



OUTLOOK

THE EDUCATED SAUSAGE

American Meat Institute Foundation research scientists at the University of Chicago have developed a pure starter culture which will enable sausage makers to produce a uniform, tangy-flavored summer sausage in one-third of the customary processing time. This milestone in meat processing represents several years of research and experimentation by AMIF scientists such as Dr. George D. Wilson, food technologist.

The University-affiliated Foundation was established under sponsorship of the meat packing industry to conduct "unselfish research," now contributing to improved meat processing and better products for the dinner table. (see Feature Story, page 12.)

The Markle Scholarships

Philanthropic organizations which support health and medical research have followed a variety of patterns in their techniques of support. One of the unique plans is that of the John and Mary R. Markle Foundation, which ten years ago established scholarships in the medical sciences. Annually, twenty-five awards are made to faculty members of medical schools in the United States and Canada. Among the scholarships awarded this year was one to Dr. Robert E. Carter, Assistant Professor of Pediatrics at the University of Chicago. Dr. Carter is the fifth candidate nominated by the University of Chicago to receive this award. The others have been Drs. Robert H. Ebert, Frank W. Putnam, Edward R. Woodward and David W. Talmage.

The scholarship program of the Markle Foundation was established to relieve the shortage of teachers in medical schools and to strengthen their faculties by encouraging young scientists to remain in academic medicine. According to a recent announcement by the Markle Foundation, of those men appointed during the past ten years, two have become deans of medical schools, five are assistant or associate deans, twenty-four have become heads of departments, one directs an important cancer research institute, and two head research divisions in government laboratories. Twenty-five are full professors, and fifty-one are associate professors. The candidates for the Markle Scholarship are nominated by the faculties of their respective medical schools. Ordinarily,

there are 50 to 60 candidates for selection each year. A committee composed of distinguished businessmen and scientists interviews the candidates during a three-day period, and on this basis the twenty-five who will receive scholarships are selected. The scholarship appointment is for a five-year period, and the Markle Foundation contributes \$6,000 a year to the medical school, or a total of \$30,000 for each scholar. The Markle Foundation was established in 1927 by John Markle, a Pennsylvania coal operator. The initial endowment was \$3 million, which has increased under the terms of his will to its present value of approximately \$16 million.

Two Conferences

One of the important but lesser known functions of the University's Medical School is to serve as a host for conferences on medical and scientific topics. At this time, scientists from many parts of the country come to the University to meet with their colleagues; they then discuss matters of policy and exchange advanced scientific information. To a surprising extent, such small conferences have replaced the regular meetings of medical societies as a medium for the exchange of this advanced and highly significant information. No official record is kept of the actual number of conferences that are held at the School of Medicine in the Division of Biological Sciences, since in most cases the arrangements are made independently by the member of the faculty concerned. Two conferences of considerable general interest may be mentioned.

On October 11, 1956, a group of pediatricians interested in childhood leukemia met to discuss a coordinated program of therapeutic trials. Their host was Dr. Mila I. Pierce, Associate Professor of Pediatrics in the Bobs Roberts Hospital. The conferees compared results obtained by using identical schedules of treatment with a variety of experimental drugs. Such coordinated studies are necessary, since few institutions admit enough children with acute leukemia to permit a careful statistical judgment of the results of the new drugs which are available.

Another conference of interest, which was sponsored by the Atomic Energy Commission, involved an evaluation of all aspects of the use of radioiodine in the treatment of diseases of the thyroid gland. The host for this conference was Dr. Dwight E. Clark, Professor of Surgery, and Surgeon to the Argonne Cancer Research Hospital. The guests at this conference came from Europe and all parts of the United States in an attempt to assess the usefulness of the radioactive isotope of iodine in clinical medicine. A previous conference on the same subject was held at Brookhaven National Laboratory in 1949.

