

# Status of Prerequisite and HACCP Program Implementation in Iowa and Kansas Restaurants: Sanitarians' Perspective

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## SUMMARY

The purpose of this study was to obtain baseline data about the presence of HACCP and prerequisite programs in chain and independent restaurants from the perspective of sanitarians who inspect restaurants and to determine how those programs have changed over the past five years. A three-part written questionnaire was distributed to all Iowa and Kansas sanitarians; 36 Iowa sanitarians (35%) and 18 Kansas sanitarians (41%) responded. The prerequisite program most often lacking in independent restaurants was a system of standardized recipes with critical control points (4%). Sanitarians noted little improvement in prerequisite programs over the past five years. Employee knowledge, time, and manager knowledge are identified as the top three barriers to implementing prerequisite and HACCP programs. Results indicate that important food safety practices need to be implemented in Iowa and Kansas restaurants. Sanitarians play an important role in improving food safety practices in restaurants and if more time were available to conduct inspections, sanitarians could provide referrals and resources specific to the needs of the operations to support food safety improvements.

## INTRODUCTION

Foodborne illnesses are a significant problem in the United States (1). Commercial foodservice operations frequently are identified as the source of foodborne illness outbreaks resulting from mishandled foods (5). The Report of the FDA Retail Food Program Database of Foodborne Illness Risk Factors (6) was the first attempt of the Food and Drug Administration (FDA) to develop baseline data on compliance of retail foodservice operations with regard to risk factors for foodborne illness. Full-service restaurants were found to be 60% in compliance and fast food restaurants in 74% compliance for major risk factors, which represents compliance scores that are lower than those for hospitals, nursing homes, and elementary schools.

The follow-up study by FDA (8) found that only 13% of full-service restaurants were out of compliance with food from unsafe sources, but 42.7% were out of compliance with poor personal hygiene, and 63.8% were out of compliance for improper holding time and temperature. The percentages of fast food restaurants out of compliance with these risk factors were lower, with 2.3%, 31.2%, and 41.7%, respectively. Because of the relatively high percentages of restaurants that are "out of compliance" with regard to risk factors, food safety should be of utmost concern to restaurant owners/managers.

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**TABLE I. Characteristics of sanitarians (n = 54)\***

Characteristic	N
<b>Age</b>	
30 years or younger	8
31 – 40 years	19
41 – 50 years	10
51 – 60 years	14
<b>Gender</b>	
Male	32
Female	20
<b>Education</b>	
High School	0
Some College	8
Bachelor's Degree	34
Graduate Degree	10
<b>Years employed as a sanitarian</b>	
5 years or less	26
6 – 15 years	21
16 – 25 years	2
26 years or more	3
<b>Number of operations inspected/sanitarian</b>	
Less than 300 operations	27
300 – 599 operations	20
600 – 899 operations	4
Greater than 900 operations	2

\*Due to non-respondents, totals may not equal 54

Implementation of Hazard Analysis Critical Control Point (HACCP) systems has been recognized as having great potential for reducing the number of foodborne illness outbreaks (3, 7). The federal government has placed significant emphasis on food safety, recommending HACCP programs as a way to protect the health of the public. The 2001 Food Code stated that “implementation of HACCP programs by the establishments will profoundly enhance their (commercial foodservice’s) role in the protection of public health” (7). In addition, the National Advisory Committee on Microbiological Criteria for Foods (NACMCF) (12) contends that “preventing problems from occurring is the paramount goal underlying any HACCP system.” HACCP prerequisite programs, the foundation upon which HACCP systems are built, include sanitation recommendations relating to facilities, supplier control, specifications, production equipment, cleaning and sanitizing, personal hygiene, training, chemi-

cal control, receiving, storage, shipping, and pest control.

Management plays a vital role in determining the level of sanitation within foodservice operations (9) and the degree to which employees follow basic prerequisite programs and HACCP. To be certain that food safety programs are successful, managers should train employees in food safety, empower them to make decisions regarding food safety, and encourage them to take leadership roles in implementing these programs (2, 13, 14, 15). To do this, managers and employees must be knowledgeable about factors that contribute to foodborne disease and should have a full understanding of HACCP practices that prevent them (3).

There is little reported research related to HACCP prerequisite programs and implementation in restaurants. To date, research has been conducted on costs of implementing HACCP in commercial restaurants (1) and restaurant managers’ self-

reported presence of prerequisite and HACCP programs in independent restaurants (13). However, self-reported data should be viewed with caution because misconceptions are common among restaurant managers about what HACCP actually is, what HACCP requires in terms of prerequisite programs, and what it means to fully implement a HACCP program.

