

THE MINIMAL EDUCATION REQUIREMENTS
FOR A NON-PROFESSIONAL PROCESSING INSPECTOR

by

DOUGLAS LYNN BERNDT

B.S., Kansas State University, 1969
D.V.M., Kansas State University, 1970

613-8301

A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

in

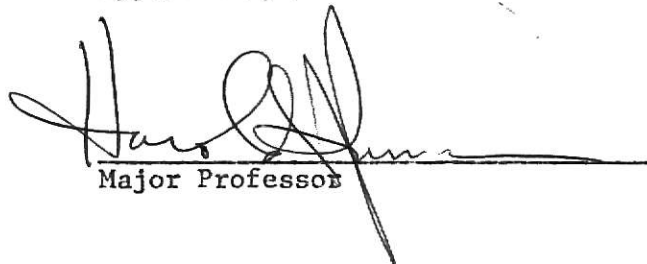
Food Science

Department of Animal Science and Industry

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

Approved by:


Major Professor

ACKNOWLEDGMENTS

LD
2668
R4
1973
B47
C.2
Docu-
ment

The author wishes to express sincere appreciation to Dr. H. J. Tuma, major professor, for his very sincere guidance and assistance during this masters program. Appreciation is also expressed to Dr. D. C. Kelley and Dr. J. Barton-Dobenin for serving on the supervisory committee and their efforts in aiding the design and preparation of this report.

Special thanks are extended to Dr. R. E. Owens, Dr. A. J. Moore, Dr. T. J. Clayton, Dr. D. E. Schafer, Dr. A. D. Dayton, and Dr. D. H. Kropf of Kansas State University and Dr. William Stringer of the University of Missouri for their assistance and professional expertise during this study.

Gratitude is also expressed to Dr. M. A. Simmons, Chief of the Training Branch of the Meat and Poultry Inspection Program, for his assistance and stimulus throughout the author's masters program.

The author is especially grateful to the Meat and Poultry Inspection Program for allowing him to continue his education and obtain a graduate degree at Kansas State University.

ORGANIZATION OF THE REPORT

This report is presented as a series of chapters. Chapter I includes a general introduction of the various training programs used in the Meat and Poultry Inspection Program. A statement of the objective of the total study is also provided. Chapter II describes the procedure used in the study in obtaining the specific information.

The total training program consists of five subject areas. The five chapters following the procedures deal with each subject area of the program. Each chapter is written in the form of an introduction which describes the problem, course of instruction required, and a discussion.

Chapter VIII is a comparison and summerization of the entire report. The Processed Food Division is under the Meat and Poultry Inspection Program. This Program is under the control of the Animal and Plant Health Inspection Service which is under the offices of the United States Department of Agriculture.

TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGMENTS	ii
ORGANIZATION OF THE REPORT	iii
CHAPTER	
I GENERAL INTRODUCTION	1
II PROCEDURES	4
III MICROBIOLOGY	6
Introduction	6
Course of Instruction	6
Discussion	8
IV SANITATION	10
Introduction	10
Course of Instruction	11
Discussion	12
V STATISTICS AND MATHEMATICS	14
Introduction	14
Course of Instruction	14
Discussion	16
VI MEAT AND CHEMICAL CHEMISTRY	17
Introduction	17
Course of Instruction	18
Discussion	21
VII FOOD PROCESSING	24
Introduction	24
Course of Instruction	24
Discussion	27
VIII SUMMARY	29
REFERENCES	32
APPENDIX	34

CHAPTER I

GENERAL INTRODUCTION

The diversity of meat and poultry processing operations call for well-qualified inspectors having the technical training and background necessary to evaluate controls used by the manufacturer of these products. As food processing has developed, more and more ready-to-eat, heat-and-serve, and fully processed meat and poultry products move from the manufacturing plants into the consumer's kitchen; they bring with them all the problems of sanitation, prevention of food poisoning and many of the more difficult problems associated with adulteration and misbranding. The non-professional food inspector today must be better trained and better qualified with an educational background that will keep him aware of current trends and allow him to give the consuming public the type of protection needed in the processing of meat and poultry products (6, 15).

The Meat and Poultry Inspection Program of the United States Department of Agriculture has experienced greater advancement in the basic and continued training of its processing personnel in the last decade than during the first fifty years of its existence (15). This is not to imply that all early training practices were unacceptable. Deficiencies of early training practices were generally recognized to be lack of program uniformity, delayed employee development and self-fulfillment, and reduced manpower flexibility because of incomplete work qualifications of the inspectional force.

The lack of uniform training practices and the absence of central program direction were the major underlying causes in these early years. In 1964 the first nationwide program of in-plant slaughter inspection

training was adopted by the Federal Meat and Poultry Inspection Program (15). This training initially applied to veterinarians just entering the inspection service. Throughout the years it has been extended to non-professional personnel as well.

In 1968 the Meat and Poultry Inspection Program believed that the theoretical knowledge and skills of its non-professional processing inspectors needed to be upgraded again. Reasoning behind this idea was that the meat industry over those few years had experienced much technical innovation and was using new ingredients, additives, and more sophisticated methods in the preparation of processed meat foods. In addition, newly hired packer and processing plant employees, with whom the Federal and State inspectors deal on a daily basis, were better and more technically educated than in earlier years (4).

After considering numerous alternatives, a university-based scheme was decided upon as offering the most advantages of upgrading the education of the employees of the Processed Meat Inspection Division. It was believed that this proposed educational scheme could most economically and efficiently be carried out on a university campus with the theoretical topical areas being taught in classrooms by university faculty with the Federal regulatory aspects of processing inspection being taught by a Federal Resident Instructor. Homogeneity of trainee population would be maintained by pre-selection of potential trainees by the Government and by university sponsored quick review courses to be used to aid persons in areas of initial difficulty.

