

Concerns, Experiences, Attitudes and Practices of Food Market Managers Regarding Sanitation and Safe Food Handling Procedures¹

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ABSTRACT

Managers or owners from 219 randomly selected food markets in Oregon were surveyed concerning their attitudes and practices on sanitation and safe food handling. Completed questionnaires were received from 49.8% of those surveyed. Inquiries were made relative to sanitation procedures used, knowledge of sanitation principles, and food protection and safety. Most indicated a concern for sanitation and felt that the employed procedures were effective. The survey indicated a lack of specific knowledge on basic principles of sanitation and food safety. Few respondents understood elementary principles of food contamination, temperature controls, personal hygiene and food protection. Most responses indicated a need for a training program in sanitation and safe food handling procedures for food retail employees at all levels.

Several programs in retail food market sanitation have been developed recently. The Joint Committee of the United States Department of Agriculture and the National Association of Retail Grocers of the United States have established a check list and guidelines for retail store sanitation (7). These guidelines have been offered as an aid for the retail store employee in achieving sanitary conditions, but no effort is made to educate or train individuals in sanitation procedures within this program.

The Food Marketing Institute has developed a program and a set of training materials for management, the "Uniform Sanitation Training and Certification" or the MUST program (3). This program is designed to give the participants an understanding of the role of retail food store management in public health and safety; significance and need for sanitary food handling practices; good sanitation practices; and principles of good sanitation as good business.

The Food and Drug Administration has published a proposed model ordinance for retail food store sanitation (2). The ordinance sets forth minimum requirements for retail food store compliance. The purpose of the model ordinance is to set uniform standards across the country.

In 1974 a nationwide survey of homemakers' attitudes on food safety was conducted by the United States Department of Agriculture (8). The objectives of this survey were to obtain information on homemakers food

safety practices and knowledge of bacterial contamination of food; to identify those groups of people having the greatest needs for food safety information; and to solicit homemakers' opinions on the most effective ways of disseminating food safety information. Results showed 63% of homemakers sampled conducted at least one high-risk practice relating to handling, preparing and storing selected meat and poultry products. Most homemakers were unfamiliar with conditions and practices allowing bacteria to grow and their potential for foodborne illness. Most of the homemakers were unaware of the effects of food contamination and the role personal hygiene plays in protecting food from contamination. Thirty-two percent of the homes surveyed maintained their refrigerators at or above 45 F.

In 1977, the Oregon Department of Agriculture review committee on meat bacterial standards recommended a continuous education and training program be provided to Oregon retail food store employees (6). The stated purpose of this program was to educate retail store employees in proper sanitation and safe food handling procedures and help them understand and solve food sanitation and food safety problems. However, very little was known about the concerns, experiences, attitudes and practices of food retail personnel on sanitation and safe food handling practices. Therefore, the purpose of this study was to gain some insight into the opinions, practices, knowledge and experiences regarding procedures for sanitation and food safety of food retailers.

METHODS

A questionnaire was used to collect information from food market employees on knowledge, attitude, opinions, experiences and practices regarding sanitation and food safety. The questionnaire was developed, reviewed and approved by the Oregon State University Survey Research Center. The questionnaire was pre-tested and minor changes made in certain questions based upon the findings of the pre-test.

A systematic sample of licensed meat sellers in the State of Oregon was selected from a list provided by a licensing agency, the Oregon Department of Agriculture. Ten percent (219) of the total number of food stores in Oregon was chosen as the sample.

Questionnaires were mailed to the respondents along with a cover letter explaining the purpose of the study, the importance of the cooperation of the respondents and the confidentiality of information obtained. The respondent was asked to return the questionnaire within a 2-week period in the self-addressed stamped envelope provided. If the initial questionnaire was not returned within the 2-week period, a

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follow-up letter and questionnaire were sent. The frequency distributions of the response to each question were examined.

