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**Steritech White Paper:
 The Annual Food Safety
 Audit Trend Report:
 2006**

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INTRODUCTION

There are more than 925,000 restaurant locations in the United States, with sales anticipated to reach \$511 billion in 2006, up from \$476 billion in 2005 (1). With a growing number of meals eaten out of the home, the public and media are increasingly aware of the possibility of foodborne illnesses and outbreaks resulting from those meals.

In 2004, FoodNet cases were part of 239 nationally reported foodborne disease outbreaks (defined as two or more illnesses from a common source). Of these outbreaks 138 (58%) were associated with restaurants. The causative agent was reported in 152 (64%) outbreaks. The most common agents were norovirus (57%) and *Salmonella* (18%) (2). Norovirus is typically associated with poor personal hygiene on the part of infected food workers. A number of recent outbreaks associated with norovirus on cruise ships and in the foodservice industry have raised the profile of this illness in the media and with consumers.

An At-Risk Population

Greater numbers of vulnerable persons in the general population result in an increased need to safeguard the food supply. All areas of the at-risk populations are growing, including the immunocompromised, the very young, pregnant women and the elderly.

According to CDC approximately 40,000 people each year are diagnosed with AIDS in the United States, and significantly fewer are dying (3), meaning that there is a continually growing at-risk population of persons in an immunocompromised state due to this illness alone. In addition, each year the number of persons with organ transplants has risen steadily over the last decade, as seen in Table 1. Transplant Statistics (4). These persons are often required to take drugs that suppress their immune response to the new organ and are, therefore, more susceptible to foodborne illness.

Approximately 4.1 million babies were born in 2004, up slightly from 2003. This means that there were more pregnant women during the year and, by consequence, more children (5).

TABLE 1. TRANSPLANT STATISTICS

Year	Number of Transplants	Year	Number of Transplants
1995	19,392	2000	23,245
1996	19,749	2001	24,215
1997	20,303	2002	24,906
1998	21,518	2003	25,467
1999	22,012	2004	27,037

Finally, the census bureau anticipates that the percentage of the population over 65 will increase from 12.4% in 2000 to 16.3% by 2020 and 20% by 2030 (6). This aging population is extremely vulnerable to foodborne illness.

These factors contribute to the growing concern for food safety issues in public health and the restaurant industry. As a result, the restaurant industry continues to search for effective strategies to identify critical issues that occur in restaurants in order to prevent the occurrence of foodborne illness. One of these strategies is the use of third-party inspections.

Retail inspection has been described as “the primary tool a regulatory agency has for detecting hazardous practices and for taking action to correct deficiencies” (7). Regulatory inspectors attempt to fulfill two roles simultaneously, that of teacher and enforcer (8). How to achieve the optimum balance between advice and enforcement actions is a fundamental question concerning these regulators. A long-held industry complaint has been inconsistency of inspections (7, 9). Third-party audits have the benefit of providing the educational side of the equation, resulting in improved conditions in the restaurant facility through a consultative process rather than a punitive one.

In a paper published in 2005, Griffith suggested that inspection data collected in a database, such as the audit database maintained by Steritech, “provides evidence for what is possible and practical [through effective inspection]. It can be used for benchmarking, it can be used to identify the most poorly performed personal hygiene practices” (8).

The goal of this study is to provide a look at those issues most commonly cited in restaurants during a given calendar year, to show the potential for improvements, and to provide data for benchmarking.

“Traditionally, the word inspection means to look closely or officially to examine. Within environmental health circles this historically has been used in conjunction with floors, walls and ceilings to describe and EHP [Environmental Health Protection] inspection. More recently, especially with the introduction of HACCP and the need for verification, there has been a move towards auditing. From the Latin ‘auditus’ hearing this usually incorporates examining documentation and observing and asking about adherence to it. Traditional inspections assess the structure and fabric of the premises and visual cleanliness, although these may not be good indicators. Auditing may well follow a raw material, through preparation to dispatch/service and be more comprehensive” (8).

The data presented in this report provide evidence of improvements that can be seen through a coordinated food safety effort. Other studies have shown similar results. For example, a recent article evaluated the effectiveness of hygiene training in a retail environment by evaluating food safety practices and bacterial counts one month and six months after an initial training course (10). Bacterial counts were significantly higher at the initial

measurement, and improvements were observed in all categories of issues inspected.

Results such as these and those documented in this study demonstrate that improvement is possible with the proper focus on food safety measures.

In studies published by CDC analyzing the causes of foodborne disease outbreaks from 1988-1997 (11), the factors most commonly associated with foodborne illness outbreaks are grouped as follows:

1. Improper holding temperature
2. Poor personal hygiene
3. Inadequate cooking
4. Contaminated equipment

5. Food from unsafe sources

The data are grouped in this manner because the form that CDC uses to gather outbreak information collects the data in this format (12). These factors are defined broadly by CDC to fit the majority of causes of illness. Even so, some non-critical issues that have been shown to be predictive of investigated foodborne incidents, such as the lack of a thermometer (13), are not included in these categories. As a result, this study goes beyond the CDC scope to evaluate other issues defined as critical in the FDA Food Code (14), in addition to issues identified as non-critical by FDA.

SAMPLE SET & METHODOLOGY

In 2004, Steritech, in cooperation with the National Restaurant Association, published the first annual Audit Trend Report. The report was compiled from food safety audit data culled from both the full service and quick service industries. Both the 2004 Audit Trend Report and this 2006 Audit Trend Report have been provided as a service to industry to assist in determining those areas where challenges routinely occur, and to demonstrate the possibilities for improvement with management intervention.

The requirements for the sample used in compiling the data set for this report are that the sample size must be as large as possible and locations comprised from any given brand do not make up more than 10% of the total. In addition, brands may choose not to be included in the study at their discretion. Fulfilling these requirements has meant that for 2005, this study will present only data for the full service restaurant industry.

The sample size for this industry is 807 locations. Individual locations were audited initially and then again approximately one year later. Most locations also received one or more intermediate audits.

Audit Issue Study

The Steritech standard audit format conforms closely to the FDA Food Code (14), with some

variation for specific brands. Variations from the FDA Food Code are towards more stringent requirements, rather than towards more lenient ones.

Through a process of mapping violations at each location back to a specific list of food safety issues, Steritech was able to follow the sample set through one year of food safety auditing. Where the audit format differed from the standard Steritech audit format, individual and specific audit comments were evaluated to determine the correct categorization of issues.

Time of Day Study

In addition to the evaluation of the audit results over a year, a second study was conducted to evaluate the effect that time of day of the audit had on the violations observed. Audits were categorized as morning, lunch, afternoon and evening audits, and the percentage of violation of each type in each time frame was determined. Many issues were found to be independent of the time of day of the audit, but a small number of key issues were found to be time dependent.

For the purposes of the time of day study, the audits from the first round and the round one year later were combined to create a total sample set of 1,614 audits.