In 1969 the proposal of Ohio State University was accepted by the Meat and Poultry Inspection Program. This proposal was based on a five week training course involving fifty trainees per cycle. The decision

for the five-week period was made after evaluating the amount of subject matter that should be covered in order to meet the requirements proposed by the Program. The course material was developed cooperatively by the Department of Animal Science, College of Agriculture and the Department of Veterinary Medicine, College of Veterinary Medicine. The topic elements of the training course would be conducted by an experienced Meat Science and Veterinary faculty (7).

Although this training program has worked well for the past four years, the Ohio State Program will be discontinued in May 1973. The ever increasing and diversified processing operations in the meat and poultry industries have placed a heavy burden on this program. The length of time necessary for training only fifty people has not allowed the Meat and Poultry Inspection Program to keep up with the fast pace of industry.

In this study the objective was to estimate the minimal educational requirements for the non-professional processing inspector. Since the feasibility of the present five-week training course is questionable as to the amount of time needed, a detailed study of this type can be used to determine the time required for a minimal educational program. After determination of these educational requirements, the Meat and Poultry Inspection Program can use them to develop an education training course which will increase the educational level of the inspector consistently and with uniformity in the least amount of time. A system design of this type will enable the inspectors to understand the newest techniques and be on a par with their industrial counterparts (9, 18).

CHAPTER II

PROCEDURES

A minimal educational level of a high school graduate was used as a basic starting point in the design of this study since most inspectors in the Meat and Poultry Inspection Program have a high school education. The level of education of the candidate is not of major consideration because inspectors chosen by the Program have a minimal of three years of slaughter inspection experience and the time interval from his formal education may be excessive. The job which this study is based upon is the GS-7 Food Inspector as described by the Position-Classification Standards for Food Inspection Series (GS-1863) as listed in the Appendix. The reason for choosing this grade level is that the GS-7 Inspector is the first level in which processing inspection can be assigned to the inspector. Although the personnel or classification standards have been changed from GS to SJ Standards within the last year, the basic standards used in this study have not changed significantly.

Since many types of educational methods exist for developing short course training programs, the assistance of professional educators in curriculum development was sought. After consulting Dr. R. E. Owens, Associate Professor of Educational Resources and Dr. A. J. Moore, Professor and Head of Curriculum and Instruction at Kansas State University, a combination type program was deemed most appropriate for the processing inspector training program. Implementation of this type of program requires three steps: 1) an introductory booklet, containing background information of each subject area and situational questions and examples, which is sent to the inspector some four to six weeks prior to the

classroom training period, 2) a two or three-week classroom training session in which lectures, demonstrations, and laboratories are used, and 3) a follow-up program to analyze the inspector after his initial training and to determine the effectiveness of the training program in achieving its goal. It was felt that this type of program minimizes student fatigue and boredom since most of the participants are not used to classroom situations.

The inspector's job was evaluated and five instructional areas were identified to meet the job specifications. These five courses consist of: (1) Microbiology, (2) Sanitation, (3) Statistics and Mathematics, (4) Meat and Chemical Chemistry, and (5) Food Processing. The procedure for determining the minimal educational requirements was done by interviewing five educators who had expertise in the areas corresponding to each subject area listed. Before interviewing these educators, a brief summary of the GS-7 Inspector's duties was given to each. They were allowed to study the nature of the assignment and the level of responsibility for approximately six weeks before the interview was given. An attempt was also made to answer all questions relating to the inspector's job before the interviews were started. From the interviews, information on what should be contained in the booklet and what needed to be taught in the classroom was obtained. The author's formulation of the minimal educational training course for non-professional processing inspectors was determined by examining the rationale behind each course and determining the feasibility of the material by using criteria such as time required, prerequisites needed, and the importance of material.

CHAPTER III

MICROBIOLOGY

I. Introduction

The field of microbiology is very diverse and is usually subdivided into several types. Since meat and poultry processing operations are the areas of concern in this study, the field of meat microbiology becomes of major importance; however, food microbiology which covers the areas of spices, seasonings, extenders, etc., must be included in the training of the processing inspector (19). From the raw product to the processing of food, storage of the finished product, and eventual consumption, the processing inspector must concern himself with all phases of food processing and products, the quality control program, and the sanitation program of the food plant. This effort by the inspector will give the consumer some assurance that food products will be free from disease-causing microorganisms and free from microbes that might cause spoilage or undesirable flavors in food and render it unfit for consumption (10, 13, 19). To accomplish this objective, an introductory course outline of microbilolgy was developed for the non-professional processing inspector under the guidance of Dr. T. J. Claydon, Professor of Dairy and Poultry Science at Kansas State University.

II. Course of Instruction

Booklet:

The history of microorganisms and how they relate to man and his environment should be one of the most important parts of this introductory booklet according to Dr. Claydon. With this historical background, the

inspector can relate the importance of food microbiology to the micro-organisms which may cause disease or death in man. Once the inspector is introduced to these concepts, further study of microbiology as it relates to food products can be brought to their attention in the lecture material.