RESULTS AND DISCUSSION

Completed questionnaires were received from 49.8% of those surveyed. The response rate in each category of food store is shown in Table 1. The sample was classified into the following categories: chain supermarkets, convenience stores, independent food markets, meat markets and others (i.e. warehouses, cooperatives, wholesale, produce markets, etc. on the basis of the license list). The survey response was determined by the respondent. Approximately 5.5% of the initial mailing of questionnaires was returned as undeliverable, incomplete address, out of business, changed owners, or refused to answer questionnaire.

TABLE 1. *Categories of food stores in survey.*

	No. in sample	% of sample	% response
Chain supermarket	36	16.4	20.4
Convenience store	27	12.3	29.6
Independent food market	122	55.7	45.4
Meat market	16	7.3	9.3
Other (warehouse, co-ops, produce, wholesale, etc.)	18	8.2	11.4
TOTAL	219	—	49.8

The returned questionnaires indicated 82.4% of those surveyed had a routine sanitation procedure that was being followed by employees and that they were achieving a "good" to "very good" job of keeping the store sanitary. A few (0.9%) of the establishments had no "outside" employees as the store was family-owned and -operated. Only 2.8% of the establishments felt they were not doing a good job in keeping their store sanitary. An attempt was made to determine, from the respondents point of view, the motivating factor for store sanitation. The question was posed to bring forth these attitudes. The answers reflect ambivalence. Such responses as "good for customer relations," "corporate policy," "protect health of customers," "good for business," "required by law," were some of the reasons given.

A substantial percentage (40%) of respondents indicated they do not have any programs for training or educating employees in sanitation and safe handling practices. Table 2 shows sources of information on proper sanitation procedures. The majority (65.7%) seem to learn by experience on the job. Beyond that there doesn't appear to be any other source from which most

TABLE 2. *Sources of information on sanitation procedures.*

Source	% Response
Experience	65.7
Trade publications	42.6
Newspapers - TV	35.2
Company policies	31.5
Company headquarters	27.8
Salesmen	25.9
Formal training	21.3
Other (inspectors, etc.)	16.7

retailers acquire information on sanitation procedures.

A fear of more government regulations and increased control of business was clearly expressed by some of the respondents. Many commented on the confusion and inconsistency in requirements and regulations from the multitude of governmental agencies such as federal, state, county, city, etc. However, when asked if they were aware of proposed federal regulations on sanitation requirements for retail food stores, most (68.5%) responded they had no knowledge of this proposal.

A battery of questions was designed to obtain data about the specific knowledge of food retailers on sanitation and safe food handling practices. As expected, most (72%) judged their knowledge on sanitation as being adequate. The attitude reflected was positive and the individual judged himself as being knowledgeable, doing the right things and confident he would give the right information. The right information was concerned with such things as ability to explain food poisoning to customers, which involves specific knowledge of bacteria, conditions of growth and potential foods involved (Table 3).

TABLE 3. *Self-evaluation of knowledge of food sanitation and safe food handling practices.*

Factor	Response
Adequacy of knowledge	72% - adequate 16.7% - need an up-date 6.5% - inadequate
Ability to explain to customers what food poisoning is	78.7% - could do so
Need for a training program on sanitation and safe food handling practices	67.7% saw a need

The questions purposely did not reflect details such as different types of organisms that can cause illness, foods involved, symptoms, conditions necessary to cause illness, etc. It is obvious from the nature of the response, the respondents attached little importance to this technical information.

In an attempt to evaluate if the individuals did in fact have specific knowledge, a series of "specific knowledge" questions were designed. A group of organisms were listed and the individual was asked to indicate which ones would cause food poisoning. The types of responses varied greatly but only *Salmonella* and trichinia were recognized by the majority (over 50%) as being a causative factor for food-borne illness. Less than 50% of the respondents failed to recognize the potential dangers associated with *Bacillus*, *Staphylococcus*, *Escherichia* and *Clostridium* organisms (Table 4).

