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Running Head: Food Safety in Ethnic Restaurants

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Abstract

This study compared compliance with the Food Code between ethnic and non-ethnic restaurants and identified specific food safety practices needing improvement. Frequencies for 275 individual Kansas Food Code violations and the number of critical and non-critical violations were compared between independent ethnic, chain ethnic, independent non-ethnic, and chain non-ethnic restaurants. Independent ethnic restaurants had significantly more critical and non-critical violations than the other three types of restaurants. The majority of differences in code violations were found between independent ethnic restaurants and the other three categories. Overall, non-ethnic restaurants had higher food code compliance scores than independent and chain ethnic restaurants.

Food Safety Practices Lacking in Independent Ethnic Restaurants

The National Restaurant Association (NRA) projected that the restaurant industry will serve more than 70 billion meals or snack occasions in 2009 and will garner 48% of the consumer food dollar (NRA, 2009a). The restaurant industry continues to be a pillar in the American economy and plays a significant role in the fast-paced lives of American consumers who demand convenience in all aspects of their lives, including the food they eat and prepare for their family. In fact, 45% of Americans indicate that restaurant operations play a pivotal role in their lives. In 2009, restaurant industry sales are expected to exceed $566 billion (NRA, 2008).

Research has shown that 53% of consumers eat outside the home at least once per week, 17% dine outside the home on average of five or more times per week (Jones, Vugia, Selman, Angulo, and EIP FoodNet Working Group, 2002), and 4% dine outside the home seven or more times in any given week (Garman et al., 2002). Given the increasing number of Americans that dine in a restaurant or other foodservice operation on a daily basis, food safety practices in restaurants are critical to protecting the health of the American public.

Restaurant owners and managers depend on frontline employees on a daily basis to prepare and serve safe food to customers. Restaurant operations have been reported to be the cause of between 52% (Jones & Angulo, 2006) and 59% (Centers for Disease Control and Prevention, 2006) of foodborne illness outbreaks in the United States. Foodservice employees play a pivotal role in the prevention of foodborne disease (Harrington, 1992).

In 1998, the Food and Drug Administration (FDA) began to collect baseline data of food safety practices in foodservice operations. The first report, the *Report of the FDA Retail Food Program Database of Foodborne Illness Risk Factors*, was released in 2000 and focused on and

explored major risk factors that are attributed to foodborne disease (FDA Retail Food Program Steering Committee, 2000). The report indicated that full service restaurants were 40% out-of-compliance with overall food code standards. Fast food restaurants were slightly better with an overall out-of-compliance rate of 26%. These out-of-compliance rates are higher than other non-commercial foodservice establishments such as hospitals, nursing homes, and elementary schools. In full service restaurants, the most often out-of-compliance practices included cooling potentially hazardous foods to 70°F within two hours (85%), proper adequate handwashing (81%), and holding potentially hazardous foods at 41°F or below (81%). The report identified 15 practices that were in need of "priority attention," the most of any operation. The most out-of-compliance practices in fast food restaurants included ready-to-eat, potentially hazardous foods date marked after 24 hours (71%), holding potentially hazardous foods at 41°F or below (62%), and prevention of hand contamination (58%) (FDA Retail Food Program Steering Committee, 2000). All of the top practices that are out-of-compliance in both fast food and full service restaurants are directly related to employee food safety knowledge and on-the-job practices of foodservice employees.

In 2003, the FDA began collecting data to follow-up on the initial report. The report, published in 2004 showed only marginal overall improvement, with 38.5% and 25% out-of-compliance rates for full service and fast food restaurants, respectively. Because of the relatively high incidence that restaurants are out-of-compliance with risk factors, food safety should be of utmost concern to restaurant owners/managers. The 2004 report showed that the practices most often out-of-compliance in full service restaurants included holding potentially hazardous foods at 41°F or below (77.8%), cooling potentially hazardous foods to 70°F within two hours (77.3%), and potentially hazardous foods date marked after 24 hours (74.2%). The most out-of-

compliance practices in fast food restaurants included date marking of commercially processed ready-to-eat foods (57.6%), ready-to-eat, holding potentially hazardous foods at 41°F or below (56.5%), and potentially hazardous foods date marked after 24 hours (40.7%) (FDA National Retail Food Team, 2004).