EXECUTIVE SUMMARY

In 2004, Steritech published the first Audit Trend Report. This report was intended as a service to industry to delineate issues routinely found in food safety audits, and to promote discussions on the interventions that took place to eliminate these problems. Data were presented on initial audits conducted at restaurants compared to audits conducted one year later.

This report, the 2006 edition of The Annual Food Safety Audit Trend Report analyzes data collected in 2005, following the publication of the 2004 Audit Trend Report. Similar to the 2004 report, this report presents audit data collected during initial audits at locations that had never been audited previously, as well as results from an audit a year after the initial audit.

This report has been expanded to include a study of the time of day when issues occurred, in addition to a study of the number of violations that occurred during initial audits and audits one year subsequent. This information provides interesting insight into some possible causes for issues where there is a trend related to time of day.

The 2006 study showed a reduction in the percentage of locations in nearly all issues. Of the critical issues studied, significant reductions were observed in (1) potential for contamination (39.8% reduction), (2) improper/inadequate handwashing (33.8% reduction), (3) improper sanitization (31.7% reduction), (4) improper condition of food contact

surfaces (29.4% reduction), and (5) presence of expired food (28.8% reduction).

Three issues showed an increase in the level of violations in the 2006 study. These were: (1) hot holding (-11.4%), (2) proper cooking (-25.0%), and (3) foods from approved source and in sound condition (-29.2%).

Due to the initial and subsequent low level of violations seen in the area of proper cooking and foods from approved source and in sound condition, the statistical significance of these issues is questionable, but the hot holding statistics definitively demonstrated a significant and troubling regression.

The time of day study showed that the incidence of hot holding issues increased significantly from the morning (9.1%) to the afternoon (22.9%). This may indicate that food that was initially hot from cooking cooled during the day to an unsafe temperature. The time of day information provides further texture to the data provided to brands to help determine the root cause of ongoing issues.

The summary of the issues studied and their change over the course of the study is as follows. Of the 24 critical issues studied, 20 showed improvement, 1 showed no change, and 3 showed regression. For the non-critical issues studied, 10 showed improvement and 2 showed no change. Tables 2 & 3 show the specific issues and the percentage change for each issue.

TABLE 2. CHANGES IN CRITICAL ISSUES AFTER ONE YEAR

Critical Issue Studied	Percent Change
Persons with infections or communicable disease are restricted from food handling.	100.0
Sewage disposal systems, including grease traps, operating properly.	66.7
Foods free of hazardous contamination.	62.5
Adequate handwashing facilities present in food handling areas.	40.0
No potential for contamination of food.	39.8
Proper handwashing practices followed.	33.8
Sanitizer solutions at proper concentration and temperature; dishwashing machine final rinse at proper temperature.	31.7
Plumbing provides adequate pressure; air gaps/backflow prevention devices in place where required.	31.4
Food contact surfaces of equipment and utensils durable, non-toxic, easily cleanable and in good condition.	29.4
Food products not held or sold past expiration date.	28.8
No bare hand contact with ready-to-eat foods.	27.9
Foods properly handled.	15.7
Food properly dated.	11.3
Food contact surfaces properly cleaned, sanitized and air-dried.	9.6
Eating, drinking and tobacco use restricted to nonfood areas. Drinking allowed from covered containers stored appropriately.	8.3
Chemicals and spray bottles properly labeled and stored.	7.9
Potentially hazardous foods properly cooled.	7.3
Pest prevention program is effective.	7.2
Cold potentially hazardous foods maintained at 41°F or below.	6.7
Adequate hot and cold water available and from an approved source.	6.1
Walk-in cooler product temperatures maintained at 41°F or below.	0.0
Hot potentially hazardous foods maintained at 140°F or above.	-11.4
Potentially hazardous foods cooked to proper internal temperatures.	-25.0
Food from approved source and in sound condition.	-29.2

TABLE 3. CHANGES IN NON-CRITICAL ISSUES AFTER ONE YEAR

Non-critical Issue Studied	Percent Change
Restrooms clean, fully stocked and in good repair; doors are self-closing; covered receptacles where required	27.9
Potentially hazardous foods properly thawed.	26.7
Thermometers available for use, accurate and used appropriately	25.7
Food and food contact packaging stored at least six inches off floor	22.6
In-use utensils properly handled and stored	18.4
Clean utensils, equipment and food contact packaging properly stored	18.1
Refrigerated units equipped with accurate thermometers	15.3
Handwashing facilities in food handling areas clean, accessible, fully stocked and properly signed.	13.8
Personal items properly stored in designated areas away from food, utensils and equipment	11.5
Foods properly covered and protected.	1.4
Fruits and vegetables properly washed prior to processing and serving	0
Frozen foods held solidly frozen.	0



Specific Issues

Similar to the 2004 study, the most commonly cited critical issue in the 2006 study was the improper cleaning and sanitizing of food contact surfaces. Amongst the 2006 data set, the initial percentage of violations for this item was higher than the 2004 study, but the level after one year was similar.

The second most common issue in the 2004 study was cold holding, which was in third place in the 2006 study. The percentage of violations was again higher in 2006 than in 2004, but the reduction was also higher (6.7% versus 5.7%).

The third most common critical issue observed in 2004 was sanitizer concentration, which was in second place in 2006. This issue was also more commonly cited in 2006, but a 31.7% reduction in the number of issues over the course of the year brought it closer in line with 2004 results.

The audit results in the 2004 and 2006 studies are from two very different data sets taken at two different times. The most important conclusion that can be drawn from this data is that even with the two different data sets, many of the same issues remain at the forefront of food safety. That having been said, despite the two different data sets, improvements that are seen are dramatic and statistically significant.



AUDIT FORMAT

The standard audit format for this study is primarily based on the FDA Food Code (14). For the purposes of this study, all audit data were mapped back to the format presented in this section, even if a brand-specific format was used for the actual audits.

The audit format Steritech uses has been modified over time as major changes have been made to the FDA Food Code. The audit data have been mapped to the 2001 version of the Food Code for the purposes of this study, as changes implemented in the 2003 Supplement and the 2005 Food Code have not generally been implemented as law in most states.

The language used in defining these audit issues is simpler than that found in the FDA Food Code or similar publications studying compliance with food safety factors. This is due to the fact that the audit format is designed to be accessible to persons with-

out a background in food safety. For instance, rather than requiring “Date marking of potentially hazardous foods if stored for more than 24 hours,” this audit format states the requirement as “Foods properly dated.” During the audit itself the auditor provides guidance on specific requirements verbally and in writing.

Certain aspects of the audit format are intentionally left vague. For instance, “Foods properly handled” is an audit item that is typically used to indicate time/temperature abuse related to employee practices not identified elsewhere. For example, if potentially hazardous food were left out of temperature control unattended for an extended period of time, it would be scored under this item. When mapping these items back to the standard Steritech audit format, specific auditor comments were examined to classify these items.

