Research Needs in Processed Meats From an Industry Point of View

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In order to understand the meat processor's research needs, we must first understand something about the meat processing company. The primary objective for every successful meat processing company is to meet the needs of the customers. Some people may have thought that the main objective was to make a profit. While profitability is very important, it is also a result of meeting the customer's needs. The meat processing company must put the customer first.

These are fast changing times. The processed meat industry must keep in step. Customers' eating habits are changing. In order to successfully compete with other food sources, the meat industry must not only give its customers what they want today, but must plan for the future and predict what customers will want next year and the year after. These new products which meet our customers' needs in the future will be based on the basic and applied research that is done today. Webster's Dictionary defines research as careful, systematic study and investigation in some field of knowledge, undertaken to establish facts or principles. These facts and principles which are established today from your basic and applied research are the building blocks that the meat processing companies need to develop new and improved products for future consumption.

Let us examine the role of research in our industry. Compared to industries such as chemical, pharmaceutical and heavy manufacturing, the U.S. food industry is oriented toward short-term goals and makes a relatively small commitment to research and development. Less than 0.5% of U.S. food industry revenues were allocated to research and development programs during the past decade. This is less than one-fourth of the national average for all types of manufacturing. While this 0.5% outlay for research and development will vary from company to company, it is my feeling that most companies in the meat processing area are probably below that figure or very close to it.

As a comparison, companies in machinery manufacturing, such as John Deere, and high-tech firms, such as IBM, spend over 5% of their yearly sales on research and development. The processed meat industry and food industry in general ranks low for expenditures on research and development. Among the 17 major industry groups studied by the National Science Foundation, the food industry ranked 14th on the basis of research and development budget as a percent of sales. Some people use these statistics to find fault with the meat industry because of our low research and development expenditures. I believe that this is a case where the numbers are used to make the argument look good. A more holistic view will also take into consideration that meat industry profit margins are among the lowest of any manufacturing category. They typically run under 2.5% for meat processors. The meat processing business is one of high volumes along with these low margins. Any comparison to other industries must take these major differences into consideration.

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The research and development that is done by industry is geared to different objectives than that done by the universities and government labs. A large, basic research operation does not directly benefit the customer. Since it does not turn a profit, it does not directly benefit the stockholder. Our research and development is primarily defensive work and product development work.

While this graph covers all U.S. Industry, I'm sure that the trend applies to the meat processing industry as well. Seventy-six percent of the industry research and development dollars are spent on development. This development helps to meet customer needs with new and improved products. These satisfied customers, in turn, help a company to be profitable and this meets the stockholder's needs.

University expenditures complement those made by industry. Basic research gets the most funding with a substantial amount also going to applied research. Universities have three major goals: education, the advancement of knowledge and public service. Basic and applied research in meat processing meets these goals. It educates the processor and the consumer. We in the meat processing industry need this basic and applied research which the universities and government laboratories provide. This research complements the industry's development of new and better products, helps us to reduce waste and to develop more efficient processes.

**Demographics and Geographics**

Before we can look at research needs, we must consider changing demographics and geographics. Today's research should relate to the customer's needs for tomorrow. Some very significant changes in demographics will affect the customer's eating habits. Smaller households, single parents with one or two children, single people living alone and families in which both husband and wife work are some of the changes that are taking place. The fastest growing segment of our population is working women and persons 55 and older. Processed meats must continue to meet the needs of these customers. Easily prepared products, smaller portion sizes and leaner, more nutrient-dense processed meat items should appeal to these groups.

Urbanization is likely to continue on its present course while the trend for meat processing companies is to locate in areas which are close to the raw material supply, normally away from urban areas. This increases the distance between the processor and the customer, which in turn results in the need for better methods of preservation. Changes in the distribution system also affect the needs of today's meat processor. Not too long ago, a local butcher would slaughter, process his raw materials and sell directly to the consumer. This evolved to a larger processor who would sell processed meats to grocery stores within a region of the country. In the 1980's, the distribution system is much more complicated. Because of specialization, product is slaughtered at one location and distributed to meat processors. They in turn distribute to regional distribution centers, who distribute to chain warehouses or wholesalers. Product then goes to the retail store and finally to the consumer. This system requires longer shelf lives, better process controls and better preservation methods.