Many studies have shown that there are critical practices in restaurants that are simply not being followed. For example, Roberts and Sneed (2003) surveyed independent restaurant managers in Iowa and found that 43.2% of respondents did not have specifications for cleaning and sanitizing equipment, 24% did not have a policy on handwashing, and 46% did not have basic procedures in place to check the temperatures of food upon receiving. However, when sanitarians in Kansas and Iowa were asked the same questions and asked to estimate the number of operations they inspected that had food safety programs in place, their responses were drastically lower. Of those sanitarians who responded, 80% indicated independent restaurants did not have specifications for cleaning and sanitizing equipment, 82% did not have a policy on handwashing, and 90% did not have basic procedures in place to check the temperatures of food upon receiving. In this study, chain restaurant operations performed better with sanitarians estimating that only 37% of chain restaurants did not have specifications for cleaning and sanitizing equipment, 6% did not have a policy on handwashing, and 47% did not have basic procedures in place to check the temperatures of food upon receiving (Roberts, Barrett, & Sneed, 2005).

While research has been conducted to explore food safety practices in fast food and full service restaurants and independent and chain restaurants, there is a paucity of research that has explored food safety practices in ethnic restaurants when compared to their non-ethnic counterparts. As the ethnic population of the United States continues to increase, so do demands

for authentic ethnic foods as Americans are introduced to food from around the globe (Hensley & Bohm, 2000a; Hensley & Bohm, 2000b; Howell, 2005). Over half of Americans surveyed indicated that they eat ethnic foods frequently, and 90% indicated that they are familiar with these types of food offerings (Hensley & Bohm, 2000a). One of the major trends in the restaurant industry is the increasing number of ethnic restaurants. During the past 10 years, Italian, Mexican, and Chinese cuisines have become so popular that they are now considered mainstream in American culture (Hensley & Bohm, 2000a). This should come as no surprise as the diversity in ethnic cultures in the United States continues to increase. By 2042, the minority population in the United States is expected to become the majority, with nearly one third of all U.S. residents being of Hispanic heritage (Bernstein & Edwards, 2006). Of the ethnic population, Asians and Hispanics are the two largest minority groups who own restaurant operations, with 15% of restaurants owned by Asians and 8% by Hispanics (NRA, 2009b).

Between 1990 and 2000, the total number of foodborne disease outbreaks traced back to ethnic foods increased 7%, with the most outbreaks being reported for Mexican, Italian, or Asian foods. Of these, 43% were attributed to food served in a restaurant (Simonne, Nelle, Evans, & Marshall, 2004).

Mauer et al. (2006) found that improper food temperatures, cross-contamination, and employee hygiene were among the top concerns for food safety professionals when dealing with ethnic restaurant operations. Respondents in this survey cited language barriers as a major concern. Language has also been found as a barrier in other food safety related studies (Bermúdez-Millán, Pérez-Escamilla, Damio, González, Segura-Pérez, 2004; Rudder, 2006).

Rudder (2006) concluded that operators of ethnic restaurants were willing to learn proper food safety practices in order to operate within the law; however, operators did not initially

comprehend the importance of following proper food safety practices and the relevance to their establishment. Simonne et al., (2004) posited that "current food manager certification may not adequately cover specific details essential for safe ethnic food preparation" (Simonne et al. 2004, 590). Therefore, the purpose of this study was to compare compliance with the Food Code between ethnic and non-ethnic restaurants. Specific objectives were to:

1. Determine if critical and non-critical violations differ based on ownership of the operation (e.g., independent ethnic restaurant, chain ethnic restaurant, independent non-ethnic restaurant, chain non-ethnic restaurant).
2. Determine which health code violations are more prevalent in ethnic versus non-ethnic restaurants.
3. Identify specific food safety practices needing improvement in ethnic restaurants.

Methodology

Sample

The sample consisted of ethnic (n=424) and non-ethnic (n=500) restaurants and were chosen from 14 Kansas counties with the highest populations of Asians and Hispanics in the state. A listing of operations licensed to sell food in the state of Kansas was obtained from the state agency responsible for inspections. Operations not classified as a commercial restaurant were excluded from the sample. This included non-commercial foodservice operations, such as schools and nursing homes, and establishments that do not provide food as the main product such as gas stations and bars. The listing was then subdivided into four groups: independent non-ethnic restaurants, chain non-ethnic restaurants, independent ethnic restaurants, and chain ethnic restaurants.