The audit format is divided into critical issues and non-critical issues as follows:

TABLE 4. CRITICAL AUDIT ISSUES

Cold potentially hazardous foods maintained at 41°F or below.	Food contact surfaces of equipment and utensils durable, non-toxic, easily cleanable and in good condition.
Hot potentially hazardous foods maintained at 140°F or above.	Sanitizer solutions at proper concentration and temperature; dishwashing machine final rinse at proper temperature.
Walk-in cooler product temperatures maintained at 41°F or below.	Adequate handwashing facilities present in food handling areas.
Food from approved source and in sound condition.	Proper handwashing practices followed.
Food properly dated.	No bare hand contact with ready-to-eat foods.
Food products not held or sold past expiration date.	Persons with infections or communicable disease are restricted from food handling.
Potentially hazardous foods cooked to proper internal temperatures.	Eating, drinking and tobacco use restricted to nonfood areas. Drinking allowed from covered containers stored appropriately.
Foods properly handled.	Sewage disposal systems, including grease traps, operating properly.
Potentially hazardous foods properly cooled.	Chemicals and spray bottles properly labeled and stored.
No potential for contamination of food.	Adequate hot and cold water available and from an approved source.
Foods free of hazardous contamination.	Plumbing provides adequate pressure; air gaps/backflow prevention devices in place where required.
Food contact surfaces properly cleaned, sanitized and air-dried.	Pest prevention program is effective.

TABLE 5. NON-CRITICAL AUDIT ISSUES

Handwashing facilities in food handling areas clean, accessible, fully stocked and properly signed.	In-use utensils properly handled and stored.
Fruits and vegetables properly washed prior to processing and serving.	Clean utensils, equipment and food contact packaging properly stored.
Potentially hazardous foods properly thawed.	Food and food contact packaging stored at least six inches off floor.
Foods properly covered and protected.	Refrigerated units equipped with accurate thermometers.
Frozen foods held solidly frozen.	Thermometers available for use, accurate and used appropriately.
Personal items properly stored in designated areas away from food, utensils and equipment.	Restrooms clean, fully stocked and in good repair. Doors are self-closing. Covered receptacles where required.



DATA COLLECTION

The data for this study were collected by a team of auditors who have received specialized food safety training with a strong emphasis on the study of the FDA Food Code. Each auditor has a background in food safety and sanitation and receives extensive in-field training. Steritech auditors are also required to attain the National Environmental Health Association's Certified Food Safety Professional credential and maintain that credential through continuing education.

In the collection of these data, an issue is marked as in compliance if the auditor does not observe a violation. For instance, receiving practices are not always observed but will be marked compliant unless an issue is noted. While some customized Steritech audit formats include the ability to mark audit items as Not Applicable or Not Observed, many do not. In cases where a customized audit format did offer this ability, Not Applicable or Not Observed items have been counted as compliant.



AUDIT DATA

The initial audit data were collected for 807 full service restaurants in the United States and Canada.

For the purpose of this study, data will be presented in the following categories:

1. Improper Holding Time/Temperature
2. Poor Personal Hygiene
3. Inadequate Cooking
4. Contaminated Food Equipment
5. Food From Improper Sources
6. Other Issues: Critical
7. Other Issues: Non-critical

The first five categories are the same as those used in similar studies (15, 16) published by FDA, while the last two categories contain issues that were not evaluated in those studies.

Overview of Time of Day Audit Data

In addition to studying the numbers of violations assessed, this study attempts to evaluate the significance of the time of day that the audit occurred. To that end, audits were categorized as either morning, lunch, afternoon or evening audits.

The time periods represented by these classifications are as follows:

- Morning: 7:30AM to 10:30AM
- Lunch: 10:30AM to 1:30PM
- Afternoon: 1:30PM to 4:30PM
- Evening: 4:30PM to 7:30PM

The audits were classified based on the time of day that the audit began. The number of audits in each classification for each round of audits is shown in Tables 6 & 7.

TABLE 6. TIME OF DAY AUDITS ROUND ONE

	Round One (Initial)			
	Morning	Lunch	Afternoon	Evening
Number of Audits	245	236	298	28

TABLE 7. TIME OF DAY AUDITS ROUND TWO

	Round Two (One Year Later)			
	Morning	Lunch	Afternoon	Evening
Number of Audits	215	314	244	34

Critical Issues

Initially, locations showed an average of 4.52 critical violations per location, irrespective of time of day. At the end of one year of auditing, this number was reduced to 3.75 critical violations per location. This represents a reduction of 17.1% in the number of critical issues cited per location.

Table 8 shows the number of critical issues per location cited in the four time of day ranges in both rounds one and two. The sample size for evening audits is quite small in both the first and second rounds, so very little can be deduced from the evening audits. For both rounds one and two, a steady rise in the number of violations per location is seen from the morning to the afternoon.

TABLE 8. NUMBER OF CRITICAL ISSUES PER LOCATION BY TIME OF DAY

Round 1			Round 2			Percentage Reduction
	Number of Critical Issues	Violations per Location		Number of Critical Issues	Violations per Location	
Morning	1065	4.35	Morning	778	3.62	16.8
Lunch	1045	4.43	Lunch	1163	3.70	16.5
Afternoon	1419	4.76	Afternoon	927	3.80	20.1
Evening	120	4.29	Evening	157	4.62	-7.7
TOTAL	3649	4.52	TOTAL	3025	3.75	17.1

Non-critical Issues

In regards to the non-critical issues studied, locations initially showed an average of 3.50 non-critical issues per location, irrespective of time of day. At the end of one year of auditing, this number was reduced to 2.95 non-critical violations per location. This represents a reduction of 15.8% in the number of non-critical issues cited per location.

Table 9 shows the number of non-critical issues per location cited in the four time ranges in both rounds one and two. The sample size for evening audits is quite small in both the first and second rounds, so very little can be deduced from the evening audits. No consistent trend in the non-critical issues can be seen for time of day.

TABLE 9. NUMBER OF NON-CRITICAL ISSUES PER LOCATION BY TIME OF DAY

Round 1		Round 2		Percentage Reduction		
	Number of Non-critical Issues	Violations per Location		Number of Non-critical Issues	Violations per Location	
Morning	880	3.59	Morning	599	2.79	22.3
Lunch	768	3.25	Lunch	935	2.98	8.3
Afternoon	1072	3.60	Afternoon	728	2.98	17.2
Evening	105	3.75	Evening	116	3.41	9.1
TOTAL	2825	3.50	TOTAL	2378	2.95	15.8

Specific Issues

Some issues showed no definitive trending over the course of the day, while others showed interesting results. This section presents some of the issues showing definite trending. A complete list of time of day data can be found at the end of this report.