The fact that less than 50% of the respondents surveyed ranked *Escherichia* as an organism causing illness is interesting. The food retailers in Oregon should be more familiar with this organism due to problems experienced with the Oregon meat bacterial standards, which were in effect from 1973-1977 (6). Possibly if "*E. coli*" had been the nomenclature for the organism used in the questionnaire instead of "*Escherichia*" a different

TABLE 4. Grouping of organisms as to pathogenicity.

	<i>Food pathogen</i>	<i>Non-food pathogen</i>
Acceptable grouping	<i>Salmonella</i>	<i>Lactobacillus</i>
	<i>Bacillus</i>	<i>Aerobacter</i>
	<i>Trichinina</i>	<i>Streptococcus</i>
	<i>Staphylococcus</i>	<i>Pseudomonas</i>
	<i>Escherichia</i>	
	<i>Clostridium</i>	
	<i>Food pathogen^a</i>	<i>Non-food pathogen^b</i>
Survey response	<i>Salmonella</i>	<i>Lactobacillus</i>
	<i>Trichinina</i>	<i>Bacillus</i>
		<i>Aerobacter</i>
		<i>Staphylococcus</i>
		<i>Streptococcus</i>
		<i>Escherichia</i>
		<i>Clostridium</i>
		<i>Pseudomonas</i>

^aRanked by over 50% of respondents.

^bRanked by less than 50% of respondents.

level of response would have been obtained. However, the obtained response may have reflected a "true" level of recognition, in the fact the organism is not considered harmful. Spokesmen for the food retail industry have made this point in an argument against the enforcement of the former bacterial standards on meat products (4,5,10).

To further determine the level of specific knowledge of the respondents, a series of statements related to food sanitation and food handling were listed. The respondent was asked to agree or disagree with a series of statements (Table 5).

Good agreement or proper response was obtained on subject matter questions dealing with simple elementary statements about bacteria such as conditions of growth for bacteria. However only approximately 1/3 of the respondents knew or understood more specific facts about bacteria, such as statements relating to the mode of transport of bacteria and basic principles of food contamination.

A relatively high percentage (77.8%) recognized growth of bacteria can be controlled by keeping foods cold. There was not the same level of recognition or understanding of some of the more complex statements such as "safe temperatures for potentially hazardous foods are 45 F or below and 140 F or above." Only 37% of the respondents agreed that this was a correct statement, which would basically indicate the respon-

dents were unsure of specific temperatures necessary for adequate control of the growth of bacteria.

The response on the statement "frozen food should be held at 10 F or below" is interesting. Seventy-five percent agreed with the statement, but more important, is the fact that such a large number of food retailers agreed with *that* statement. The Oregon sanitary code requires frozen foods be held at 0 F or below; a temperature of 10 F would be unacceptable.

Concerning the statement "food contact surfaces can not be adequately cleaned without the use of sanitizers" - 64.8% agreed with this statement. Concurrently, a combination of 30.6% either disagreed or strongly disagreed with this statement. This statement attempted to gain an insight as to the specific awareness of food retailers on what constitutes "sanitation" and how it can be accomplished. However, based upon the response to this statement, a common reliance on chemical sanitizers is apparent and reflects belief in the "magic of chemicals." The fact that food-contact surfaces must be cleaned before the application of sanitizers is not reflected as a practice by the respondents.

A question was designed to determine how retailers perceive given situations and their relationship to public health. The situations listed in the questionnaire are most common to the operation of food markets.

Table 6 lists the various situations posed in the questionnaire. The respondent was asked to rank them one to ten as to which situations would pose the greatest *public health risk* (one being the greatest and ten the least). Each situation will be discussed separately.

A. Sick employees

One would expect a high ranking for potential public health hazard. Indeed the majority (51.9%) did give it a high (1-3) priority. However, it should be noted this is a much lower response than is acceptable. If the respondents were adequately aware of the real dangers and problems ill workers can cause in handling food, a greater percentage would have recognized this as a "high risk situation."

B. Food stored at 120 F

The temperature of 120 F is at the end of the danger zone, a temperature where many harmful organisms can

TABLE 5. Response to statements related to food sanitation and safe food handling practices.