Two-hundred and fifty restaurants in each of the four different classifications were chosen for the sample. Independent non-ethnic restaurants (n=250), chain non-ethnic restaurants (n=250), and independent ethnic restaurants (n=250) were selected utilizing a stratified random sample. Because there were only 174 chain ethnic restaurants available in the identified counties, all chain ethnic restaurants were included in the study. The total number of establishments was 924.

Data Collection

Once the sample was determined, health inspection reports were gathered from the online Kansas Health Inspection Database (Kansas Department of Health and Environment, 2008). For each operation, the inspection report with the highest number of total (both critical and non-critical) violations from September 1, 2007 through August 31, 2008 was utilized for data analysis. Since this information is considered public records and no human subjects were involved in the research protocol, the approval of the institutional review board was not needed.

Data was gathered for each inspection item in the Kansas Food Code, and included 275 different inspection criteria (Kansas Department of Agriculture, 2005). Violations were recorded based on the number of times it was noted on the operation's inspection report. For the majority of inspections, specific violations within each operation were noted only once on the inspection report. Others, for example, "effective pest control measures in place; dead or trapped pest removed from traps at adequate frequency" were noted multiple times in the same operation during the inspection and thus were recorded with the total number of times it was noted on the inspection report.

Two research assistants entered health inspection data into the data collection form then into a Microsoft Access Database. To validate the classification of the ethic restaurants,

researchers utilized phonebooks, restaurant websites, or telephone calls to the operation. After the initial data entry was complete, the data was cross checked to ensure accuracy and then converted to SPSS, Version 15.0 for analysis. Descriptive statistics computed included frequencies, means, and standard deviations. Analysis of variance with Scheffe's post hoc analysis was used to compare the total number of critical and non-critical violations overall and between each of the different cohorts within the sample (chain non-ethnic restaurants, independent ethnic restaurants, chain ethic restaurants, and independent non-ethnic restaurants).

Results

The final sample included independent ethnic restaurants (n=250), chain non-ethnic restaurants (n=250), independent ethnic restaurants (n=250), and chain ethnic restaurants (n=174). There were 14 different types of ethnic cuisine represented in the sample (Table 1). Within the sample of ethnic restaurants (n=424), the majority of ethnic restaurants were Mexican (54.7%) or Chinese (24.1%).

INSERT TABLE 1

Overall, the average number of critical and non-critical violations and number of inspections per year were 3.23 ± 2.73, 1.87 ± 2.19, and 1.95 ± 1.31, respectively. An analysis of variance (ANOVA) with Scheffe's post hoc test was used to explore differences in the total numbers of critical and non-critical violations and number of inspections among the four types of restaurants: independent ethnic restaurants, independent non-ethnic restaurants, chain ethnic restaurants, and chain non-ethnic restaurants. Independent ethnic restaurants had significantly

more violations and inspections than independent non-ethnic restaurants, chain non-ethnic restaurants, and chain ethnic restaurants ($p < 0.001$) (Table 2). Independent ethnic restaurants had more inspections than any of the other categories of restaurants ($p < 0.001$). However, no differences in the number of inspections were noted between independent and chain non-ethnic restaurants.

INSERT TABLE 2

An analysis of variance (ANOVA) with Scheffe's post hoc test was used to compare the mean number of violations between independent ethnic, chain ethnic, independent non-ethnic, and chain operations. In 38 of the 275 individual violations explored, significant differences at a type I error rate of .05 was noted (Table 3). In most cases, specific differences were found between independent ethnic restaurants and the other three categories. There were no violations where non-ethnic restaurants, neither chain nor independent, had significantly higher mean scores than independent and chain ethnic restaurants. Most importantly, 24 of the 38 inspection items where differences in mean scores did exist are considered a critical violation per the Kansas food code and these items are likely to contribute to a foodborne illness.