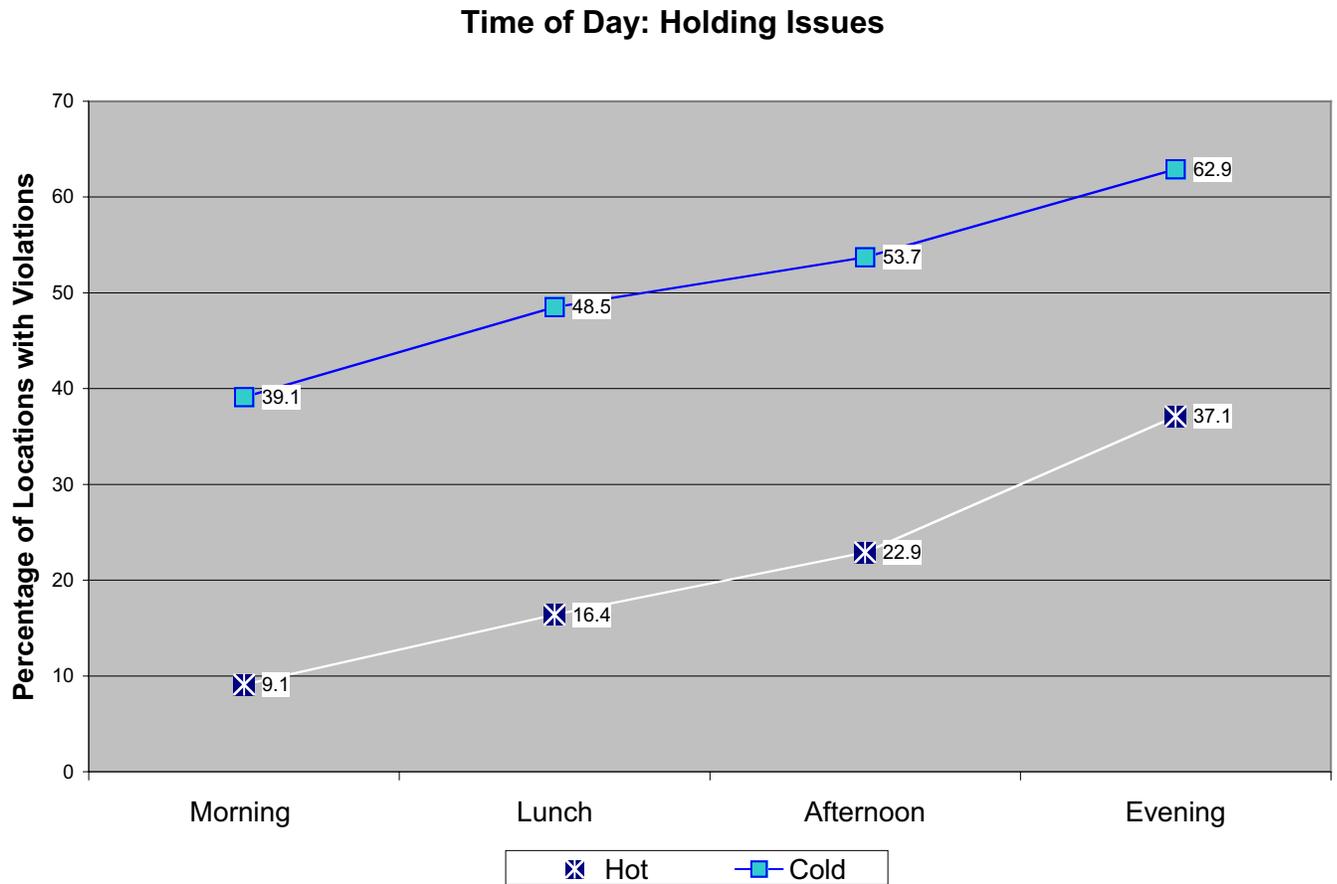
Holding Issues

Two temperature issues showed interesting trends during the course of the day. These were hot and cold holding. Violations in these areas rose steadily over the course of the day. There are a number of

possible reasons for this trend including: 1) refrigeration begins the day at an acceptable temperature, and then rises due to unit access; 2) hot food begins the day at an acceptable temperature from cooking, then cools over time; 3) employees monitor temperature at the beginning of the day, but miss opportunities as they become busier.

Whatever the reason, these data clearly indicate the need to monitor temperature several times over the course of the day to prevent temperature abuse.