Because there is a paucity of research on restaurant practices other than those that are self reported, perceptions of other additional constituent groups are needed. Thus, the purpose of this study was to obtain baseline data about the presence of HACCP and prerequisite programs in chain and independent restaurants in Iowa and Kansas from the perspective of sanitarians who inspect restaurants. Specific objectives were to determine if chain and independent restaurants have prerequisite programs in place that are necessary for HACCP implementation; to assess HACCP components that are already in place in restaurants; to compare the existence of prerequisite and HACCP programs in chain and independent operations; and to determine barriers that impede prerequisite program and HACCP implementation.

## METHODS

The 3-part questionnaire used for this study was a modified version of the questionnaire developed by Roberts and Sneed (13). Part I asked sanitarians to estimate the percentage of independent and chain restaurants that had implemented prerequisite and HACCP programs and to indicate if there had been improvement within the last five years. A 5-point Likert-type rating scale used anchors of no improvement, little improvement, improved, very improved, and much improved. Part II determined sanitarians’ perceptions of food safety training needs of restaurant employees. Part III asked demographic questions about the sanitarian and the number of independent and chain restaurants inspected annually. The questionnaire took approximately 15 minutes to complete. The Iowa State University and Kansas State University Committees on the Use of Human Subjects in Research approved the research protocol and questionnaire.

Iowa sanitarians (n = 103) were mailed a cover letter and questionnaire, along with a postage-paid return envelope. An identification code was assigned to each questionnaire for follow-up purposes. A second letter and questionnaire were mailed to non-respondents to in-

**TABLE 2. Sanitarians' perceptions of the percentage of chain and independent restaurants with prerequisite and HACCP programs (n = 54)**

Practice <sup>a</sup>	Total	
	Chain Mean % ± SD % <sup>b</sup>	Independent Mean % ± SD % <sup>b</sup>
<b>Cleaning &amp; Sanitizing</b>		
All employees trained on cleaning and sanitation procedures	59 ± 32	36 ± 28*
Written specifications for cleaning and sanitizing equipment	62 ± 28	20 ± 24**
<b>Chemical Control</b>		
Documented procedures for chemical storage	52 ± 33	9 ± 14**
<b>Equipment</b>		
Equipment certified by the National Sanitation Foundation (NSF)	73 ± 27	40 ± 30**
Preventative maintenance schedules	53 ± 29	15 ± 21**
Equipment temperature calibration schedules	36 ± 31	8 ± 13**
Temperature logs for all cooling equipment	34 ± 27	5 ± 8**
Temperature logs for all heating equipment	38 ± 28	5 ± 8**
<b>Facilities</b>		
Written specifications for cleaning the facility	67 ± 30	28 ± 28**
A flow that minimizes cross contamination	43 ± 31	14 ± 22**
<b>Food Production</b>		
Procedures for checking the internal temperature of foods while cooking	65 ± 27	34 ± 23**
Procedures for checking the internal temperature of cooked foods	64 ± 28	32 ± 27**
Standardized recipes with critical control points	32 ± 29	4 ± 9**
<b>Personal Hygiene</b>		
A written policy on handwashing	61 ± 32	17 ± 26**
A written policy on the use of gloves	56 ± 30	12 ± 19**
A written policy on the use of hair restraints	50 ± 35	9 ± 13**
<b>Pest Control</b>		
Routine spraying by a pest control operator	84 ± 19	60 ± 27**
<b>Receiving and Storage</b>		
Thermometers in refrigerators	86 ± 14	74 ± 23**
Food dating and labeling procedures	79 ± 16	59 ± 23**
Thermometers in freezer	72 ± 27	53 ± 30**
Procedures to assure potentially hazardous foods are refrigerated quickly upon receiving	56 ± 31	26 ± 28**
Procedures to check temperatures when receiving foods	33 ± 24	8 ± 14**
Thermometers in dry storage	25 ± 26	10 ± 17**
<b>Specifications</b>		
Written specifications for all ingredients and food products	41 ± 33	7 ± 14**
<b>Supplier Control</b>		
Assurance from suppliers that they follow HACCP or good manufacturing practices	35 ± 31	9 ± 19**
Procedures for checking the condition of the supplier's delivery trucks (i.e., sanitation, temperature)	29 ± 27	10 ± 18**
<b>Training</b>		
All employees trained on personal hygiene	59 ± 32	34 ± 28**
All employees trained on safe food handling procedures	58 ± 31	27 ± 23**
<b>HACCP</b>		
Temperature logs to record all end point cooking temperatures	46 ± 29	8 ± 14**
Food product flow charts	34 ± 29	5 ± 13**
A comprehensive HACCP plan	22 ± 22	2 ± 5**
HACCP Team	14 ± 19	1 ± 3**