INSERT TABLE 3

Discussion and Conclusions

Results reveal that proper food safety practices are implemented less frequently in independent ethnic restaurants as evidenced by the number of food code violations when compared to chain ethnic and independent and chain non-ethnic restaurants. The expected increase in ethnic foodservice operations in the United States (Howell, 2005) brings to the forefront the importance of ensuring safe food is served to the customer. Results show that food safety training programs and interventions geared towards ethnic independent restaurant operators are needed. Programs must help ethnic restaurant employees and operators understand the importance of proper food safety practices within the operation. Moreover, helping ethnic foodservice managers and operators who might be first-generation immigrants understand food safety laws and codes within the United States is paramount. Straight forward guides about food safety codes and proper practices should be made available in the operators' native language to assist them in understanding the laws and food code. Operational manuals and signage must also be available in the native language of the foodservice manager or owner in order to allow for effective training of food production employees in the ethnic restaurant environment.

Chain ethnic restaurants did not differ in the number of critical and non-critical violations when compared to chain and independent non-ethnic restaurants. While this study did not explore why this is the case, it is posited that chain operations have the support and resources of a corporate office, while the independent ethnic operations do not. Further, chain restaurant operations often have stringent internal controls that are sometimes stricter than actual health code regulations. A language barrier or lack of understanding the food code by the owner, manager, and employees may prevent independent ethnic operations from performing better on inspections. The chain ethnic operations would likely have more support from the corporate office in terms of translating, educating, and policy-making related to the food code.

Independent ethnic restaurants had a greater frequency of health inspections than chain ethnic and non-ethnic restaurants. These results signal a potential problem within independent ethnic restaurant operations. In Kansas, as in most states, restaurant operations are inspected once per year. After the initial yearly inspection, subsequent inspections could be needed for follow-up of major issues that need to be corrected. Other inspections can occur based on complaints from customers and employees, or if an operation is suspected of contributing to a foodborne illness outbreak. Therefore, the greater the number of inspections in a given operation, the more it signals the potential of food safety problems within the facility.

A number of the inspection items where violations occurred are directly related to employee food safety practices. Time and temperature abuse, personal hygiene, and cross-contamination have routinely been identified as the most common contributors of foodborne illness (FDA National Retail Food Team, 2004; FDA Retail Food Program Steering Committee, 2000) and are directly related to employee food safety practices. Managers must assure that employees are knowledgeable about proper food safety practices and that they follow these practices while on-the-job. It only takes one employee who does not follow proper food safety practices to cause a wide spread foodborne illness outbreak in any foodservice facility.

Managers and operators of ethnic foodservice operations must also be aware of code requirements. Several of the inspection items found to be significantly different between ethnic and non-ethnic foodservice operations are related to faculty maintenance and design. For example, ensuring that the operation is protected against the entry of pests is a critical violation and was found to be a significant issue in ethnic restaurant operations. Even if all employees followed proper food safety practices, they will be unable to prepare safe food if it has been contaminated by pests.

The findings from this study indicate that independent ethnic foodservice operations have specific practices that need to be addressed. Findings about the difference between ethnic and non-ethnic foodservice operations indicate that further research is needed to explore food safety training and behaviors in ethnic restaurants. These findings are significant for operators, health inspectors, and food safety educators. While the types of violations found are similar to those found in the Food and Drug Administration studies (FDA National Retail Food Team, 2004; FDA Retail Food Program Steering Committee, 2000), this study points to specific practices in ethnic restaurants that are problematic and need to be addressed. Further research is also warranted that explores the differences within specific types of ethnic restaurants. This study was unable to test for differences among the different types of ethnic cuisines (Asian, Mexican, Irish, etc) due to a limited sample size within some of the categories.

Future studies in ethnic restaurant and with ethnic employees are needed to explore ethnic employees' level of knowledge relative to U.S. food safety requirements. First and second generation immigrants may not understand sanitation procedures in the United States and may be accustomed to far less concern among the general public over food safety in their home countries when compared to the United States. In-depth research is needed to explore the barriers that prevent ethnic owners, operators, and employees from following proper practices as outlined in the food code. Knowledge issues are fairly easy to overcome with current food safety training programs that are available, such as ServSafe, sponsored by the NRA Educational Foundation. However, ServSafe has been found to not address issues that impact behavior, such as attitudes, subjective norms, or perceptions of control (Roberts et al., 2008; York et al., 2009). Therefore, future research is warranted that explores not only the knowledge component, but the antecedents of actual behavior.