GRAPH 1. TIME OF DAY: HOLDING ISSUES

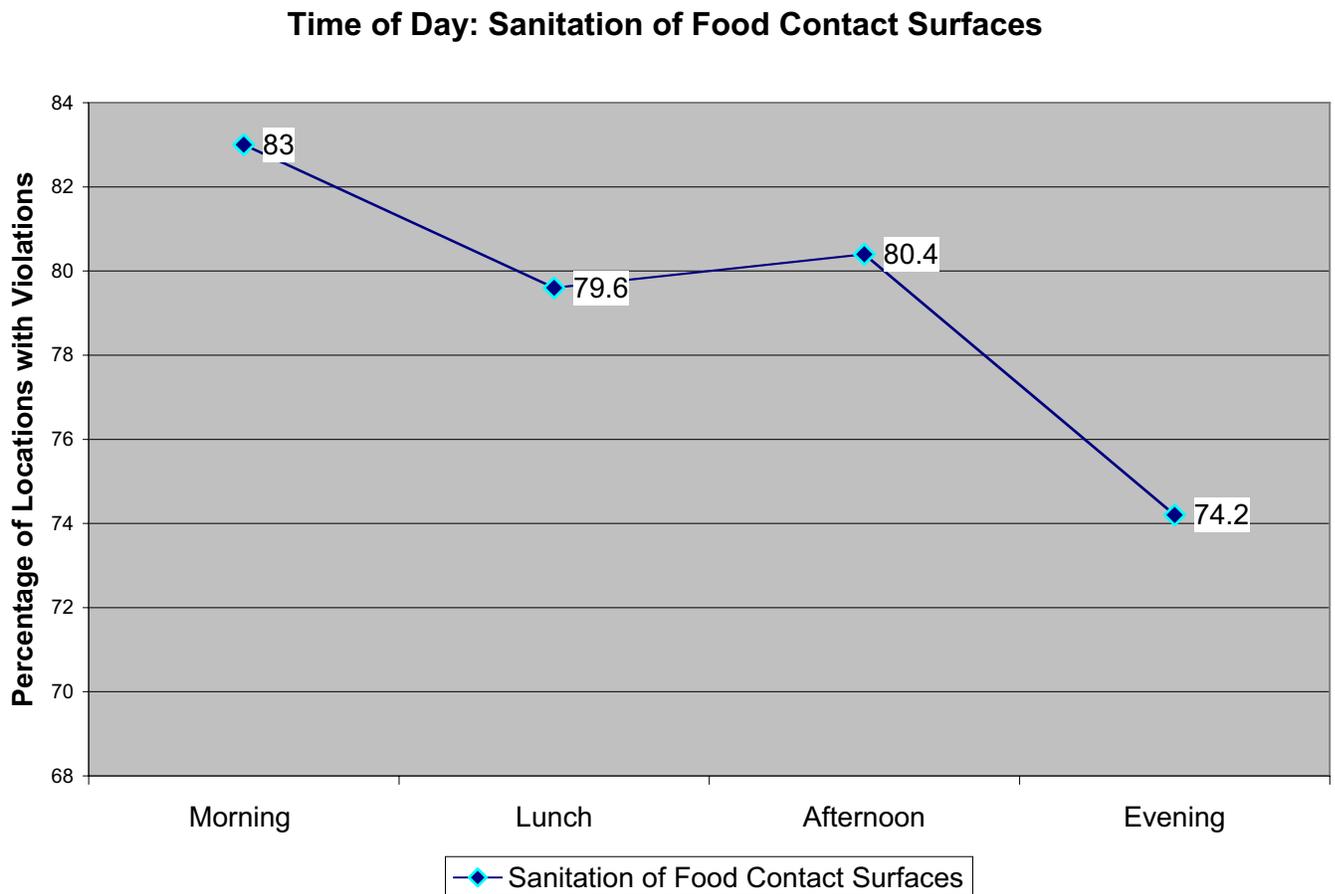


Sanitation of Food Contact Surfaces Issues

The sanitation of food contact surfaces showed an interesting trend over the course of the day as well, with an initially high level of violations falling somewhat over the course of the day. Some of this can probably be explained by the fact that in the

morning all equipment should be clean and can be observed by the auditor, while during the day, more equipment is in use, and the number of possible observations is reduced.

GRAPH 2. TIME OF DAY: SANITATION OF FOOD CONTACT SURFACES



Personal Hygiene Issues

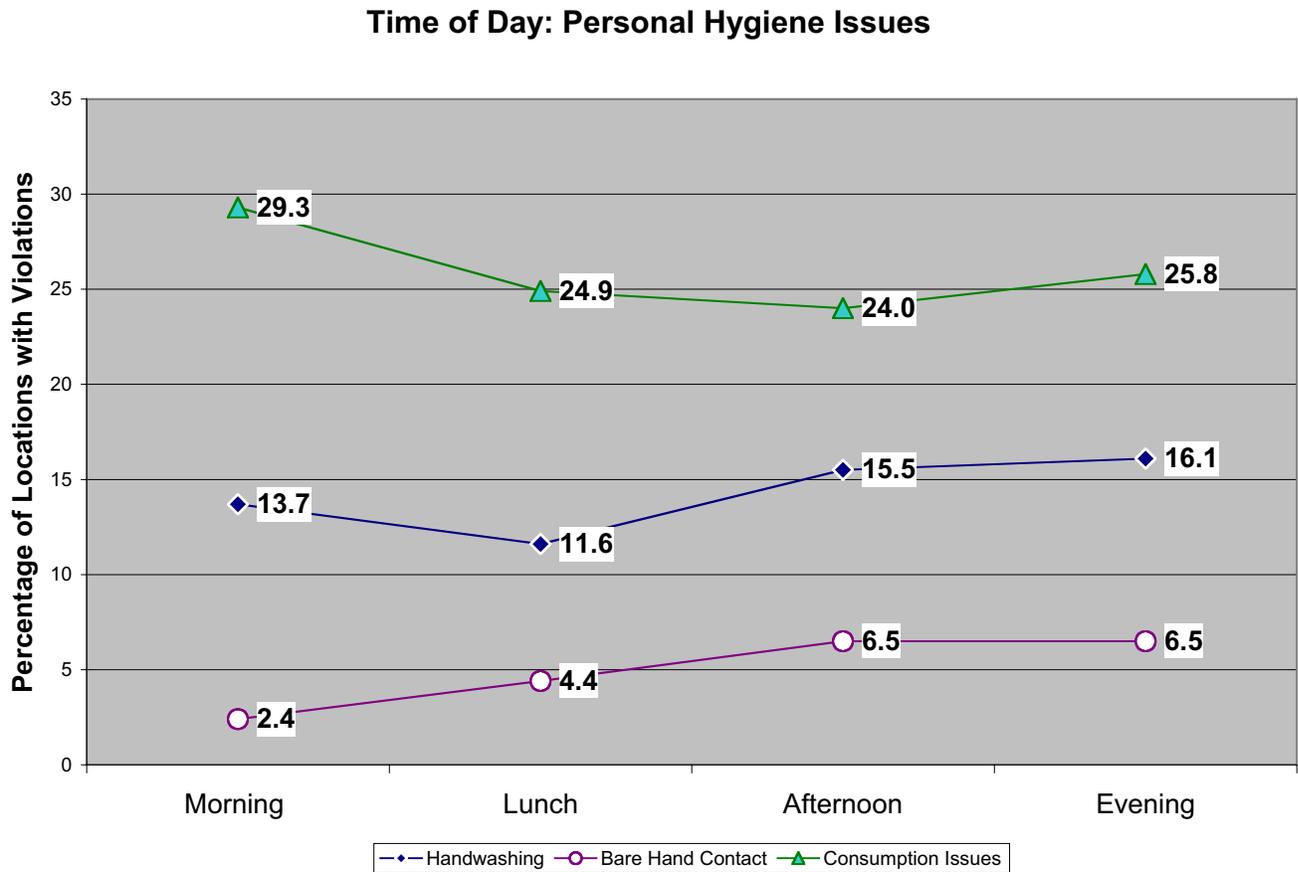
Study of several personal hygiene issues in relation to the time of day also revealed interesting results. Consumption issues on the graph below are those issues related to the improper consumption of food, beverages and tobacco by food workers. These issues fell from a morning high to the lowest point in the afternoon. This may be related to problems covering cups containing coffee, which is more difficult to drink through a straw than other beverages and is often consumed in the morning.

Handwashing violations were least commonly observed in the lunch period, which is typically

extremely busy and would be thought to present a significant opportunity to observe these issues. It may be that times of day when food preparation and multi-tasking occur, handwashing violations are more likely to occur. During a busy time of day when a food worker does the same task repetitively, the likelihood of handwashing violations may decrease.

Finally, issues associated with bare hand contact with ready to eat food rose steadily throughout the day. More intensive study of the reasons behind this issue is needed to determine the cause.

GRAPH 3. TIME OF DAY: PERSONAL HYGIENE ISSUES



Improper Holding Time/Temperature

Five factors contribute to the category of improper holding time/temperature. These factors are: cold holding temperature; hot holding temperature; walk-in cooler temperature; date marking; and improper cooling.

Table 10 shows performance based on these factors.