**Figure 2**

<table>
<thead>
<tr>
<th>US R &amp; D PERFORMANCE IN 1979</th>
<th>INDUSTRY</th>
<th>UNIVERSITY*</th>
</tr>
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<tbody>
<tr>
<td>TYPE OF RESEARCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Research</td>
<td>1</td>
<td>4 (57%)</td>
</tr>
<tr>
<td>Applied Research</td>
<td>7</td>
<td>2 (29%)</td>
</tr>
<tr>
<td>Development</td>
<td>29 (76%)</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>7</td>
</tr>
</tbody>
</table>

*Includes Federally Funded R & D Centers

Source of data is National Science Foundation, as reported in July 28, 1980, Chemical and Engineering News.

**Figure 3**

**CHANGES IN THE DISTRIBUTION SYSTEM**

- Butcher (slaughter & process) → Consumer
- Regional processor slaughter & process → Retail Stores → Consumer
- Slaughter → Meat Processor → Regional Distribution Center → Chain Warehouse or Wholesaler → Retail Store → Consumer

Requires longer shelf lives, better process controls, better preservation.
Lean Meats

While keeping in mind the needs of our customers, let us look at some research needs. I'm sure there will be little argument among us that fat is out and lean is in. There are a number of recent publications, such as the report on diet and cancer from a committee of the National Research Council and dietary goals report of the McGovern Committee, that have presented our customers with the view that lower consumption of animal fats will help them reduce disease and increase their life expectancies. We believe that there is a demand by our customers for lower fat in processed meat products. During the past two years, we have seen a proliferation of advertising in some processed meat items. 95% or 93% Fat Free processed hams are now commonplace in retail display cases.

Yet, ham is probably the easiest processed meat item to produce at a very lean level. Other processed meats, such as frankfurters, bologna and coarse-ground ethnic type sausages, can use some research assistance. There is room for research on bind and texture of these products at lower fat levels. Since fat plays an important role in the flavor of these items, there is room for research on spices, processing and cookery methods. Flavor and texture are crucial to the acceptance by the customer of lower fat products. Sensory evaluation should play a major role in this research. I believe the day of the 80% or 85% Fat Free sausage is right around the corner.

Flavor

Flavor is always one of the top concerns in the meat processing industry. The customer demands good flavor. Yet, this is an area where we do not find a great deal of information. Research work could be done comparing bull meat flavors with those of other types generally used in sausage such as Utility, Canner and Cutter grades of beef. Flavor difference in heavy sows versus light sows and butcher hogs could be researched. Boar odor in boars and in cryptorchid hogs could be studied. Means of controlling these odors and flavors would benefit producers as well as processors.

Different cookery methods, steam cooking versus dry cooking and their effects on flavor could be researched. We encourage every researcher who is dealing with a product or process to consider flavor implications.

Trichinosis

The United States is one of the few developed countries where trichinosis remains an important public health problem. Most foreign countries will not accept our pork until it is inspected and certified free of *Trichinella*. The United States is far behind Europe in the control of trichinosis. Many European countries have effectively reduced the number of human cases of trichinosis and the percentage of infected pork carcasses by requiring the trichinoscopic examination of each pork carcass. Any carcasses identified as having the larvae are removed from the marketing channels and utilized in products which are adequately processed to destroy the larvae. The key to control of the larvae in European countries is detection. The United States has relied on public awareness and destruction of the *Trichinella* larvae for control.

Although the incidence of trichinosis in swine and cases of human trichinosis have declined in the past 35 years, now is the time to make pork trichina safe.

The National Pork Producers Council, acting on a 1982 resolution from its delegates, appointed a Trichina-Safe Pork Committee. The goal of this committee is to make the U.S. pork supply trichina safe by 1987.

Irradiation

One of the most promising methods of eliminating the threat of trichinosis is the process of irradiation. Hog carcases are exposed to very low doses of gamma rays which render the *Trichinella* sexually inactive. Since the larvae is then unable to reproduce, this eliminates the possibility of contracting trichinosis from that carcass. Pork industry customers have a need for trichina-free pork. Industry, government and university must work together on researching the irradiation method.

Irradiation has many other uses. The American Council on Science and Health recently issued a report which stated that preserving food by irradiation could offer substantial benefits to consumers. Irradiation can be used to delay the ripening of fruit, to inhibit the sprouting of potatoes and onions and to kill insects that infest grain. In the processed meats area, in addition to *Trichinella* control, it could be used to minimize losses in nutritive value, extend the shelf life of processed meat items and produce shelf-stable meats.