This study did not explore the ethnic background of the owner/manager of each operation. Therefore, results can only be generalized to ethnic restaurants and not the ethnicity of the owner. It is plausible that many ethnic owners/managers exist within independent and chain non-ethnic restaurants and ethnic restaurants can be owned/managed by non-ethnic individuals. Further research could explore the ethnic background of the owner and the role it plays in overall food safety programs within restaurant operations.

This study only included restaurants located in the state of Kansas and findings cannot be generalized beyond Kansas. The results of this study included data gathered for restaurant operations only. Thus, results cannot be generalized to other types of foodservice systems.

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Table 1. Types of Ethnic Restaurants in the Sample (N=424)

	Independent Ethnic		Chain Ethnic		Total	
Characteristic	**n**	**%**	**n**	**%**	**n**	**%[a]**
Ethnicity						
Mexican	106	25.0	126	29.7	232	54.7
Chinese	68	16.0	34	8.0	102	24.0
Italian	9	2.1	14	3.3	23	5.4
Japanese	22	5.2	--	--	22	5.2
Thailand	13	3.1	--	--	13	3.1
Other	10	2.4	--	--	10	2.4
Vietnamese	6	1.4	--	--	6	1.4
Indian	5	1.2	--	--	5	1.2
French	3	0.7	--	--	3	0.7
Korean	3	0.7	--	--	3	0.7
Greek	2	0.4	--	--	2	0.4
Irish	1	0.2	--	--	1	0.2
Malaysian	1	0.2	--	--	1	0.2
German	1	0.2	--	--	1	0.2

[a]Percentages may not equal 100% due to rounding errors.

Note: 500 non-ethnic restaurants (250 each independent and chain) were included in the sample for comparison purposes.

Table 2. Mean Number of Critical and Non-critical Violations and Inspections Based on Restaurant Type

Dependent Variables	Independent Ethnic Operations (n=250)	Chain Ethnic Operations (n=174)	Independent Non-ethnic Operations (n=250)	Chain Non-ethnic Operations (n=250)	*F* value[a]	*P* value
	Mean Number of Violations ± SD					
Number of Critical Violations	4.52±2.97^{x}	2.81±2.45^{y}	2.90±2.83^{y}	2.58±2.06^{y}	28.11	<0.001
Number of Non-Critical Violations	2.84±2.85^{x}	1.39±1.65^{y}	1.71±1.94^{y}	1.40±1.65^{y}	25.14	<0.001
Number of Inspections	2.29±1.63^{x}	1.88±1.13^{y}	1.76±1.11^{y}	1.85±1.18^{y}	8.25	<0.001

Note: Means with different superscripts (x, y, z series) differed significantly by Scheffe's post hoc test, $P < 0.01$

[a] Results from Analysis of Variance (ANOVA)

Table 3. Individual Inspection Items with Significant ($p \leq .05$) differences Based on Type of Restaurant (n=943)