TABLE 10. AUDIT DATA: IMPROPER HOLDING TIME/TEMPERATURE

Issue	Percentage of Locations Out of Compliance		
	Initial	One Year	Percent Change
Potentially hazardous foods properly cooled.	5.1	4.7	7.3
Foods properly dated.	18.6	16.5	11.3
Walk-in cooler product temperatures at 41°F or below.	4.3	4.3	0.0
Hot potentially hazardous foods maintained at 140°F or above.	16.4	18.2	-11.4
Cold potentially hazardous foods maintained at 41°F or below.	49.8	46.5	6.7

Issues associated with improper cold holding were the fourth most commonly cited issue in the first round of audits, and the second most commonly cited critical issue in the final audit, although a 6.7% reduction in the number of violations was observed.

The Time of Day Study showed that the number of violations related to cold holding rose steadily over the course of a day, indicating that later in the day cold holding issues were more prevalent.

Hot holding issues were one of the three issues that showed regression from the first round to the round after one year. This issue also showed an increase in the number of issues from the morning time frame through the later hours of the day.

Date marking issues displayed a significant reduction from the initial measurement to the audit one year later. Improvements in this issue are usually related to coaching over the year, both from auditors and restaurant management.

Poor Personal Hygiene

In this research, four critical issues comprised the personal hygiene aspect of the study. These factors were: improper handwashing; improper eating, drinking or tobacco use; bare hand contact with ready-to-eat foods; and inaccessibility of handwash facilities.

TABLE 11. AUDIT DATA: POOR PERSONAL HYGIENE

Issue	Percentage of Locations Out of Compliance		
	Initial	One Year	Percent Change
Handwashing facilities in food handling areas clean, accessible, fully stocked and properly signed.	50.3	43.4	13.8
No bare hand contact with ready-to-eat foods.	5.3	3.8	27.9
Eating, drinking and tobacco use restricted to nonfood areas. Drinking allowed from covered containers stored appropriately.	27.0	24.8	8.3
Proper handwashing practices followed.	16.5	10.9	33.8

Although issues associated with the accessibility, stocking and signage of handwash sinks showed significant improvement from the first round to the round after a year, these issues were the third most commonly cited issues in both rounds.

Issues associated with proper handwashing practices were the tenth most commonly cited issues in the first round. The 33.8% reduction in the number of handwashing issues is an impressive improvement. Handwashing and related personal hygiene issues are a significant focus in the Steritech audit, especially as viral outbreaks become more common.

There has been significant controversy in the food safety industry around the issue of bare hand contact with ready-to-eat food. Recent research published in the *Journal of Food Protection* suggests a lack of statistical significance in coliform bacterial contamination between food products handled by food workers with gloved hands and those handled

by food workers with bare hands (17). In that study, food workers were observed wearing the same gloves for extended periods of time without handwashing. Steritech enforces a strict policy of no bare hand contact with ready-to-eat food combined with handwashing and glove changes whenever gloves may become contaminated. In addition, Steritech monitors proper glove usage and changes in a separate audit item. Issues associated with bare hand contact with ready-to-eat food were reduced by 27.9%.

Issues associated with eating, drinking and tobacco use were observed in more than a quarter of the locations during the initial audit, and were reduced by 8.3% in the follow-up audit. This is another type of violation that is typically reduced through education and discipline over the course of the audit round, in a cooperative effort between auditors and restaurant management.

Inadequate Cooking

Inadequate cooking and reheating is represented by a single audit issue in the audit format used for this study.

TABLE 12. AUDIT DATA: INADEQUATE COOKING

Issue	Percentage of Locations Out of Compliance		
	Initial	One Year	Percent Change
Potentially hazardous foods cooked to proper internal temperatures.	1.5	1.9	-25.0

This issue is marked by an extremely low level of non-compliance in both the first audit and the audit after one year. There was an increase in the number of issues found associated with this item, but the low observational level means that there is no statistical significance to this increase.

This issue was 22nd in the list of most commonly cited critical issues in the first round of audits and 21st in the final round.

Contaminated Equipment

The CDC risk factor “Contaminated Equipment” is broadly defined for the purpose of this study. The risk factor includes protection from contamination, including cross-contamination from raw to ready-to-eat, but also including protection from other types of contamination. In addition, this category includes cleaning and sanitizing food contact surfaces and utensils. Finally, protection from environmental contamination is included in this category. As a result, the issue “Foods properly covered and protected” is listed below.

TABLE 13. AUDIT DATA: CONTAMINATED EQUIPMENT

Issue	Percentage of Locations Out of Compliance		
	Initial	One Year	Percent Change
Foods properly covered and protected.	43.0	42.4	1.4
Food contact surfaces properly cleaned, sanitized and air-dried.	84.8	76.6	9.6
No potential for contamination of food.	32.7	19.7	39.8

The item “Food contact surfaces properly cleaned, sanitized and air-dried” was, by far, the most commonly cited critical issue and was observed at almost 30% more locations initially than the second most commonly cited critical issue (sanitizer concentration). Although an improvement of almost 10% was observed in this issue, this is still a very serious issue in a large number of locations.

There are many opportunities to evaluate the cleanliness of food contact surfaces in the restaurant environment. Any one violation will result in the issue being assessed as out of compliance for the location, which accounts for the high level of violations seen.

A marked improvement was observed in issues associated with the item “No potential for contamination of food.” As this item includes raw to ready-to-eat cross contamination issues, the improvement in this area is a very significant accomplishment. This item is often related to improper education of the foodservice management on the definition of commingling and the proper ways to avoid it. As restaurant managers are made aware of this issue by their auditor, they act to correct it.

Foods from Improper Sources

Facilities with structured food safety programs do not typically have issues associated with food from improper sources, as they often engage in quality assurance measures such as vendor approval programs. It is extremely rare to observe food products from home canning, home kitchens or other non-approved sources. In addition, only a small number of the full service restaurants in this study serve molluscan shellfish raw or must keep shellstock tags on site. As such, the item evaluated in this audit views the issue in two parts: “Foods from approved sources and in sound condition.” In general, issues cited for this item relates to the “sound condition” aspect of the issue, rather than “approved sources” aspect.

TABLE 14. AUDIT DATA: FOODS FROM IMPROPER SOURCES

Issue	Percentage of Locations Out of Compliance		
	Initial	One Year	Percent Change
Food from approved source and in sound condition.	3.0	3.8	-29.2

This audit item was observed at a low level both initially and in the follow-up audit after a year. The audit did show regression from the first round to the

final round of audits, which should be addressed in future audits.

Other Issues: Critical

This section addresses other issues identified as critical in the Steritech Audit Format, but not specifically addressed in the previous categories. Such issues include:

- Food products not held or sold past expiration date
- Potentially hazardous foods received at proper temperatures
- Foods properly handled
- Foods free of hazardous contamination
- Sanitizer solutions at proper concentration and temperature; dishwashing machine final rinse at proper temperature
- Chemicals and spray bottles properly labeled and stored
- Adequate hot and cold water available and from an approved source
- Sewage disposal systems, including grease traps, operating properly
- Adequate handwashing facilities present in food handling areas
- Plumbing provides adequate pressure; air gaps/backflow prevention devices in place where required

Most of the issues listed above need no explanation, however two of the items are specific to the Steritech audit format: “Foods properly handled” and “Foods free of hazardous contamination.”