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
1. Nature and Characteristics of Microorganisms	Lecture & Demonstration	1 hour 2 hours
a) Yeasts, molds, bacteria, viruses, and protozoa		
b) Size, composition, and morphology		
c) Reproduction and growth		
2. Factors Affecting Development and Destruction	Lecture	1 hour
a) Development--temperature, time, water, pH, nutrients, salt, oxygen reduction, and surface tension		
b) Destruction--heat (dry and wet), autoclaving, pasteurization, sunlight, ultraviolet light, dessication, freezing, and chemical methods		
3. Culturing	Lecture & Laboratory	1 hour 4 hours
a) Microscopic methods		
b) Cultural methods--media, inoculation, incubation, and propagation		
c) Aseptic techniques		
d) Enumeration--standard plate counts and direct microscopic counts		
4. Importance of Food Microbiology	Lecture	1 hour
a) Pathogens in food products		
b) Spoilage of food		
c) Desirable changes in food products		
(1) Cured meats		
(2) Cheese products		
5. Sanitation and Public Health Aspects	Lecture	1 hour
a) Food-borne diseases		
b) Sanitary prevention and regulatory control		

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
6. Methods of Determining Quality Control of Food Products	Lecture & Laboratory	1 hour 2 hours
a) Bacterial estimates		
(1) Routine counts		
(2) Dye reduction tests		
b) Tests of organism types		
c) Quality tests		
7. Contamination in Foods--Meats	Lecture & Laboratory	1 hour 4 hours
a) Sources		
b) Conditions promoting increases		
(1) Temperature		
(2) Time		
(3) Handling		
c) Conditions promoting decreases		
(1) Refrigeration		
(2) Freezing		
(3) Additives		
8. Types of Microbial Spoilage in Meats	Lecture	1 hour
a) Microorganisms involved		
b) Characteristics		
(1) Flavor changes		
(2) Surface changes		
	Total	20 hours

III. Discussion

This type of course allows the inspector to become familiar with the basic elements of microbiology before he is introduced to the food aspects. Dr. Claydon's idea of this concept allows the inspector to correlate the two areas much better than teaching them as one. It should be mentioned that the laboratory periods follow in sequence with the lecture sessions. A course of this type will have to be taught in a combination lecture-laboratory room capable of showing demonstrations and audio-visual presentations by the instructor. The study of microorganisms can be extremely complex for the processing inspector so the various aspects of teaching

such as the use of visual aids throughout the lecture sessions is definitely needed according to Dr. Claydon.

CHAPTER IV

SANITATION

I. Introduction

"Sanitation is a way of life. It is the quality of living that is expressed in the clean home, the clean farm, the clean business and industry, the clean neighborhood, the clean community and clean people. Being a way of life, it must come from within the people. It is nourished by knowledge and grows as an obligation and an idea in human relations." This quotation taken from a poster credited to the National Association of Sanitarians attempts to explain sanitation as something simple to define but yet complex to achieve. It points up the fact that sanitation is a continuing program that must be promoted and monitored by all who are involved with food processing (3). Since managing a sanitation program in the meat industry is similar to any other industry, sanitation deals mainly with the management or, basically, with people (13, 17). The processing inspector's responsibility is to assess the entire sanitation picture and to show that a well-conducted program can lead to improvements in product quality, extended shelf life, and a reduction of product losses, to say nothing of the improvements in efficiency and the public image. In order for an inspector to fulfill this responsibility, he must be introduced to the fundamental principles and practices involved in maintaining acceptable sanitary standards in a food plant (5, 7). What basic concepts of sanitation would benefit the inspector in dealing with these situations? With this question in mind and the aid of Dr. William Stringer, Associate Professor of Food Science at the University of Missouri, a course outline was developed for the processing inspector.

II. Course of Instruction

Booklet:

A review of basic personal habits of both the inspector and plant personnel must be stressed in this introductory material according to Dr. Stringer. It is his opinion that the area of personal habits has not been stressed in past training programs. Brief explanations on what sanitation consists of and why sanitation plays a role in the inspector's job should also be included. Examples of sanitation problems and the fundamental ways of correcting them are of the utmost importance. By giving the what and why of sanitation along with the examples, Dr. Stringer believes the inspector will become more aware of the situation thus a correct attitude is created, allowing him to perform the assigned duty better.

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
1. Personal Hygiene	Lecture	8 hours
a) Personal habits		
b) Dress		
c) Health standards		
d) Attitude of cleanliness		
(1) Conditioning of inspector		
(2) Communication to employees		
2. Equipment Construction	Lecture & Film	1 hour 1/2 hour
a) Types		
b) Design for cleaning		
c) Methods of cleaning		
(1) Procedures		
(2) Actual observation		
3. Physical Facilities	Lecture	2 hours
a) Awareness of trouble areas		
(1) Curing areas		
(2) Tables and saws		
b) Maintenance		

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
c) Methods of cleaning (1) Procedures (2) Actual observation d) Rodent and fly control (1) Prevention (2) Methods of control		
4. Products	Lecture	2 hours
a) Basic characteristics (1) Refrigeration temperatures (2) Freezing requirements b) Handling of products (1) Need for control (2) Sources of contamination		
5. Air and Ventilation Control	Lecture	1/2 hour
a) Sources of intake b) Odors c) Contaminants d) Gases		
6. Water and Ice	Lecture	1 hour
a) Standards b) Trouble areas (1) Containers (2) Ice machines		
7. Waste Disposal and Removal	Lecture	1 hour
a) Restroom facilities (1) Maintenance (2) Cleanliness b) Plumbing connections		
	Total	16 hours

III. Discussion

The main objective of Dr. Stringer's course is to create the proper attitude of sanitation. In order to achieve a desirable total plant-product, the basic principles of personal hygiene must be stressed in the training program. It is the belief of Dr. Stringer that personal hygiene has not been emphasized in the past so he has devoted one-half

of the classroom time and part of the booklet to this area. It is his opinion that this training along with communicating with management will eliminate a significant portion of the sanitation problems.

In other areas of his course, Dr. Stringer believes a film showing actual equipment cleaning will benefit the inspector. The inspector should actually observe the cleaning process in his duties rather than the normal pre-operation sanitation review of equipment that is currently being done in most food plants. This will allow the inspector to develop and maintain a good sanitation program which will continue to function even in the inspector's absence. It is recommended that selected visual aids be used in reference to the lecture material. This will allow the inspector to become familiar with a wide variety of equipment and physical facilities. With this type of training, the proper attitude, and the regulations, an inspector will be able to apply the basic concepts he has learned to the practical sanitation problems he encounters in the food plant.