Description of Violation	Mean ± Standard Deviation				*F* value[a]	*P* value
	Independent Ethnic Operations (n=250)	Chain Ethnic Operations (n=174)	Independent Non-ethnic Operations (n=250)	Chain Non-ethnic Operations (n=250)		
Demonstration of Knowledge						
PIC is able to demonstrate knowledge of foodborne disease prevention and application of the Hazard Analysis and Critical Control Point.*	.25 ± .44^{w}	.11 ± .31^{x}	.10 ± .30^{x}	.07 ± .26^{x}	14.37	.000
Control of Hands as a Vehicle of Contamination						
Employees use the correct handwashing procedure.*	.09 ± .29^{w}	.03 ± .18^{x}	.04 ± .06^{x}	.03 ± .18^{x}	8.83	.000
Preventing contamination from hands, including minimizing bare hand contact with ready-to-eat food.*	.16 ± .36^{w}	.07 ± .25^{x}	.08 ± .29^{x}	.06 ± .24^{x}	5.49	.001
Handwashing sinks must be accessible and not used for any other activity.	.10 ± .31	.05 ± .22	.05 ± .21	.04 ± .21	2.84	.037
Appropriate hand drying provisions available.	.13 ± .33^{w}	.06 ± .24^{wx}	.11 ± .32^{wx}	.04 ± .21^{x}	4.73	.003
Approved Sources						
Food is obtained from approved sources.*	.02 ± .14	.00 ± .00	.01 ± .09	.00 ± .00	2.81	.039
Protection from Contamination						
Separation of food items to prevent cross contamination.*	.26 ± .51^{w}	.12 ± .41^{x}	.11 ± .32^{x}	.02 ± .14^{x}	17.46	.000
Contact surfaces and equipment must be sanitized before use and after cleaning.*	.15 ± .36^{w}	.09 ± .28^{wx}	.07 ± .25^{x}	.07 ± .26^{x}	4.46	.004
Potentially Hazardous Food Time/Temperature						
Foods should be reheated so all parts reach an internal temperature of 74 degrees C for at least 15 seconds.*	.02 ± .14^{wx}	.06 ± .23^{w}	.02 ± .14^{wx}	.01 ± .09^{x}	3.86	.009
Cooked foods need to be cooled from 57 degrees C to 21 degrees C within 2 hours. Within a total of 6 hours from 57 degrees C to 5 degrees C.*	.13 ± .35^{w}	.05 ± .22^{x}	.06 ± .23^{x}	.01 ± .11^{x}	10.38	.000
Potentially hazardous foods must be maintained at appropriate temperature of 5 degrees C or less.*	.56 ± .69^{w}	.42 ± .58^{wx}	.38 ± .56^{x}	.36 ± .57^{x}	5.22	.001
Food should be clearly marked to indicate the date food should be consumed by, sold, or discarded.*	.23 ± .45^{w}	.07 ± .25^{x}	.18 ± .43^{wy}	.09 ± .29^{xy}	9.12	.000
Need written procedures to maintain food establishment or a maximum of 4 hours past the point and time in was removed from temperature control must be marked.*	.06 ± .25^{w}	.04 ± .20^{w}	.14 ± .34^{x}	.05 ± .23^{w}	6.67	.000
Chemical Handling						
Working containers containing toxic or poisonous chemicals clearly labeled with the common name.*	.16 ± .37^{w}	.05 ± .22^{x}	.11 ± .32^{wx}	.08 ± .27^{x}	5.09	.002
Poisonous or toxic materials shall be stored so they cannot contaminate food, equipment, utensils, linens, and single service and single-use articles.*	.11 ± .31^{wx}	.10 ± .30^{wx}	.08 ± .28^{w}	.19 ± .40^{x}	4.97	.002
Only poisonous or toxic materials required for the operation and maintenance of a foodservice shall be allowed in the establishment.*	.02 ± .15	.01 ± .08	.01 ± .09	.00 ± .00	2.71	.044

Table 3. Individual Inspection Items with Significant ($p \leq .05$) differences Based on Type of Restaurant (n=943)