A New Look for the Psychiatry Department

On April 12, Dr. C. Knight Aldrich and his associates held open house in their recently remodeled quarters in the Department of Psychiatry. University Clinics staff members, former Psychiatry personnel and graduates of the Department's training program inspected the improvements that had been made.

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Whether it arises from normal skin, farmers' skin or leukoplakia, skin cancer takes one of three principal forms:

1. Basal cell carcinoma, *which originates in the deepest layer of the cells of the skin. Although this type of tumor does not spread to other parts of the body, its growth locally can encroach upon and destroy surrounding tissue.*
2. Squamous cell carcinoma, *originating in the middle layer of skin cells. These tumors are particularly dangerous because they may metastasize or spread to other parts of the body.*
3. Melanoma, *originating from special, brown pigment-producing cells in the basal layer. Melanin is the normal brown pigment of the skin. Melanomas metastasize early and widely and are therefore extraordinarily malignant. Fortunately, this form of cancer occurs rarely.*

Research into these forms of skin cancer and into precancerous conditions is naturally diversified. Much of the research is now centered on carcinogens, the cancer-producing agents. While most human skin cancers are of the basal cell type, this form of cancer is almost impossible to produce in experimental animals. The difficulty in applying the results of research on animals to humans is also demonstrated by the fact that carcinogens painted on different species of animals produce very different results. Mice, for example, develop skin cancers readily, while guinea pigs are quite resistant.

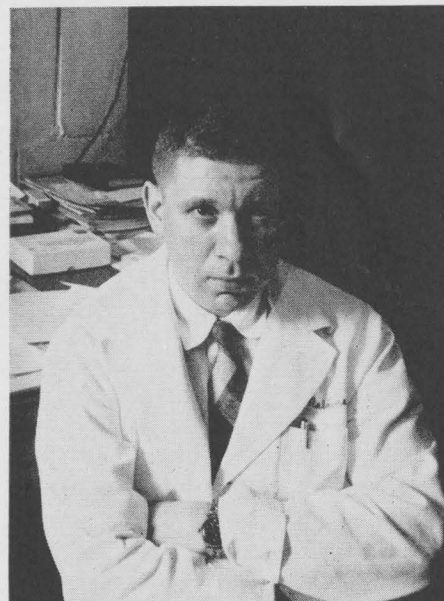
At one time, it was thought that the oily secretions of the skin might become cancer-producing on exposure to sunlight, but this has been proved false. In fact, one lipid component of the skin actually has a neutralizing effect on the induction by carcinogens of skin cancers.

In attempting to shed light upon factors which regulate the behavior of epithelial cells in the skin and which may be important in the development of skin cancer, research has focused on endocrine factors which control the growth of the cells of the oil glands. These factors are especially active at puberty. Researchers in the Section of Dermatology at the University of Chicago have recently discovered a pituitary hormone which is necessary, together with certain sex hormones, for the normal development of the oil gland cells. It is hoped that this finding will lead to other discoveries about the nature of skin cancers, which may implicate endocrine disturbances.

A most unusual subject for cancer research is the very rare skin disease, xeroderma pigmentosum. This is a mutation, and thus a genetic disorder, which results in the development of severe farmers' skin after only brief exposures to the sunlight. Individuals with this peculiar disorder rarely survive to adulthood because of the early development of numerous skin cancers.

The same portion of the ultraviolet spectrum which produces sunburn also produces farmers' skin. The fact that blondes and other persons who burn easily develop farmers' skin more readily than others, illustrates another way in which genetic factors play a role in skin cancer. Dark-skinned races are relatively immune to skin cancer, probably because of their resistance to the sunburn-producing wavelengths of sunlight.

Farmers' skin, as well as sunburn, can be prevented by the use of sun-screening protective ointments such as those containing 15% para-aminobenzoic acid. However, it has not been practical thus far to encourage the widespread and continuous use of sun-protective preparations by people chronically exposed to intense sunshine.