Statement	Correct response	Survey results	
		Correct	Incorrect
Bacteria need specific conditions to grow and multiply	Agree	82.4%	14.8%
All bacteria are harmful	Disagree	94.5%	2.8%
Frozen food should be held at 10 F or below	Agree	75.0%	24.2%
Bacteria can go from place to place without help	Disagree	39.8%	54.6%
Bacteria do not grow rapidly at refrigerated temperatures	Agree	77.8%	19.4%
Food products containing food poisoning organisms will smell spoiled	Disagree	87.0%	9.3%
Safe temperature for potentially hazardous foods are 45 F or below and 140 F or above	Agree	37.0%	52.8%
Food contact surfaces can not be adequately cleaned without the use of a chemical sanitizer	Disagree	30.6%	64.8%
As long as saw and grinder are kept clean it is not necessary to sanitize them during a day's processing of different cuts of meat such as beef, pork and poultry	Disagree	80.5%	13.0%

thrive and cause serious problems. Again most (55.6%) did recognize the seriousness of that temperature but a fact worthy of concern, is that a significant portion of the sample *did not readily recognize* the dangers of a food product being held at 120 F and the importance of temperature control for microbial growth.

C. Storing fish, poultry and meat in the same cooler room

Storing of fish, poultry and meat together is a practice that should not be tolerated in a food market under any circumstances. In design of the question, the author felt it would receive an overwhelming response as a "high public health risk." In fact, the response was almost the opposite. The situation was ranked as a "low risk" by 59.9% of the respondents. One might argue the practicality of the situation in that a market may only have one cooler room, and therefore the practice would be satisfactory if the products were properly segregated and proper control measures taken. However, as the situation was cast in the question, the practice offers an excellent opportunity for cross-contamination and this apparently was not discerned by many respondents.

D. Smoking and eating by employees in food preparation areas

The author again expected to receive a relatively strong ranking of this situation as a "high risk," since it is a prohibited act; survey results showed just the opposite. Only 7.4% of the respondents gave this situation a one to three ranking. This illustrates a lack of understanding of the sources of food contamination and the importance of proper methods for food protection.

E. Cracks in floors or walls

Cracks in a food establishment do pose a potential source of food contamination, a place for insects to be harbored, filth and mold to accumulate and could lead to many problems in a food market. Floors and walls must be adequately cleaned and food sanitation and housekeeping practices followed. It is recognized that if proper procedures are followed and adequate cleaning and sanitizing accomplished, then cracks in floors and walls are not as critical, therefore a moderate ranking was expected. It was assigned a "low risk" (8 to 10) situation by 70.3% of the respondents, while 4.6% assigned it to a "high risk" (1-3) situation.

F. Meat processing room temperature of 55 F

Most meat processing rooms are set at 55 F primarily for the workers comfort. It is very uncomfortable to work at temperatures much below 55 F for any length of time; however, control procedures are necessary to prevent the temperature of the product from exceeding 35 F. This is usually accomplished by moving the product through the processing room rapidly. This concept was not intentionally made a part of the situation. It was designed to determine the level of knowledge of the temperature factor only. The generated response was uninformative, which may indicate a questionable fact of what the temperature should be.

G. Discolored meats

Many consumers associate the color of fresh meat with its safety and discolored or dark meat is considered spoiled or unsafe. Consumers made this association as they do not understand the role of oxygen and meat pigmentation. The situation was posed to test or determine how well food retailers understand this concept. Fifty-eight and three tenths percent of the respondents correctly assigned discolored meat as a "low risk" situation.

H. Broken cartons of dry foods

This situation specifically included the words "dry foods" to convey to the respondents that the situation concerned foods that were not likely to spoil quickly or would not support the growth of pathogenic organisms (i.e. low-moisture foods). The broken package itself could pose a potential for food contamination however. An expected low risk situation was indicated (62.9%).