<sup>a</sup>The stem "% of Restaurants in which Implemented" was used for all questions

<sup>b</sup>Mean Percentage ± Standard Deviation

\*P<.05

\*\*P<.001

crease response rate. The Kansas sample (n = 44) was asked to complete the questionnaire at a statewide training session.

Data were analyzed by use of SPSS for Windows 11.5. Descriptive statistics (frequencies, means, and standard deviations) and pairwise t-tests were used for data analysis. Reliability analysis was conducted on the scale in Part I of the survey for both independent and chain restaurants; the alpha coefficients were .91 and .94, respectively. In analyzing data, the type I error rate for all comparisons was set at .05.

## RESULTS AND DISCUSSION

### Characteristics of the sanitarians

A total of 36 sanitarians from Iowa responded, for a response rate of 35%. Eighteen Kansas sanitarians completed the questionnaire, for a response rate of 41%. Characteristics of sanitarians responding to the questionnaire are presented in Table 1. The majority of sanitarians inspected 300 or fewer operations each. Two sanitarians inspected more than 900 operations each. On average, each Kansas sanitarian inspected more foodservice operations than did each Iowa sanitarian ( $P = .008$ ).

### Prerequisite programs and HACCP implementation

Ten prerequisite programs were explored: chemical control, cleaning/sanitizing, equipment, facilities, food production, specifications, supplier control, pest control, receiving and storage, and training. Table 2 presents mean percentage estimates of the chain and independent restaurants with prerequisite and HACCP programs in place. The prerequisite program most often lacking in independent restaurants was a system of standardized recipes with critical control points (4%). In contrast, in the Roberts and Sneed (13) study in which restaurant operators identified which programs were or were not in place, 75% of the managers stated that their operation had standardized recipes with critical control points. Sanitarians estimated the placing of thermometers in refrigerators as the practice most often implemented in independent restaurants (74%); in a survey of independent restaurant managers, 100% of the managers surveyed indicated compliance in this area (13).

For chain restaurants, sanitarians indicated that the practice most often implemented was the placing of thermometers

in refrigerators (86%) and that the practice least often implemented was the placing of thermometers in dry storage area (25%). Sanitarians identified having a HACCP team as the lowest implemented practice related to HACCP in both independent and chain operations.

Paired samples t-tests were conducted on the mean percentages related to prerequisite and HACCP programs to determine whether chain or independent restaurants differed in the percentages of programs implemented. In all categories, results indicated that chains have more prerequisite and HACCP programs implemented than their independent counterparts.

Table 3 presents data regarding the improvement of chain and independent restaurants over the past five years. For the majority of prerequisite programs, sanitarians noted very little improvement. Moreover, even though chain restaurants exceed their independent counterparts in the percentage of food safety practices implemented, chain operations have not improved much over independent restaurants within the past five years. Both types of restaurants have improved most in food dating and labeling practices and use of thermometers in refrigerators.

When pairwise comparisons are made between chain and independent restaurants for improvement within the past five years, figures for chains were higher in all but one category, routine spraying by a pest control operator. Chain restaurants improved the most in food dating and labeling procedures, and independent operations improved the most in placing thermometers in refrigerators.

When sanitarians were asked what food safety practices were most often lacking in restaurants, handwashing and personal hygiene were mentioned by most sanitarians. Taking and recording temperatures, monitoring hot and cold holding temperatures, and training were other food safety practices that were found to be lacking.

### Barriers to implementation

Sanitarians' perceptions of barriers to implementing prerequisite and HACCP programs in restaurants are presented in Table 4. The greatest perceived barriers were employee knowledge and time, which is similar to findings of Roberts and Sneed (13) in their study of independent restaurant managers. These results also mirror findings of barriers in school foodservice, where Hwang, Almanza, and

Nelson (10) identified time to establish the HACCP program, time and labor cost to run the HACCP program on a daily basis, training funds, and union problems as barriers to implementation. These results also were consistent with findings of Youn and Sneed (15). A national random sample of school foodservice directors reported that employee training (70%), employee motivation and time (66%), and not having a HACCP plan (62%) were all important barriers that needed to be overcome.