Dr. Frederick D. Malkinson, dermatologist whose research activities include investigation of skin cancer.

Another interesting aspect of skin cancer research relates to the cancer-inducing effect of excessive irradiation with x-rays. Until they learned how to protect themselves, the pioneer workers with x-rays suffered injuries to the skin which nearly always developed into skin cancer. It is now known that the very weak, or soft, x-rays are the most hazardous, and appropriate filters in x-ray tubes have practically eliminated this cause of cancer. The mechanism of cancer production by x-rays is not well understood although a great many studies have been done, and are now in progress. The same is true of arsenic, which causes keratosis first, and then cancer of the skin.

Melanoma has also attracted much research interest. Scientists are trying to combine radioactive isotopes with materials involved in the production of melanin in attempts to destroy selectively melanin-producing tumor cells by internal radiation. Although some degree of selective localization of radioactivity in melanomas has been achieved, a practical treatment for melanoma has yet to be developed.

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AMIF - RESEARCH AND ROAST BEEF

Today, under Dr. Bernard S. Schweigert, the AMIF has a staff of over fifty scientists working on research projects that will ultimately benefit the average American at his dinner table. These scientists represent the fields of organic, physical and analytic chemistry, bacteriology, histology, biochemistry, nutrition, home economics, food technology, and engineering. Several staff members have professorial appointments in the University's Departments of Biochemistry and Microbiology, and a number of University students have elected to do research for their graduate degrees at the AMIF.

Ask an average American to look up from his dinner long enough to guess the center of the industry which has provided his steak, chop or roast, and chances are he'll say "Chicago." He may recall Carl Sandburg's famous line, "Hog Butcher for the World." He will probably think of the thousands of head of livestock processed through the Chicago stockyards.

But ask instead the location of the scientific nerve center of the nation's meat industry, and the average American may puzzle silently a moment before returning to the cut of meat on the plate before him. He probably won't guess that scientific study of the quality of his meat, its flavor, tenderness, color, moisture, etc. is centered in a large limestone building on the University of Chicago campus.

The American Meat Institute Foundation (AMIF) was founded as a research and educational institution through the collaborative effort of the meat industry. One of the Foundation objectives is "to provide scientific information that will be of direct value in improving products and processes and in developing new products or new uses for meat and meat by-products." This objective is achieved through basic research, and education in affiliation with the University of Chicago.

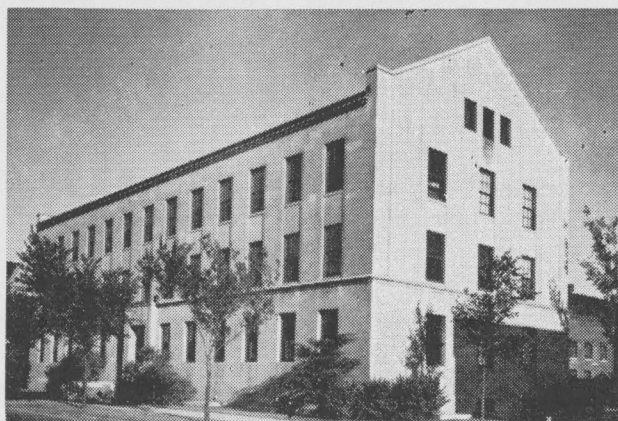
Although the Foundation was incorporated in 1944, research on meats

actually began at the University in 1924. In that year the American Meat Institute, trade association for the meat and meat packing industry, organized an industry-wide program of research and development. Through the combined efforts of Oscar G. Mayer, Thomas E. Wilson and others prominent in the industry, and Emery T. Filbey of the University, the Institute established its laboratories on the Chicago campus. The late Dr. W. Lee Lewis, who had previously headed the Department of Chemistry at Northwestern University, became director of research.