CHAPTER V

STATISTICS & MATHEMATICS

I. Introduction

Statistics deals with techniques for collecting, analyzing, and drawing conclusions from data. This type of description helps explain why an introduction to higher mathematics and statistical methods are useful to the processing inspector (12, 14). The inspector must have a basic knowledge of statistics so that he can use and understand sampling techniques necessary for the verification of minimal federal requirements. If he understands and knows statistical methods well, he will understand the probabilities involved of making a correct or incorrect judgment. With this objective and the help of Dr. A. D. Dayton, Associate Professor of Statistics at Kansas State University, a course outline for statistical training for non-professional processing inspectors was developed.

II. Course of Instruction

Booklet:

The area of sampling should be stressed much more than statistical methodology in this type of introductory material according to Dr. Dayton. Since people who do not understand statistics usually react in extreme manners from acceptance to rejection, a general introduction to population sampling with reference to statistics will tend to make the inspector understand the logic of statistical methods. Information on why statistics are needed will also help the inspector understand how to sample and how to interpret the results from the sample.

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
1. Basic Definitions and Notations	Lecture	1 hour
a) Definitions		
b) Notation		
c) Simple random sampling		
2. Descriptive Statistics	Lecture & Laboratory	3 hours 2 hours
a) Distribution forms and shapes		
b) Forming distributions		
c) Graphing distributions		
d) Measures of locations		
e) Measures of dispersion		
3. Models for Data	Lecture & Laboratory	3 hours 2 hours
a) Introduction		
b) The binomial distribution		
c) The hypergeometric distribution		
d) The normal distribution		
4. Sampling Distributions	Lecture & Laboratory	3 hours 2 hours
a) Introduction		
b) Point estimation of parameters		
c) Sampling distributions of the sample mean		
d) Sampling properties of point estimators		
5. Inferences and Uses	Lecture & Laboratory	1 hour 1 hour
a) Tolerance intervals		
b) Confidence intervals		
6. Correlation	Lecture & Laboratory	1/2 hour 1/2 hour
a) Introduction		
b) Correlation analysis		
7. Sampling	Lecture & Demonstration	11 hours
a) The estimation of sample size		
b) Stratified random sampling		
c) Systematic sampling		
Total		30 hours

III. Discussion

The reasoning behind this type of course outline is that sampling and being able to interpret results of sampling techniques are most important to the inspector's job. Therefore, Dr. Dayton has designed this course so that the inspector has an introduction to the basic statistical principles before continuing into the different phases of statistics. This attempt will allow the inspector to know what statistical information, from a sample, is important and what the results tell him (as well as what they do not tell him) about the population sampled. The sampling laboratory which is a major part of the course is very important in Dr. Dayton's opinion since the lab will allow the inspector to practice sampling and become confident in interpreting results.

CHAPTER VI

MEAT & CHEMICAL CHEMISTRY

I. Introduction

The science of chemistry can be very complex because the depth of study which is often required is overwhelming to many people. A person may be convinced chemical experiments are performed under mysterious powers and that he can not understand them (11). This ideology is unrealistic since there is no real escape to chemistry. Everything one touches, sees, smells, eats, or breathes is chemical. Certainly it is not necessary for a person to understand the complete chemical process of life but a basic understanding is needed (11).

The interest and activity in meat chemistry has expanded steadily, not only within industry, but also in universities and federal laboratories. The trend of many training programs involving meat as a science has been to develop the concept into the area of processing or manufacturing of all foods (8, 13). These programs allow the inspector or any person in industry to grasp a better understanding of chemical reactions involving meat. This trend will continue as further knowledge is gained on the physical and chemical characteristics and functional properties of food elements and meat.

A processing inspector is required to make many decisions involving chemical reactions. The better he understands these reactions, the more intelligent will be his judgment. In order for the inspector to understand various manufacturing processes, he must know the reasons why meat acts as a chemical and why it reacts in a specific fashion to a given ingredient. Since additives play a very important role in many

processes, the inspector should have an understanding of their biochemical reactions with meat and the methods used in their analysis. With these concepts in mind and under the direction of Dr. D. H. Kropf, Professor of Animal Science at Kansas State University, a course in meat chemistry for the non-professional processing inspector was derived.

II. Course of Instruction

Booklet:

An introduction into the field of chemistry is definitely needed for background information. It is Dr. Kropf's opinion that this information will allow the inspector to be better prepared for the classroom lectures. Generality should be stressed in the booklet since too much detail at this early stage of training will tend to make the inspector shy away from the subject.

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
1. Introduction to Chemistry	Lecture	1/4 hour
a) Universality		
b) Relationship to meat		
2. Water	Lecture	1/2 hour
a) Importance as a diluent		
b) Addition to meat products		
3. Fats	Lecture	3/4 hour
a) Chemical reactions		
(1) Antioxidants		
(2) Interesterification		
(3) Major biological functions		
4. Fat Oxidation	Lecture	3/4 hour
a) Deterioration		
b) Flavor changes		