“Foods properly handled” is typically used to indicate time/temperature abuse that is related to employee practices not identified elsewhere in the audit. For example, if potentially hazardous food were left out of temperature control unattended for an extended period of time, it would be scored under this item.

“Foods free of hazardous contamination” is used to assess any incident where food has been contaminated and must be discarded, as it is unsafe to serve. For example, the practice of storing raw animal foods above ready-to-eat product would typically be scored as “No potential for contamination of food.” However, if the raw product were actually observed dripping onto the ready-to-eat product, the issue would be scored as “Foods free of hazardous contamination.” This is a red flag issue for Steritech customers and must be corrected immediately.

TABLE 15. AUDIT DATA: OTHER ISSUES: CRITICAL

Issue	Percentage of Locations Out of Compliance		
	Initial	One Year	Percent Change
Pest prevention program is effective.	8.6	7.9	7.2
Adequate hot and cold water available and from an approved source.	4.1	3.8	6.1
Chemicals and spray bottles properly labeled and stored.	40.9	37.7	7.9
Sanitizer solutions at proper concentration and temperature. Dishwashing machine final rinse at proper temperature.	55.1	37.7	31.7
Foods properly handled.	13.4	11.3	15.7
Foods free of hazardous contamination.	3.0	1.1	62.5
Food contact surfaces of equipment and utensils durable, non-toxic, easily cleanable and in good condition.	47.7	33.7	29.4
Food products not held or sold past expiration date.	9.0	6.4	28.8
Persons with infections or communicable disease are restricted from food handling.	0.1	0.0	100.0
Sewage disposal systems, including grease traps, operating properly.	0.4	0.1	66.7
Adequate handwashing facilities present in food handling areas.	0.6	0.4	40.0
Plumbing provides adequate pressure; air gaps/backflow prevention devices in place where required.	4.3	3.0	31.4

This category includes the second, fourth and fifth most commonly cited critical items in the first round of audits: sanitizer issues; food contact surface condition issues; and chemical labeling and storage, respectively. In addition, pest control issues are frequently reasons for closure of restaurants by health departments and other regulatory authorities.

All issues in this category showed improvement after one year of inspections. Many decreased considerably. However, these data show a high level of out of compliance for several critical issues.

Other Issues: Non-Critical

In this section, data are presented for several specific non-critical issues. Non-compliance in issues identified in the FDA Food Code as non-critical typically will not cause foodborne outbreaks in and of themselves. However, these issues do support compliance with critical issues and violations in these areas indicate a lack of control that can be indicative of larger problems.

For instance, lack of properly calibrated thermometers or the absence of thermometers in refrigerated units means that there can be no definite control of temperature, because there is no way to measure this important factor.

One very important issue represented in this category is washing produce prior to processing and service. There have been a number of recent outbreaks associated with produce. This issue relates to the reduction in the level of contamination on produce. Washing cannot completely remove all microbial contaminants, but this practice can reduce the level of these contaminants and pesticides.

Issues related to storage of products off the floor, storing clean and in-use utensils and restroom

maintenance all relate to a lack of attention to detail in the area of food safety that can be indicative of larger problems.

The issues presented in this category are:

- Thermometers available for use, accurate, used appropriately
- Refrigerated units equipped with accurate thermometers
- Fruits and vegetables properly washed prior to processing and serving
- Food and food contact packaging stored at least six inches off floor
- Clean utensils, equipment and food contact packaging properly stored
- In-use utensils properly handled and stored
- Personal items properly stored in designated areas away from food, utensils and equipment
- Restrooms clean, fully stocked and in good repair; doors are self-closing; covered receptacles where required
- Potentially hazardous foods properly thawed.
- Frozen foods held solidly frozen

TABLE 16. AUDIT DATA: OTHER ISSUES: NON-CRITICAL

Issue	Percentage of Locations Out of Compliance		
	Initial	One Year	Percent Change
Restrooms clean, fully stocked and in good repair. Doors are self-closing. Covered receptacles where required.	22.7	16.4	27.9
Personal items properly stored in designated areas away from food, utensils and equipment.	31.2	27.6	11.5
In-use utensils properly handled and stored.	53.9	44.0	18.4
Clean utensils, equipment and food contact packaging properly stored.	62.5	51.2	18.1
Food and food contact packaging stored at least six inches off floor.	29.6	22.9	22.6
Fruits and vegetables properly washed prior to processing and serving.	1.9	1.9	0.0
Refrigerated units equipped with accurate thermometers.	31.6	26.8	15.3
Thermometers available for use, accurate and used appropriately.	12.5	9.3	25.7
Potentially hazardous foods properly thawed.	7.4	5.5	26.7
Frozen foods held solidly frozen.	3.5	3.5	0.0

All non-critical issues studied were either reduced in occurrence, or remained the same, as in the case of produce washing. Many issues, such as thermometer-related issues, are corrected through the consultative process of the audit. In the initial round of audits, the auditor will make an observation of an out of compliance issue. In the case of an

improperly calibrated thermometer, the auditor will demonstrate the proper calibration method to the personnel involved and teach them the proper use and calibration of the device. In this manner, future violations can be avoided because the staff is made aware of the correct procedures.

SUMMARY

Data are presented for 24 critical issues and 12 non-critical issues studied over the course of a one year period for full service restaurants. This data showed a reduction in the level of critical issues for 20 of the 24 critical issues, with no change in one issue. The data also revealed improvement in 10 of the 12 non-critical issues, with no change in two issues.

In the Time of Day Study, trends were observed in cold and hot holding issues, temperature issues and in the area of contamination of food contact surfaces. The trend in hot and cold holding shows that the number of violations related to these issues

increases during the day. This may provide clues to ways to handle these issues in foodservice establishment.

The data imply that attention to food safety issues identified during audits can reduce the level of future violations. The consultative process of auditing can help to educate foodservice managers and foodservice workers to decrease the number of critical and non-critical violations in an establishment and help to ensure safe food.

The next two pages show a summary of the data for the Time of Day Study and the study of specific violations.

