Many citations were from researchers in other countries and from researchers not generally regarded as meat scientists, yet the preponderance of citations came from U.S. meat scientists. Of the more than 550 citations, less than 10% came from research

prior to 1950. This period from 1950 to 1965 was indeed the era that established meat science and muscle biology as a recognized research area. This thrust, and the subsequent momentum by meat scientists, continues to have a major impact upon the quality and safety of all meat products.

Research in the late 1950's began to be directed toward more basic studies of muscle. Research was not just the "what" but importantly "why" we had variations in meat quality and meat processing results.

Production factors that altered the fat and muscle composition and the eating quality of pork and processed meat products continued and great progress was made through genetics, nutrition and management in reducing the percentage of fat in meat animals through the use of parameters established by meat scientists. Likewise, fresh muscle characteristics and their relationship to meat eating quality have become more firmly established. Yet the need for improved objective measurements of lean-to-fat ratios and eating quality of fresh meat continues.

### Significant Research Efforts

Beginning in the 1960's and 70's, the frontiers for meat research broadened with the ever-increasing demands and concerns by consumers for more uniform quality in fresh and processed meats, convenience foods, new products, safety of food products and diet and health. I will try to cite a few of the significant research efforts that have met or are meeting these consumer concerns.

It was during this period, 1960's and 70's, that the concept of muscle as a food was recognized. This in turn led to an emphasis upon how biochemical, physiological and histological factors affected muscle properties. Growth biology as a research emphasis came into its own during this period and is helping to explain differences in carcass composition. As a result, major advances have been made in understanding the cellular and metabolic factors associated with muscle and adipose tissue growth in meat animals. A number of repartitioning agents are now being studied with the goal of improved lean-to-fat ratios in meat animals and subsequently in fresh meat cuts.

The many years of biochemical, physiological, and histological studies on pale, soft and exudative pork and dark-cutting beef have provided good basic knowledge that now makes it possible to recommend production and processing practices to help, although not totally eliminate, quality variations in meat products. These basic research approaches as related to meat quality stand as an outstanding example of how genetics, environment, diet and postmortem processing variables, such as chilling rate, can markedly alter the metabolism of muscle and the quality of meat. Also the research brought muscle biologists and meat scientists into the same arena.

Consumer concerns about meat tenderness led to research and thus improved knowledge as to the role of muscle contraction, collagen crosslinking, cold shortening, thaw rigor, postmortem aging and cooking procedures in meat tenderness. Electrical stunning used for the humane slaughter of meat animals resulted in improved tenderness; currently, several studies are in progress to understand the fundamental factors behind this phenomenon and the conditions necessary for optimum improvement in meat tenderness.

Advances in chromatography and more sensitive analytical techniques have been used to help unravel the complexities of meat flavor. The cause of sex odor in pork and the rancidity and warmed-over flavor in meat are outcomes of flavor research.

The concern about food additives has led to considerable research in food safety. Although approved for use in cured meat products, nitrites became very controversial when bacon cooked to a high degree of doneness was shown to contain carcinogenic nitrosopyridine. This led to much work in the chemistry of its formation and the effects of processing or cooking conditions on its formation. The minimal amounts of nitrite necessary for proper cure color and safety for human consumption have been established through this research. Other additives, such as salt in processed products, remain under study. In the case of microorganisms which are common to all meat products, researchers have elucidated many of the factors that can be used to minimize the contamination of meat and the growth of the microorganisms on fresh and processed meat products. An example is the application of this research to the greater shelf-life of fresh and processed meat through vacuum packaging.

The need for convenience foods by consumers and the need to better utilize the less-demanded portion of the carcass of meat animals has led to a major effort in the development of reformed or restructured meat products. The technology developed has resulted in new kinds of products that permit uniform control of composition and quality, portion size and products that can be quickly prepared. Precooked products to be meal-ready by microwaving are receiving considerable research effort.

Diet and health is an overwhelming concern today and is resulting in research about the role of cholesterol and the various fatty acids in heart disease and the role of various types of meat cookery, fatty acids and fiber in the production of cancer. Meat scientists, along with scientists in other disciplines, are involved in this effort.

### **Toward the Future**

This brief delineation of the research areas in which meat biologists and scientists have been and currently are involved reiterates their expanding role today in meeting the concerns of consumers. Indeed the American Meat Science Association can be proud of the achievements of its scientists. However, in my opinion, the breadth of meats research in the past ten years has begun to divide researchers into three categories: (1) practical and very applied researchers, (2) growth biologists, and (3) basic food-related researchers. The danger I see is what I perceive to be a lack of adequate coordination and communication among these groups of scientists. Thus I see the need for better coordination and understanding among these groups if meat science, defined in its broadest sense, is to retain or increase its share of funding support in the years ahead. Much of meat research has been supported by Hatch funds, especially for base-fund support, and many times as start-up funding for new research ideas. I can say with certainty that Hatch funds have played a significant role in the development of meat science. Meat scientists, I am sure, are pleased to be a part of the centennial celebration of the Hatch Act of 1887.