I already mentioned how the changing demographics and geography of this nation will affect our customer needs. There is another change that affects their needs. This is psychographic change that is taking place. This has to do with our customer's changing tastes and interests. The long-term trend for frankfurters, for example, has been on a slight decline. The trend for items of a more specialized nature, such as dry sausage, fresh sausage and ethnic sausages, is on the incline. Pizzas, Mexican and other highly seasoned foods are becoming quite popular. A lot of research has been done on emulsion or "batter" technology which applies to the skinless wiener type processed items. Since many of these newer processed meat items are coarse ground, we think that there is room for research on the stability of these products at different temperatures, factors which influence water-holding capability and the histology of coarse-ground meat products.

Productivity and Energy

Our customers will receive more consistent quality in the processed meats that they purchase if improvements can be made in rapid analytical methods. During the last decade, many new analytical devices have been introduced. Some methods work fairly well, others are somewhat unreliable. Some of the newer technology, such as microwave systems and infrared analysis, looks promising. Methodology and comparisons of these methods to the AOAC methods are needed.

The meat processing area is one of the leaders in energy consumption in all of the food processing industry. Recent decreases in the price of some types of energy must not mislead us to the very real need for energy conservation as we look to the future. Since 1970, the cost of raw materials to
the meat processor has roughly doubled. In the same period of time, the cost of energy has increased 13-fold. The sophistication and extent of processing, packaging and distribution has increased the demand for energy to the extent that, in some cases, one-third of the energy needs of the entire food chain are accounted for in processing alone. The industry needs more efficient cooking and cooling systems and systems which recycle water and heat.

The need to reduce energy consumption has been the driving force for hot boning. Several studies have been done to investigate the potential of hot boning as it relates to energy conservation. Figure 4 is from a report by Donald Ragmond, Agriculture Canada. It depicts the total energy required to slaughter and kill beef for one particular plant. Approximately 70 percent of the energy is used for cooling.

Research on prevention of cold shortening, handling, packaging and marketing of hot boned primals and measures to prevent contamination of hot boned meat could be of value to the processing industry.

![Figure 4](image)

**THE TOTAL ENERGY REQUIRED TO SLAUGHTER & KILL**

<table>
<thead>
<tr>
<th>Process Step</th>
<th>Electrical Energy</th>
<th>Steam Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shackle and Bleed</td>
<td>0.372</td>
<td>7.76</td>
</tr>
<tr>
<td>Hide Stripping</td>
<td>0.101</td>
<td>1.61</td>
</tr>
<tr>
<td>Evisceration</td>
<td>1.50</td>
<td>294.87</td>
</tr>
<tr>
<td>Cooling</td>
<td>115.47</td>
<td>TOTAL 286.64</td>
</tr>
<tr>
<td>Sanitation</td>
<td></td>
<td>124.84</td>
</tr>
</tbody>
</table>

When dealing with pork, where 70 percent of the carcass is used for further processing, it seems ironic to take so much energy to cool the hams, bellies, picnics and trim, then turn around and heat them back up a day later in a processed product. Wouldn't it be more efficient to process some of these primais and trimmings hot? I realize that this is no easy challenge but the savings in energy and space would be considerable.

Hot processing technology appears to be one answer to reducing high energy costs. Research done to solve some of the problems which are still associated with it is very worthwhile.

**Conclusion**

These research ideas which I have presented to you today meet our processing industry's needs. More importantly, however, I hope that I have clearly presented to you the main factor which determines our needs. Because, if you understand our objective — to meet our customer's needs — then it becomes easy for you to understand our needs. Industry's research and development emphasis is on development of products. Your diligent efforts in basic and applied research are needed to complement the industry role.

Albert Szent-Gyorgyi, a Hungarian-born chemist who won a Nobel Prize in 1937, once said, "I find myself running impatiently to my laboratory every morning at an early hour. My work is not finished when I leave my workbench in the afternoon. I go on thinking about my problems all the time; and my brain must continue to think about them even when I sleep, for I wake up sometimes in the middle of the night, with answers to questions that have been puzzling me. I think that without such concentration and devotion, nothing serious can be achieved, be it in the arts or in the sciences."

I leave you with that thought as I conclude. As you go about your research work, I would urge you to ask yourself whether Szent-Gyorgyi's type of concentration and devotion might have an impact on the success of your own activities.

**References**


Kotula, A.W. Postslaughter Control of Trichinella Spiralis. Food Technology, March 1983, pp. 91-94.