## CONCLUSIONS

Results of this study indicate that important food safety practices relating to prerequisite programs and HACCP implementation need to be implemented in both Iowa and Kansas restaurants. While some practices would require training for both employees and managers, some practices, such as written specifications for cleaning and sanitizing equipment, documented procedures for chemical storage, written policies on handwashing, and use of hair restraints and gloves, are simple to implement and would require few resources.

When chain and independent restaurants are compared, it is evident that chain operations implement more food safety practices. Chain restaurants often have the support of a corporate office to aid in the development and implementation of food safety programs. Additionally, in some chains, food safety requirements are more stringent than state requirements, forcing managers to implement these programs. Managers in independent restaurants are faced with great challenges to implementing food safety and HACCP programs. Employee knowledge, time, and manager knowledge are the top three barriers identified in this study. University extension, local and national restaurant associations, and state health departments can focus efforts on foodservice employee education and provide HACCP training for managers. Local and national restaurant associations should focus efforts on developing standardized food safety systems that could be adapted and implemented by independent operators and managers.

Sanitarians can play a key role in improving food safety in restaurants. Through the inspection process, food safety issues can be brought to the attention of restaurant managers. Sanitarians could provide referrals and resources specific to the needs of the operation; however, they have insufficient time to pro-

**TABLE 3. Improvement of prerequisite and HACCP programs in chain and independent operations within the last 5 years**

Characteristic <sup>a</sup>	Chain Total (N=54) <sup>***</sup>					Independent Total (N=54) <sup>***</sup>						
	Mean ±SD <sup>b</sup>	Frequency of Responses <sup>c</sup>					Mean ±SD <sup>b</sup>	Frequency of Responses <sup>c</sup>				
		NI	LI	I	VI	MI		NI	LI	I	VI	MI
<b>Cleaning &amp; Sanitizing</b>												
All employees trained on cleaning and sanitation procedures	2.8 ± 1.0	5	10	26	5	3	2.3 ± 0.8**	6	22	18	2	0
Written specifications for cleaning and sanitizing equipment	2.6 ± 1.0	8	13	20	9	0	1.9 ± 0.9**	16	23	11	0	0
<b>Chemical Control</b>												
Documented procedures for chemical storage	2.4 ± 0.9	9	17	18	5	0	1.7 ± 0.7**	22	22	6	0	0
<b>Equipment</b>												
Equipment certified by the National Sanitation Foundation (NSF)	2.8 ± 1.0	5	13	18	9	2	2.2 ± 1.0**	12	17	17	2	1
Temperature logs for all heating equipment	2.5 ± 1.0	10	16	14	10	0	1.5 ± 0.7**	29	15	6	0	0
Temperature logs for all cooling equipment	2.5 ± 1.0	10	16	15	9	0	1.5 ± 0.7**	29	15	6	0	0
Preventative maintenance schedules	2.4 ± 0.8	8	16	22	3	0	1.8 ± 0.8**	20	18	12	0	0
Equipment temperature calibration schedules	2.1 ± 0.8	14	19	15	1	0	1.5 ± 0.6**	28	20	2	0	0
<b>Facilities</b>												
Written specifications for cleaning the facility	2.8 ± 1.1	8	9	20	11	1	2.1 ± 0.9**	14	1	19	12	4
A flow that minimizes cross contamination	2.4 ± 0.8	8	18	20	3	0	1.6 ± 0.5**	26	16	8	0	0
<b>Food Production</b>												
Procedures for checking the internal temperature of cooked foods	3.0 ± 1.0	4	11	21	12	2	2.4 ± 0.9**	6	22	17	2	2
Procedures for checking the internal temperature of foods while cooking	3.0 ± 1.1	6	8	22	12	3	2.6 ± 0.9**	4	18	22	5	1
Standardized recipes with critical control points	2.3 ± 0.9	8	20	14	5	0	1.4 ± 0.6**	30	16	2	0	0
<b>Personal Hygiene</b>												
A written policy on handwashing	2.9 ± 1.0	5	9	21	13	1	2.1 ± 1.0**	18	17	12	3	1
A written policy on the use of gloves	2.9 ± 0.9	5	7	26	10	1	2.0 ± 0.9**	18	15	14	2	0
A written policy on the use of hair restraints	2.4 ± 0.9	8	15	22	3	0	1.7 ± 0.7**	23	22	6	0	0
<b>Pest Control</b>												
Routine spraying by a pest control operator	3.0 ± 1.1	6	9	17	11	4	2.8 ± 1.1	4	17	19	3	6