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
5. Proteins	Lecture	1 hour
a) Chemical elements b) Conversion techniques c) Chemical reactions (1) Hydrolysis (2) Digestion d) Locations in muscle e) Enzyme reactions f) Major biological function		
6. Enzymes	Lecture	3/4 hour
a) Major biological function b) Role in deterioration of muscle (1) Time (2) Temperature		
7. Pigments	Lecture	3/4 hour
a) Myoglobin b) Hemoglobin c) Chemical composition		
8. Color	Lecture	1 hour
a) Meat color reactions (1) Myoglobin (2) Oxy-myoglobin (3) Metmyoglobin (4) Oxidized forms b) Role of contaminants (1) Copper (2) Zinc (3) Miscellaneous c) Role of temperature d) Cured meat color reactions e) Off colors of meat		
9. Ash	Lecture	1/4 hour
10. pH	Lecture	3/4 hour
a) Chart relationship to acids and bases b) Controlling bacterial growth c) Relationship to bacteria d) Post-Mortem changes (1) Dark-cutters (2) PSE pork		

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
11. Food additives	Lecture	3 1/2 hours
a) Role in the food industry b) Salt c) Sweetners d) Nitrate and nitrite (1) Function (2) Overuse e) Reducing compounds f) Cure accelerators g) Phosphates h) Water (1) Limitations (2) Contribution to the product i) Emulsion products (1) Extraction of myosin by salt (2) Role in food processing (3) Limitations and calculations j) Binders (1) Limitations (2) Differentiation k) Flavoring agents (1) Hydrolyzed plant protein (2) Monosodium glutamate (3) Smoke l) Spices m) Coloring agents n) Starter cultures o) Tenderizers p) Preservatives q) Gums r) Miscellaneous (1) Gases--CO ₂ , N ₂ , Ozone (2) Wrapping materials (3) Casings		
12. Cooking and Heating	Lecture	1/4 hour
a) Chemical changes b) Reasons for use (1) Yield (2) Bacterial control (3) Parasitic control c) Tenderness relationships		
13. Freezing	Lecture	1/4 hour
a) Physical and chemical changes (1) Drip loss (2) Water holding capacity		

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
14. Methods of Analysis	Lecture & Film	4 1/4 hours 1 hour
a) Zones of limitations		
b) Sampling requirements		
(1) Mixing and grinding		
(2) Handling		
c) Fats--oxidation characteristics		
(1) Free fatty acid		
(2) Peroxide number		
d) Protein		
e) Salt		
f) Nitrate and nitrite		
(1) Spot test		
(2) Quantitation test		
g) Phosphate		
h) Residues		
(1) DES		
(2) Pesticides		
(3) Antibiotics		
i) Levels of legal additives		
(1) Tracers		
(2) Dried milk		
j) Meat type species		
k) Methods of microscopic detection		
l) Mechanical adulteration		
m) Intentional additives		
(1) Sulfites		
(2) Boric acid		
(3) Miscellaneous		
	Total	16 hours

III. Discussion

The detail seen in this course indicates the complexity of teaching this subject. Dr. Kropf's outline allows the inspector to be introduced to the general area of chemistry before actual instruction of the different elements is attempted. This procedure actually supplements the booklet thus the inspector should understand the basics before he is introduced to the specifics. Dr. Kropf's idea of teaching each element separately allows him to go into more detail thus better understanding results. This approach also allows the instructor to cover more material

in less time which is essential to the training program. The use of audio-visual aids is a must according to Dr. Kropf. The use of slides in sequence with the lectures will answer many questions which may arise throughout the course. A film demonstrating the methods of analysis is definitely needed, for this will allow the inspector to appreciate the what and why of sampling meat products. Thus a feeling of competence can be experienced by the inspector as he attempts to fulfill his duties.

CHAPTER VII

FOOD PROCESSING

I. Introduction

Technological developments in the meat processing industry have stimulated much interest in the last few years. People in industry and educators have had to extend themselves in an effort to keep pace with the ever-changing developments (2). In manufacturing food products, the inspector must assure that the processes employed are those that are normal for the particular products (1, 16). These activities are not permitted to impair the wholesomeness of the product, to result in adulteration, or to impart a deceptive character to the finished product. To accomplish these objectives, the inspector should have training in the normal processing of each product and knowledge of these steps in those areas where deviations from the normal might occur. With this knowledge the inspector can provide more effective control and supervision over handling procedures, processing and packaging of meats, preparation of emulsion products, canning and curing operations, freezing methods, and smoking procedures (1). Since the inspector must continually up-date his knowledge in food processing, a training course should be developed which presents practical information but yet stimulates continued interest in learning through reference to other sources (2). This practical approach to teaching can be seen in the course developed by Dr. D. E. Schafer, Assistant Professor of Animal Science at Kansas State University.

II. Course of Instruction

Booklet:

A background in processing terminology and principles is definitely needed in the introductory material. Dr. Schafer believes that this will greatly facilitate in-class learning for the inspector. A lesson outline in the booklet would be beneficial in keeping the most up-to-date material to the inspector. It is Dr. Schafer's opinion that contacts by correspondence are needed so that the instructor can evaluate the pre-classroom progress of the inspector. Situational examples could be used for the assignments which might stimulate self study and in addition could help the instructor determine what particular areas to stress in the lecture sessions.

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
1. Processes Encountered	Lecture	4 hours
a) Curing		
(1) Principles		
(2) Control		
(3) Temperatures		
b) Smoking and heat treatment		
(1) Principles and function		
(2) Types and methods		
c) Sausage production		
(1) Phases		
(2) Temperature effects		
(3) Time effects		
(4) Color development		
(5) Cooking & smoking		
d) Freezing and defrosting		
(1) Temperature effects		
(2) Packaging and storage		
e) Canning		
(1) Processing		
(2) Containers		
(3) Storage		
f) Specialty products development		
g) Dehydration and freeze dehydration--brief coverage		
(1) Procedures		
(2) Quality control		
(3) Rehydration techniques		