In 1944, four years after Dr. Lewis' retirement, the AMIF was incorporated as an independent, non-profit organization. It began to take over Institute research three years later under the direction of Dr. Lewis' successor, the late Dr. Henry R. Kraybill. In 1949 the Foundation, with a nucleus staff of about twenty, moved into new million dollar quarters on this campus.

The Foundation is supported by voluntary contributions from the meat industry, and by contracts and grants from governmental agencies such as the U.S. Public Health Service, the Atomic Energy Commission, the Department of Agriculture and the Department of Defense. Yearly contributions come from several hundred companies in the United States and from others in Canada, England, Ireland, Australia, New Zealand, and Central and South America.

Analytical assistance from the Foundation is available to anyone, contributor or non-contributor, on a fee basis. The AMIF service laboratory analyzes about 8,000 samples annually, submitted from approximately 300 companies. These samples of product or processing difficulties frequently serve as a "feed back" to other divisions of the Foundation by suggesting problems of basic research.

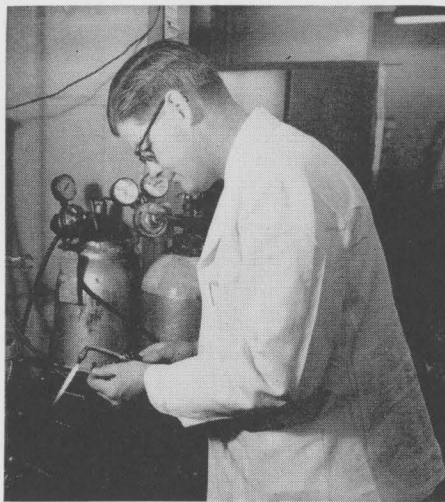


The American Meat Institute Foundation

The scope and character of this research is indicated by the following achievements:

- * *Development of basic information relating to beef tenderization, dehydration and irradiation treatment*
- * *Development of a pure starter culture for rapid flavor production in summer sausage*
- * *Development of information on the cause, detection and means of prevention of certain types of bacterial food poisoning*
- * *Development of practical information on lard processing, smokehouse control, hog dehairing and rendering temperature control*
- * *Development of information on the causes and means of prevention of various types of discoloration in sausage, vinegar, pickled meats, and other products*
- * *Development of the use of by-product animal fats in mixed feeds which has provided a market for millions of pounds of tallow and grease*

The AMIF does not actively promote industrial application of its research, but relies on what might be called "the better mouse trap" approach. Foundation achievements are reported in bulletins, circulars and papers published in scientific and technical journals. These publications are mailed to Foundation supporters, to research and educational institutions and to others on request. More than 250 AMIF publications have been issued thus far, and the in-



Dr. C. F. Niven seals bacterial cultures into vials during test of irradiation sensitivity of spoilage microorganisms.

formation contained therein has proved invaluable to the industry. The Foundation strives for judicious distribution of the scientific and technical information it has developed.

Major investigations now in progress at the American Meat Institute Foundation give further indication of the nature of its work. These include basic studies that will have a bearing on:

- * *Meat preservation through irradiation, antibiotics, packaging and bacteriology—*
- * *Beef tenderization through high temperature aging, tenderizing agents and chemicals—*
- * *Meat color and discoloration—*
- * *Nutritive values of meat, including vitamin B₆, other B vitamins, amino acids, and fats—*

The actual workings of the Foundation can best be illustrated by following the course of one of its recent investigations. In March 1954, AMIF staff members initiated a program of research and experimentation that led to the development of a pure starter culture for summer sausage. Most varieties of summer sausage are fermented meat foods, as are thuringer cervalet, Lebanon bologna and some types of salami.

After developing a purified strain of *Pediococcus cerevisiae*, Deibel and Niven began a long series of experiments. Preliminary studies revealed that the pure culture was the source of traditional summer sausage flavor, but the effectiveness of the culture and of various processes of manufacture had yet to be test-proven under carefully varied conditions.