**TABLE 3. (continued) Improvement of prerequisite and HACCP programs in chain and independent operations within the last 5 years**

Characteristic <sup>a</sup>	Chain Total (n=54) ***					Independent Total (n=54) ***						
	Mean ±SD <sup>b</sup>	Frequency of Responses <sup>c</sup>					Mean ±SD <sup>b</sup>	Frequency of Responses <sup>c</sup>				
		NI	LI	I	VI	MI		NI	LI	I	VI	MI
<b>Receiving and Storage</b>												
Thermometers in refrigerators	3.4 ± 0.9	1	8	15	22	5	3.2 ± 0.9*	2	6	27	11	4
Food dating and labeling procedures	3.5 ± 0.8	1	4	18	24	4	3.1 ± 1.1**	3	11	17	14	5
Thermometers in freezer	2.9 ± 1.0	6	9	22	10	2	2.6 ± 1.0*	5	17	22	3	3
Procedures to assure potentially hazardous foods are refrigerated quickly upon receiving	2.6 ± 0.9	6	17	20	8	0	2.2 ± 0.9*	11	20	16	3	0
Procedures to check temperatures when receiving foods	2.2 ± 1.0	15	14	17	3	1	1.6 ± 0.7**	25	21	5	0	0
Thermometers in dry storage	2.1 ± 1.0	17	16	12	4	1	1.7 ± 0.9*	28	12	6	3	0
<b>Specifications</b>												
Written specifications for all ingredients and food products	2.3 ± 0.9	12	14	20	3	0	1.5 ± 0.6**	33	13	4	0	0
<b>Supplier Control</b>												
Assurance from suppliers that they follow HACCP or good manufacturing practices	2.3 ± 1.0	14	15	17	4	1	1.5 ± 0.6**	30	17	4	0	0
Procedures for checking the condition of the supplier's delivery trucks (i.e., sanitation, temperature)	2.0 ± 0.9	16	20	13	2	0	1.7 ± 0.7*	21	25	5	0	0
<b>Training</b>												
All employees trained on personal hygiene	2.9 ± 0.9	3	11	25	10	1	2.5 ± 0.7**	5	20	24	2	0
All employees trained on safe food handling procedures	2.8 ± 1.0	6	9	26	7	2	2.3 ± 0.7**	7	22	21	1	0
<b>HACCP</b>												
Temperature logs to record all end point cooking temperatures	2.7 ± 1.1	9	11	19	11	1	1.9 ± 0.9**	17	23	7	1	1
Food product flow charts	2.3 ± 0.9	10	19	16	3	1	1.4 ± 0.7**	33	13	3	1	0
A comprehensive HACCP plan	2.1 ± 0.9	14	18	13	3	0	1.2 ± 0.5**	39	9	1	0	0
HACCP Team	1.8 ± 0.8	18	17	11	0	0	1.2 ± 0.4**	41	6	1	0	0

<sup>a</sup>The stem "How Improved in Last 5 Years?" was used for all questions

<sup>b</sup>Mean Percentage ± Standard Deviation

<sup>c</sup>A five-point scale was used for responses. No Improvement (NI) was coded as a 1; little improvement (LI) as 2; improved (I) as 3; very improved (VI) as 4; and much improved (MI) as 5

\*P ≤ .05

\*\*P ≤ .001

\*\*\*Due to non-respondents, totals may not equal 54



**TABLE 4. Sanitarians' perceptions of barriers to implementation of prerequisite and HACCP program components (n = 54)\***

Characteristic <sup>a</sup>	Mean ± SD <sup>b</sup>	Frequency of Responses <sup>c</sup>				
		1	2	3	4	5
Employee knowledge	4.3 ± 1.0	2	2	10	12	27
Time	4.1 ± 1.1	5	11	11	11	15
Manager knowledge	4.0 ± 1.1	2	0	8	13	31
Lack of training materials	3.7 ± 1.3	4	5	12	12	19
Money	3.4 ± 1.4	2	3	11	18	20

<sup>a</sup>The stem "What obstacles do restaurants have to HACCP implementation?" was used for all questions

<sup>b</sup>Mean ± Standard Deviation

<sup>c</sup>A five-point scale was used for responses, no obstacle (1) to great obstacle (5)

\*Due to non-respondents, totals may not equal 54

vide education to individual operators. Therefore, it is imperative that sanitarians have access to a list of resources and people that could provide the needed information, training, and education for managers and employees.

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