I. Products on display beyond the pull-date

A great deal of attention has been given to dates on perishable foods in Oregon. A law is currently in effect requiring an "open date" on all perishable foods and the regulatory agencies are checking for the presence of these dates and noting violations when not in compliance with the law. It was assumed the food industry would be very sensitive to dating requirements, and for this reason the situation was included in the questionnaire. A very low number of respondents, 7.4%, considered products on display past their pull-date as a "high risk" situation,

TABLE 6. Numerical ranking^a of situations as to degree of public health risk.

Situation	Expected groupings	1-3	Results 4-7	8-10
Sick employees	high	51.9%	24.1%	24.1%
Food stored at 120 F	high	55.6%	17.6%	26.9%
Storing fish, poultry, and meat in same cooler room	high	12.9%	32.4%	59.3%
Smoking and eating by employees in food preparation areas	high	7.4%	48.1%	44.4%
Cracks in floors or walls	moderate	4.6%	25.1%	70.3%
Meat processing room temperature of 55 F	moderate	30.5%	35.3%	34.2%
Discolored meats	low	11.1%	30.5%	58.3%
Broken cartons of dry foods	low	5.6%	31.4%	62.9%
Product on display past pull date	low	7.4%	45.4%	47.3%
Temperatures above freezing in frozen foods case	low	53.7%	23.1%	23.2%

^a1 = High.

10 = Low.

however the remaining respondents were mixed as to the degree of risk involved.

J. Temperatures above freezing in frozen foods case.

Oregon law requires products to be maintained at 0 F or below and specifies that the product should not be allowed to go above 10 F during the defrost cycle or similar operations. Previous research by investigators at Oregon State University (1) revealed a serious lack of adequate temperature control by food retailers. The results of this research study have been widely disseminated to food retailers and in some organizations definite action has been taken by management. Inspectors of the state regulatory agency devote specific attention to temperature checks as part of their routine inspection procedures. The inspectors are now equipped with electronic thermometers designed to give the temperatures of products within several seconds, without destroying the integrity of the package. As a result of these efforts it can be readily observed that food retailers are sensitive about temperature monitoring in their stores.

The survey data confirm this assumption, however, the respondents did not discern factors of quality vs. safety. Temperatures above freezing would pose a serious public health risk according to 53.7% of the respondents.

There is a common assumption that the people who work in grocery stores do not stay on any given job for a very long time. In fact, a 100% turnover rate is often quoted (9). In planning for any form of training program this fact is always discussed. The respondents were asked how long they had worked in food stores (Table 7). Seventy-four percent indicates they had worked in food stores for over 10 years. This may not be such a notable fact, as most respondents (80.6%) would be classified as managers or owners.

TABLE 7. *Length of time respondents have worked in food stores.*

Less than 1 year	4.6%
0-5 years	12.0%
5-10 years	9.3%
Over 10 years	74.1%

It could be stated that maybe an individual does change jobs and maybe with different companies, but it seems from the survey data a large percentage stay within the food retailing industry. Therefore the value of training that individual has much greater merit. A need for a training program on sanitation and safe food handling practices was indicated by 76.6% of the respondents. The response indicated practically all positions in a store should be trained (Table 8) not necessarily only individuals holding managerial positions.

A question was designed to give the respondents an opportunity to comment freely on factors that in their opinion create insanitary conditions in a food store, such as practices of shoppers. The comments were most interesting. A very frequent comment made was the fact that the public does not exercise good personal hygiene

TABLE 8. *Types of employees recommended for training in sanitation and safe food handling.*

Position	% Response
Managers	47.2
Meat cutters	38.9
Clerks	36.1
Deli-section workers	32.4
Bakers	28.7
Box persons	19.4

and many bring disease, filth, dirt, etc. into stores. Customers are observed opening food cartons, misplacing items in a store, eating bulk displayed foods, etc. But the factor consistently discussed by the respondents has to do with the insanitary conditions created by return of soft drink and beer containers. Handling of these containers by the clerks and holding them in their stores until picked up by distributors created the most serious public health hazard in the opinion of the food retailers.