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
h) Irradiation--brief coverage (1) Sources (2) Methods (3) Packaging and storage		
2. Processing Equipment	Lecture	8 hours
a) Use and maintenance b) Machines changing meat form (1) Deboners (2) Saws (3) Grinders (4) Emulsifiers (5) Choppers (6) Slicers (7) Shapers and pressors (8) Mixers (9) Extruders and stuffers (10) Linkers and peelers c) Equipment changing product character (1) Pumping machines--curing (2) Cooking containers (3) Smokehouses--heat & smoke (4) Retorts for canning (5) Refrigeration d) Meat product servicing equipment (1) Weighing devices (2) Packaging machines (3) Handling and moving devices (4) Temperature monitoring devices		
3. Field Trip to a Processing Plant		8 hours
4. Ingredients and Additives	Lecture	8 hours
a) Curing ingredients (1) Nitrates and nitrites (2) Salt (3) Sugar (4) Ascorbates (5) Artificial sweeteners b) Spices and seasonings c) Antioxidants d) Binders (1) Extenders (2) Chemical e) Fillers f) Artificial coloring g) Enzymes		

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
h) Water and ice i) Bacterial starter cultures j) Vegetables and fruits k) Vinegar and lactic acid l) Mold inhibitors		
5. Packages and Containers	Lecture & Demonstration	4 hours
a) Uses (1) Forming products (2) Provide sterile conditions (3) Display in retail trade (4) Prepare full meals (5) Separation of meat products (6) Label requirements for display b) Properties (1) Transparency or opaqueness (2) Water impermeability (3) Degree of oxygen permeability (4) Mechanical strength (5) Heat sealability (6) Resistance to physical means (7) Labeling (8) Convenience of opening (9) Toxicity (10) Attractiveness (11) Edible requirements c) Materials available (1) Paper (2) Aluminum foil and cans (3) Lacquered steel cans (4) Cellophane (5) Polyethylene (6) Polyvinyl chloride copolymers (PVC) (7) Polyvinylidene chloride (PVDC-Saran) (8) Ethylene vinyl acetate (EVA) (9) Polychlorotrifluoroethylene (Aclar) (10) Polypropylene (11) Nylons (12) Cellulose casing- types (13) Natural casings (14) Reconstituted collagen casing (15) Combinations and laminations d) General labeling requirements		

<u>Subject:</u>	<u>Type of Instruction:</u>	<u>Time:</u>
6. Sampling Methods	Demonstration & Laboratory	4 hours
a) Sample variation		
b) Discussion of chemical and micro-biological tests		
7. Product Abnormalities	Lecture	4 hours
a) Color variations		
(1) Salt		
(2) Microbiological		
(3) Nitrite overuse		
(4) Chemical adulterants		
(5) PSE and dark-cutters		
(6) Others		
b) Flavors changes		
(1) Microbiological		
(2) Rancidity		
(3) Improper mixing of ingredients		
(4) Freezer-burned products		
8. People Problems	Laboratory	4 hours
a) Philosophy of maintaining inspection standards		
b) Class participation examples on plant problems		
9. Summation and Conclusion	Lecture	4 hours
a) Discussion sessions		
b) Overall review		
	Total	48 hours

III. Discussion

The outline of this course is unique in that the breakdown is by major topics with details appearing under each subject. Dr. Schafer's idea on this approach is that it helps to make the in-class training sessions more effective. This approach also allows a greater opportunity for dialogue from the inspector and yet maintain in-depth learning.

The course is developed so that the lectures will reinforce and expand

on knowledge gained in the preparatory studies from the booklet. Dr. Schafer's opinion on dialogue between the instructor and student with first hand exposure to processing situations will increase competence and instill confidence within the inspector. Another interesting part of Dr. Schafer's course is in his recommendation of a field trip to a processing plant. His belief on this action is that the inspector can reinforce his classroom learning by actually observing the processes and equipment used in the plant. Audio-visual aids are also required to demonstrate the various principles and processes in conjunction with the lecture sessions. Viewing the entire course, one can see a realistic but very practical approach to this complex area of food processing.

CHAPTER VIII

SUMMARY

In analyzing the course outlines, it is very evident that different teaching approaches exist. The order of courses given in this report by no means suggests that other arrangements cannot occur. Portions of some of the courses may be taught together or in any combination, but it is the opinion of the author that the design of this program allows each course to progressively reinforce the teaching of another. Under the Microbiological section, generalities are emphasized more so than details. Although detailed areas can be seen, the course is designed to prepare the inspector for the Sanitation section of the program. Some overlap can be seen in the two sections as would be expected since the two subjects are closely related. Sanitation stresses personal hygiene quite extensively but other areas are kept general and simple. Statistics is the one course that is common to all others. Since sampling plays a great role in the inspector's job, the basics are needed to make him confident in sampling procedures and interpreting results. The statistics course is designed so the labs follow in sequence with the lectures thus allowing the inspector practice in sampling techniques.

The remaining subjects of Meat Chemistry and Food Processing may be viewed as one. These areas are so related and each require so much detail that it becomes very impractical to separate them for analysis. It is not denied that different areas are seen in each, but the majority of items are very similar. Food additives, color reactions, ingredient reactions, and methods of analysis are just a few which each describes in detail. This inter-relationship again allows each to reinforce the

teaching and understanding of the other. This is extremely beneficial to the student since these areas can be very complex to teach and for the student to understand. The use of audio-visual aids is evident in all of the courses. This seems understandable since slides and films do explain the unknown quicker and easier than words. The field trip to a processing plant would also help the inspector greatly since he would be able to observe the aspects of all the courses before his training was completed. This could generate many questions which could be answered before the inspector left his initial training.

The development of a follow-up program would benefit both the inspector and the training program. Some areas in the program may be deficient but by visiting inspectors on-the-job after the formal training, these areas could be reviewed and revised quickly. It cannot be stressed enough that a follow-up program is definitely needed to evaluate the initial training program and have any significance to the Meat and Poultry Inspection Program. The money saved by requiring 70 less hours than the Ohio State Program would more than offset the cost of such an evaluation program.