Assisting with production of summer sausage in the Foundation's laboratories were Drs. George D. Wilson and M. C. Urbin of the division of food technology. As investigation progressed, the AMIF product was compared with commercial samples by a taste panel under the direction of Dr. C. Edith Weir of the division of home economics.

Wilson, one of the six to eight panel members who tested the individual batches of sausage described this phase of the project. "The central flavor of sausage is tangy, a combination of acids and spices, primarily pepper, in this product." He explained that uninoculated sausage tends to have a lot of "flavor notes," or extraneous flavors not present in the inoculated sausage. "The new product has a more homogeneous flavor."

The taste panel generally used two or three commercial products with each test batch. Comparisons were complicated by the varying spice formulae in the commercial sausages. Pepper, sugar, salt, mustard seed, coriander, nutmeg and allspice are all used occasionally, and each commercial brand has its own formula.

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FEATURE STORY (Cont'd.)

Foundation scientists had worked on the problem of developing a starter culture since 1948. It was known that commercial production of summer sausage depended on chance inoculation of the sausage meat with the bacteria responsible for its tangy, fermented flavor. This uncontrolled fermentation often resulted in spoilage of large quantities of sausage through lack of flavor, softening, gasiness, lack of color or a combination of these.

It was also known that commercial production of other fermented foods such as cheeses, bread and certain milk drinks had yielded to controlled fermentation. This has been accomplished for the most part by the isolation and characterization of the responsible microorganisms, and by their deliberate addition in pure culture to the respective foods.

Intensive research was begun by R. H. Deibel and Dr. C. F. Niven, Jr., of the AMIF division of bacteriology. Their studies of commercial sausage showed the frequent occurrence of the bacterial genus *Pediococcus*. This microbe had been recognized previously as being important in the desirable fermentation of pickles, sauerkraut and other food products.

Deibel and Niven were able to correlate their studies with the previous research findings of Carl S. Pederson of the New York State Agricultural Department. In 1949 Pederson had reviewed the genus *Pediococcus* and reclassified most of the previously described species into the one group, *cerevisiae*. The pediococci isolated by Deibel and Niven conformed in almost all respects to Pederson's description of this species.

The two men were also aided by the basic research performed by Eileen Wolin who was working on her master's thesis in the University's Department of Microbiology. This research, performed in conjunction with Dr. Niven, provided information on the nutrient requirements of this group of microorganisms.

Early in 1956, two years after the beginning of their research effort, Deibel and Niven arrived at a satisfactory culture. This culminated in an effective process for the production of summer sausage of a superior texture, tangy clean flavor, and uniformity from batch to batch. Moreover, their process eliminated three of the usual seven steps in sausage production, *reducing the total time from seven days to 48 hours!*

In September of last year the Foundation issued a circular outlining the 48 hour process. Meanwhile Merck and Co., Inc. of Rahway, New Jersey had contacted the Foundation concerning commercial distribution of the starter culture. A non-exclusive licens-



Meat and meat products under study as part of the Foundation's research programs are tested by a taste panel.



Members of the Foundation Bacteriology division examine many specimens during determination of bacterial sterilizing effect of various levels of irradiation of meat.

ing agreement was reached, and the Deibel-Niven team cooperated in developing a method of freeze-drying the culture so that it could be distributed to the sausage industry more conveniently. Samples of the culture were available from Merck at the time of the Foundation circular.

Merck first offered the culture for sale in March of this year, and now the AMIF is awaiting results of their better mouse trap approach. Said Niven, "I suspect that in a couple of years this or some other starter culture will have widespread use. Quality control is a very important thing in the food industry. The starter culture should assure that pretty well."

The development of a faster, better method of processing summer sausage is one example of the comprehensive program of research. Thus, the American Meat Institute Foundation continues to seek information that will assure the quality of meat and its by-products and improve meat processing. The success of the AMIF operation is a credit not only to the far-sighted sponsorship of the industry but also to this University.