TIME OF DAY STUDY

TABLE 17. TIME OF DAY DATA: CRITICAL ISSUES

	TOTAL Morning	TOTAL Lunch	TOTAL Afternoon	TOTAL Evening	Total Sample Size
Sample Size	460	550	542	62	1614
Cold potentially hazardous foods maintained at 41°F or below.	39.1	48.5	53.7	62.9	
Hot potentially hazardous foods maintained at 140°F or above.	9.1	16.4	22.9	37.1	
Walk-in cooler product temperatures maintained at 41°F or below.	5.4	4.5	3.7	0.0	
Food from approved source and in sound condition.	4.1	3.8	2.8	0.0	
Food properly dated.	22.2	13.6	17.0	22.6	
Food products not held or sold past expiration date.	6.5	8.4	8.5	4.8	
Potentially hazardous foods cooked to proper internal temperatures.	4.1	0.5	0.7	1.6	
Foods properly handled.	8.7	13.3	13.3	22.6	
Potentially hazardous foods properly cooled.	5.7	4.7	4.6	4.8	
No potential for contamination of food.	26.5	25.6	27.1	21.0	
Foods free of hazardous contamination.	1.3	2.4	2.4	1.6	
Food contact surfaces properly cleaned, sanitized and air-dried.	83.0	79.6	80.4	74.2	
Food contact surfaces of equipment and utensils durable, non-toxic, easily cleanable and in good condition.	40.9	38.4	42.8	41.9	
Sanitizer solutions at proper concentration and temperature; dishwashing machine final rinse at proper temperature.	45.0	44.9	48.7	50.0	
Adequate handwashing facilities present in food handling areas.	1.1	0.2	0.4	0.0	
Proper handwashing practices followed.	13.7	11.6	15.5	16.1	
No bare hand contact with ready-to-eat foods.	2.4	4.4	6.5	6.5	
Persons with infections or communicable disease are restricted from food handling.	0.0	0.2	0.0	0.0	
Eating, drinking and tobacco use restricted to nonfood areas. Drinking allowed from covered containers stored appropriately.	29.3	24.9	24.0	25.8	
Sewage disposal systems, including grease traps, operating properly.	0.2	0.4	0.2	0.0	
Chemicals and spray bottles properly labeled and stored.	35.4	39.1	42.4	41.9	
Adequate hot and cold water available and from an approved source.	3.7	3.5	4.8	1.6	
Plumbing provides adequate pressure; air gaps/backflow prevention devices in place where required.	3.3	3.3	4.2	4.8	
29 Pest prevention program is effective.	9.8	9.3	6.3	4.8	

TABLE 18. TIME OF DAY DATA: NON-CRITICAL ISSUES

	TOTAL Morning	TOTAL Lunch	TOTAL Afternoon	TOTAL Evening	Total Sample Size
Sample Size	460	550	542	62	1614
Handwashing facilities in food handling areas clean, accessible, fully stocked and properly signed.	45.4	47.6	46.7	51.6	
Fruits and vegetables properly washed prior to processing and serving.	2.6	1.8	1.5	0.0	
Potentially hazardous foods properly thawed.	5.4	8.4	5.7	3.2	
Foods properly covered and protected.	42.4	42.7	42.3	48.4	
Frozen foods held solidly frozen.	3.0	3.5	2.8	12.9	
Personal items properly stored in designated areas away from food, utensils and equipment.	28.3	27.5	32.7	27.4	
In-use utensils properly handled and stored.	47.6	46.4	51.7	58.1	
Clean utensils, equipment and food contact packaging properly stored.	54.1	56.2	57.9	72.6	
Food and food contact packaging stored at least six inches off floor.	28.0	24.9	26.8	21.0	
Refrigerated units equipped with accurate thermometers.	34.3	24.4	29.7	29.0	
Thermometers available for use, accurate and used appropriately.	12.0	8.7	12.0	12.9	
Restrooms clean, fully stocked and in good repair. Doors are self-closing. Covered receptacles where required.	18.3	17.6	22.5	19.4	

SUMMARY OF DATA

TABLE 19. SUMMARY OF DATA: CRITICAL ISSUES

	Percentage of Locations with Violations		
	Round One	Round Two	Percentage Change
Cold potentially hazardous foods maintained at 41°F or below.	49.8	46.5	6.7
Hot potentially hazardous foods maintained at 140°F or above.	16.4	18.2	-11.4
Walk-in cooler product temperatures maintained at 41°F or below.	4.3	4.3	0.0
Food from approved source and in sound condition.	3.0	3.8	-29.2
Food properly dated.	18.6	16.5	11.3
Food products not held or sold past expiration date.	9.0	6.4	28.8
Potentially hazardous foods cooked to proper internal temperatures.	1.5	1.9	-25.0
Foods properly handled.	13.4	11.3	15.7
Potentially hazardous foods properly cooled.	5.1	4.7	7.3
No potential for contamination of food.	32.7	19.7	39.8
Foods free of hazardous contamination.	3.0	1.1	62.5
Food contact surfaces properly cleaned, sanitized and air-dried.	84.8	76.6	9.6
Food contact surfaces of equipment and utensils durable, non-toxic, easily cleanable and in good condition.	47.7	33.7	29.4
Sanitizer solutions at proper concentration and temperature; dishwashing machine final rinse at proper temperature.	55.1	37.7	31.7
Adequate handwashing facilities present in food handling areas.	0.6	0.4	40.0
Proper handwashing practices followed.	16.5	10.9	33.8
No bare hand contact with ready-to-eat foods.	5.3	3.8	27.9
Persons with infections or communicable disease are restricted from food handling.	0.1	0.0	100.0
Eating, drinking and tobacco use restricted to nonfood areas. Drinking allowed from covered containers stored appropriately.	27.0	24.8	8.3
Sewage disposal systems, including grease traps, operating properly.	0.4	0.1	66.7
Chemicals and spray bottles properly labeled and stored.	40.9	37.7	7.9
Adequate hot and cold water available and from an approved source.	4.1	3.8	6.1
Plumbing provides adequate pressure; air gaps/backflow prevention devices in place where required.	4.3	3.0	31.4
Pest prevention program is effective.	8.6	7.9	7.2

TABLE 20. SUMMARY OF DATA: NON-CRITICAL ISSUES

	Percentage of Locations with Violations		
	Round One	Round Two	Percentage Change
Handwashing facilities in food handling areas clean, accessible, fully stocked and properly signed.	50.3	43.4	13.8
Fruits and vegetables properly washed prior to processing and serving.	1.9	1.9	0.0
Potentially hazardous foods properly thawed.	7.4	5.5	26.7
Foods properly covered and protected.	43.0	42.4	1.4
Frozen foods held solidly frozen.	3.5	3.5	0.0
Personal items properly stored in designated areas away from food, utensils and equipment.	31.2	27.6	11.5
In-use utensils properly handled and stored.	53.9	44.0	18.4
Clean utensils, equipment and food contact packaging properly stored.	62.5	51.2	18.1
Food and food contact packaging stored at least six inches off floor.	29.6	22.9	22.6
Refrigerated units equipped with accurate thermometers.	31.6	26.8	15.3
Thermometers available for use, accurate and used appropriately.	12.5	9.3	25.7
Restrooms clean, fully stocked and in good repair. Doors are self-closing. Covered receptacles where required.	22.7	16.4	27.9

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