The total program as designed by the educators involves 130 hours of lectures, demonstrations, and laboratories; but viewing the relationship and the overlap of the courses, the possibility of reducing the total time to 120 hours does exist. Thus a very efficient three-week short course training program could be developed. This type of program along with the introductory booklet is exactly the type of combination program deemed most appropriate for this study.

The author believe this type of program shows that less time can be used in training non-professional processing inspectors than used in

past programs. The saving of 70 hours of teaching and facility use could be quite large over a period of time and with controls being placed on most monetary spending today, this significance is even greater. It is the recommendation of the author that this type of teaching program be developed into the existing Meat and Poultry Inspection training centers. By developing the programs in these centers, the author believes the increased efficiency in personnel and facilities justifies this consideration by the Meat and Poultry Inspection Program.

REFERENCES

1. Brandly, P. J., Migaki, George, and Taylor, K. E., 1968. Meat Hygiene. 3rd Edition. Lea & Febiger, Philadelphia.
2. Cahill, V. R. and Miller, J. C., 1971. Meat Processing. Ohio State University Animal Science Dept., Columbus, Ohio, U.S.A.
3. Carpenter, J. A., 1972. Meat Plant Sanitation. AMI Center for Continuing Education. Edwards Brothers, Inc., Ann Arbor, Michigan, U.S.A.
4. Consumer and Marketing Service, 1968. Request for Proposal to Develop a Training Course and Conduct Classroom Instruction for Non-Professional Processing Inspector Trainees. U.S.D.A. and C&MS. RFP no. 1-C&MS-69(W), pp. 1-5.
5. Dahl, V. L., 1971. Elements of Sanitation. Ohio State University Dept. of Vet. Preventive Med., Columbus, Ohio, U.S.A.
6. Dahl, V. L., 1969. Field Training Programs-The U.S.D.A. Meat Inspection Program. Education in Vet. Public Health and Preventive Med. No. 189:92-94.
7. Fawcett, N. G., Helwig, J. H., Johnson, G. R., Cole, D. R., and Kottman, R. M., 1968. A Proposed Training Course for Non-Professional Meat Processing Inspectors. Ohio State University, Columbus, Ohio, U.S.A.
8. Lawrie, R. A., 1968. Meat Science. 2nd Edition. Pergamon Press, New York.
9. Mager, R. F., 1962. Preparing Instructional Objectives. Fearon Publishers, California.
10. Merchant, I. A. and Packer, R. A., 1961. Veterinary Bacteriology and Virology. 6th Edition. Iowa State University Press, Ames, Iowa, U.S.A.
11. Ockerman, H. W., 1971. Chemistry of Meat Tissue. Ohio State University Animal Science Dept., Columbus, Ohio, U.S.A.
12. Ockerman, H. W., 1971. Statistical Sampling Principles. 5th Edition. Ohio State University Animal Science Dept., Columbus, Ohio, U.S.A.
13. Price, J. F. and Schweigert, B. S., 1971. The Science of Meat and Meat Products. 2nd Edition. W. H. Freeman and Company, San Francisco.
14. Snedecor, G. W. and Cochran, W. G., 1967. Statistical Methods. 6th Edition. Iowa State University Press, Ames, Iowa, U.S.A.

15. Standards Division, 1969. Draft of Proposed Revision of GS-1863 Standards. U.S.D.A. and Civil Service Commission Proposal, pp. 2-10.
16. Thornton, Horace, 1968. Textbook of Meat Inspection. 5th Edition. Williams & Wilkins Company, Baltimore.
17. Trollden, J. W., 1972. Managing Sanitation Programs in the Meat Industry. Milk Food Technol. Vol. 35, No. 10:591-596.
18. VanDersal, W. R., 1968. The Successful Supervisor in Government and Business. Revised Edition. Harper & Row Publishers, Inc., New York.
19. Zottola, E. A., 1972. Introduction to Meat Microbiology. AMI Center for Continuing Education. Edwards Brothers, Inc., Ann Arbor, Michigan, U.S.A.

APPENDIX

POSITION-CLASSIFICATION STANDARD FOR
FOOD INSPECTION SERIES
GS-1863U.S. CIVIL SERVICE COMMISSION
BUREAU OF POLICIES AND STANDARDS
June 1971

GS-1863-7

Food Inspector GS-7

This is the first full working level of food inspection in both slaughter and processed products work. GS-7 food inspectors carry out one or more aspects of food inspection in situations that require the inspector to exercise judgment in the full range of inspection functions.

Nature of work assignmentsFood Inspector (Processed Products)

Food Inspectors (Processed Products) at grade GS-7 inspect meat, poultry, and fish products in plants that carry out processing procedures such as preparation of raw products, defrosting, boning, or freezing of edible meat, poultry, or fish products, in line with the instructions relating to the manufacturing and processing methods and equipment. Such inspections require overseeing the full range of processing operations at the plant by means of detailed inspection of each step of the manufacturing process in which meat and poultry or edible parts thereof are combined with other ingredients according to a specified formula and processed by various methods.

Food Inspectors (Processed Products) determine that the product is handled according to approved methods. They assure the wholesomeness of all ingredients entering into the finished product, including any which

are not derived from meat, poultry, or fish such as vegetables, spices, cereals, vegetable protein, and flavorings.

GS-7 inspectors check the meat, poultry, and fish that is received into the plant for cleanliness, decomposition, contamination, or damage in transit or storage.

Food Inspectors (Processed Products) GS-7 supervise label and formulation compliance to assure that inspected products and their ingredients conform in kind and quantity to approved formula. They make frequent examinations to verify that the net weights and the uniformity of fresh, or frozen products meet requirements.