All respondents were assured a copy of the survey results would be made available to them and 87% indicated they would like to receive a copy of the published results.

SUMMARY

This study indicates a need for training retail food store employees in sanitation procedures and safe food handling. It also points out that individuals surveyed stay within the industry for a relatively long time, which further justifies the need for a sanitation and food safety training program. In industries that experience a rapid turnover of personnel it is sometimes difficult to justify the expense of a training program.

The study showed a distinct lack of knowledge of fundamentals of good sanitation and safe food handling practices. For the food retailers surveyed, a positive response for the merits of good sanitation was received and many readily recognized potential benefits. It is apparent that the necessary training program should be offered by a qualified organization and not left up to the individual store to develop since industry experience seems to be the only identified source of information for sanitation procedures for food retailers.

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Book Review

"Hazardous and Toxic Effects of Industrial Chemicals," by Marshall Sittig. Noyes Data Corporation, Park Ridge, NJ 1979. 460 pp. \$42.00.

This book is a comprehensive encyclopedia of chemicals that are of concern to the industrial hygienist and is an attempt to catalog the hazard status of approximately 240 chemicals or groups of chemicals. The information given in the book was derived mainly from publications from government agencies; i.e., the National Institute for Occupational Safety and Health and the Environmental Protective Agency. Other data came from the conferences and other referenced sources.

Each chemical or group is listed and described as follows: name, description, synonyms, potential occupational exposures, permissible exposure limits, route of entry, harmful effects, medical surveillance, special tests, personal protective methods, and a bibliography. This format provides ready reference for the reader, and no index is necessary. One purpose of the book is that of "preventive medicine" in effect, that is, by presenting an assessment of potential hazard from the chemicals, workers and control personnel can become informed and then take necessary precautions to prevent or minimize hazard.

Since the items are presented in alphabetical list form, there is no grouping with regard to occupation as such. Also, in many instances, permissible exposure limits (federal standards) serve as a regulatory guide, but may not help the worker who does not know what a "ppm" is in his use of the chemicals. This is not a fault of the book, but possibly a shortcoming in the education of handlers of hazardous chemicals. A possible hidden value of the book is the revealing of a paucity of information under the "Special Test" heading, indicating that much analytical research is needed for developing methods for the specific chemicals.

Admittedly, no single volume can be expected to cover all known or potentially dangerous industrial chemicals, but this book is a clear catalog of many of those recognized by government agencies. However, application to food processing is ambiguous in some instances. For example, the permissible exposure limit for phosphoric acid is given as 1.0 mg/m³ (1 ppm), but the Food and Drug Administration regards phosphoric acid as "generally recognized as safe when used in accordance

with good manufacturing practice," with no tolerance set (Code of Federal Regulations, Title 21, Ch. 1, Part 182, 1073, April 1, 1978). The user of the handbook should not take the limits out of context, but should consider the entire text which points out that, in the same example, the mist of phosphoric acid at 1 ppm may be an irritant, not the food additive as such.

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Book Review

Food Microbiology. Third Edition. W. C. Frazier and D. C. Westhoff. McGraw-Hill Book Co., 1221 Avenue of the Americas, New York, NY 10020. 540 pp. 1978. \$19.50.

This book will serve very well as a reference on food microbiology for veteran food scientists and technologists as well as for beginning food microbiology students. This book is not only well written, well organized, and a very up-to-date and complete treatise of food microbiology, but the price is right.

This text is divided into six major sections: Food and Microorganisms; Principles of Food Preservation; Contamination, Preservation, and Spoilage of Different Kinds of Foods; Foods and Enzymes Produced by Microorganisms; Foods in Relation to Disease; Food Sanitation, Control, and Inspection. There are 27 chapters that present these six major parts of the text.

The authors have blended well the microorganism nomenclature of the pre-eighth edition of Bergey's Manual of Determinative Bacteriology with the current

This text will prove useful, both for the student and the practicing food scientist.

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