GS-7 food inspectors of all specializations make sanitary inspections of assigned plants to determine that sanitary requirements and regulations are being fulfilled. This includes inspection of plant facilities and equipment to assure that they are kept clean and maintained in the condition appropriate for the purpose for which they are intended, for example:

- that equipment and utensils are properly cleaned and sanitary before and during processing operations;
- that edible products are handled and stored in a sanitary manner;
- that condemned material and waste are handled and disposed of in the proper manner to assure that contamination of edible products does not occur;
- that employees are dressed in compliance with the regulations and that personal hygiene requirements are being met;
- that packaging supplies are properly cared for and used to assure that their condition is suitable for the purpose intended;
- that only approved cleanings agents and compounds are used;
- that fly control procedures are carried out in accordance with regulations;
- that outside plant premises are kept in a satisfactory condition;
- that rubbish and waste are not allowed to accumulate and become an unsanitary nuisance.

GS-7 food inspectors check the efficiency of the janitorial services in all rooms of the plant to assure that the various departments, including

employees' restrooms are kept clean, properly supplied with soap, towels, and other items needed.

Plant characteristics

Typically, the GS-7 food inspector is assigned to a plant that is well designed, not obsolescent nor cramped, and presents only the usual maintenance problems.

A processing plant to which a GS-7 food inspector is assigned produces products characterized as either simple or of medium range of complexity as discussed under Complexity of Product.*

The plant typically is considered to be in compliance with Federal regulations and has a continuing history of such compliance and cooperation with the inspection program in correcting unsanitary and unacceptable conditions. Food inspectors assigned to the plant can expect cooperation from management in carrying out suggestions and recommendations for improving the sanitary condition of the plant and the safe and wholesome handling of meat or poultry products.

Level of responsibility

GS-7 food inspectors are responsible for dealing with plant management in the persons of foremen and supervisors. These dealings consist, for example, of giving instructions to foremen and supervisors to clean up an undesirable situation; calling to their attention that employees of the plant do not meet clothing regulations; that cleaning or clean-up operations are not being carried out properly, effectively and in

*Section 2, pages 8-10. Position-Classification Standard for Food Inspection Series. GS-1863. U.S. Civil Service Commission. June 1971.

conformance with regulations; instructing them to hold for further inspection or re-work any products which do not meet standards or regulations.

GS-7 inspectors have, and exercise, the authority to stop the production line whenever, in their opinion, the work is moving too fast to permit proper sanitary procedures to be carried out or for correct and effective inspections to be made. Typically, at this level, GS-7 food inspectors do not have responsibility for dealing with top management and owners of the plant in order to work out and develop long-range programs for upgrading the general sanitation and sanitary conditions and physical facilities, etc.

GS-7 inspectors are under the direct supervision of a food inspector or veterinarian in charge of the inspection program of the plant. They receive their assignments from the supervisor. They notify their supervisor of the need for major repairs or the replacement of worn, broken, and unsanitary equipment, utensils, and other facilities, and refer major violations to him for corrective action. When other problems arise in connection with the work, the supervisor is available to provide technical advice and guidance, to resolve disputes, to resolve appeals, and negotiate with plant management when new, unusual, or controversial problems arise or where plant personnel are uncooperative. The work of the GS-7 inspector is reviewed for accuracy, judgment, effectiveness, and conformity to regulations, instructions, and procedures.

THE MINIMAL EDUCATION REQUIREMENTS
FOR A NON-PROFESSIONAL PROCESSING INSPECTOR

by

DOUGLAS LYNN BERNDT

B.S., Kansas State University, 1969
D.V.M., Kansas State University, 1970

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

in

Food Science

Department of Animal Science and Industry

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

ABSTRACT

The non-professional processing inspector must receive training that will broaden his capabilities, increase his proficiency, and prepare him for advanced grade positions. In order for the Meat and Poultry Inspection Division to achieve these goals, they must develop an instructional objective. This study was designed specifically around such an objective; estimating the minimal educational requirements for the non-professional processing inspector.

The present five week training course at Ohio State will be terminated in May 1973. Having the task of developing a new training program, the Training Branch of the Meat and Poultry Inspection Division under the Animal and Plant Health Inspection Service (APHIS) had their doubts as to the amount of time needed to ensure the most effective utilization of personnel and time. Since the minimal educational requirements have not been determined, a detailed study of this type might be used to develop an educational training course desired by the Program.

The total training program was developed using a combination type of short course in which an introductory booklet would be used, a three week classroom training session, and a follow-up evaluation program. The inspector's job was evaluated and five subject areas were identified. These consisted of: (1) Microbiology, (2) Sanitation, (3) Statistics and Mathematics, (4) Meat and Chemical Chemistry, and (5) Food Processing. Five educators having expertise in the areas corresponding to each subject area were interviewed. From the interviews, it was determined that 20 hours were needed in teaching Microbiology, 16 hours for Sanitation, 30 hours for Statistics and Mathematics, 16 hours for Meat and Chemical

Chemistry, and 48 hours for Food Processing. Thus a total of 130 hours were determined to be the minimum needed to teach a short course training program of this type.

Viewing the relationship and the overlap of material in each course, the possibility of reducing the total time to 120 hours could be seen. This would allow the Meat and Poultry Inspection Program to develop a very efficient three week training program. The results of the study proved that less time could be used in training inspectors than used in the Ohio State Program. A basic short course of this type would allow for more uniformity of competence, improve the quality of teaching material, and modernize the subject content. With these characteristics in the training program the Meat and Poultry Inspection Division could then accept the responsibility for seeing that non-professional processing inspectors are not only trained but educated to the importance and consequences of future technological changes in the field of inspection.