Description of Violation	Mean ± Standard Deviation				*F* value[a]	*P* value
	Independent Ethnic Operations (n=250)	Chain Ethnic Operations (n=174)	Independent Non-ethnic Operations (n=250)	Chain Non-ethnic Operations (n=250)		
Chemical Handling (Continued)						
Poisonous or toxic materials shall be handled according to the law, manufacturer's directions, certification conditions (if required), and any additional conditions set forth by the regulatory authority.*	.09 ± .28[w]	.04 ± .20[wx]	.07 ± .25[wx]	.02 ±.15[x]	3.74	.011
Conformance with Approved Procedures						
Variance is required before smoking food, curing food, using food additives, packing foods using reduced oxygen packaging, using a molluscan shellfish display tank, and sprouting seeds or beans.*	.02 ± .13	.00 ± .00	.00 ± .00	.00 ± .00	3.64	.013
Operations using reduced oxygen packaging with hazardous foods must ensure at least two barriers are in place to control Clostridium botulinum and Listeria monocytognes. A HACCP plan must be established and contain specified information.*	.00 ± .00	.00 ± .00	.01 ± .11	.00 ± .00	2.72	.044
Cooling Methods						
Stored frozen foods shall maintain frozen. Cooling shall be accomplished in accordance with the time and temperature criteria. *	.08 ± .27[w]	.02 ± .15[x]	.03 ± .18[x]	.00 ± .06[x]	7.64	.000
Thawing Methods						
Frozen potentially hazardous foods shall be held at any temperature to keep food frozen of at 5 degrees C. Thawing hazardous foods can be done under refrigeration, submerged under running water, or as part of a cooking process.	.14 ± .34[w]	.03 ± .18[x]	.03 ± .18[x]	.01 ± .09[x]	16.37	.000
Thermometers Provided & Accurate						
Food thermometers provided & accessible; Appropriate thermometer for measuring thin foods provided.	.08 ± .28[w]	.02 ± .13[x]	.05 ± .22[wx]	.02 ± .14[x]	5.31	.001
Insects, Rodents, & Animals Control; No unauthorized persons						
Openings to outside protected against entry of pest; Protective barriers provided for exterior walls/roofs.*	.12 ± .34[w]	.10 ± .31[wx]	.07 ± .26[wx]	.05 ± .21[x]	3.16	.024
Contamination Prevented During Food Preparation, Storage, & Display						
Food stored 6" off the floor in clean, dry location & not stored in prohibited areas.	.12 ± .36[w]	.04 ± .20[x]	.04 ± .19[x]	.02 ± .15[x]	7.53	.000
In-Use Utensils						
In-use utensils properly stored between uses.	.19 ± .39[w]	.12 ± .33[wx]	.10 ± .30[x]	.05 ± .22[x]	8.62	.000
Food & Nonfood-Contact Surfaces						
Utensils/food-contact surfaces made of safe, durable, smooth materials.*	.16 ± .37[w]	.06 ± .23[x]	.02 ± .14[x]	.02 ± .13[x]	20.82	.000
Food-contact surfaces smooth & easily accessible for cleaning; CIP equipment easily cleanable.*	.09 ± .28	.05 ± .21	.06 ± .23	.11 ± .32	2.86	.036

Table 3. Individual Inspection Items with Significant ($p \leq .05$) differences Based on Type of Restaurant (n=943)

Description of Violation	Mean ± Standard Deviation				*F* value[a]	*P* value
	Independent Ethnic Operations (n=250)	Chain Ethnic Operations (n=174)	Independent Non-ethnic Operations (n=250)	Chain Non-ethnic Operations (n=250)		
Warewashing Facilities						
Thermometer for testing sanitizing water temperature &/or test kit for measuring sanitizer concentration provided.	.15 ± .36^{w}	.06 ± .23^{x}	.11 ± .32^{wx}	.05 ± .21^{x}	6.238	.000
Warewashing sinks cleaned & sanitized after used for different purposes.	.02 ± .13	.01 ± .08	.00 ± .00	.00 ± .00	2.655	.047
Equipment maintained free of encrusted grease/soil deposits.*	.16 ± .37^{w}	.06 ± .23^{x}	.10 ± .30^{wx}	.06 ± .24^{x}	6.632	.000
Nonfood-contact surfaces cleaned at frequency to prevent buildup of residue.	.16 ± .37^{w}	.05 ± .21^{x}	.06 ± .25^{x}	.06 ± .23^{x}	9.386	.000
Hot & Cold Water Availability						
Capacity & pressure of potable water adequate to meet facility demands.*	.03 ± .18^{w}	.01 ± .11^{wx}	.00 ± .00^{x}	.01 ± .11^{wx}	3.193	.023
Water reservoir of fogging devices maintained & cleaned; Plumbing system maintained in good repair.*	.18 ± .38^{w}	.11 ± .32^{wx}	.06 ± .24^{x}	.12 ± .33^{wx}	5.816	.001
Adequate Ventilation & Lighting						
Protective shielding on light bulbs over exposed food/utensils/equipment.	.04 ± .21^{w}	.00 ± .00^{x}	.02 ± .13^{wx}	.01 ± .11^{wx}	4.109	.007
Ventilation system cleaned in way not to cause contamination or create a public health hazard.	.04 ± .21	.00 ± .00	.02 ± .15	.01 ± .09	2.836	.037
Designated dressing rooms/lockers used by employees.	.02 ± .14^{w}	.00 ± .00^{wx}	.00 ± .00^{x}	.00 ± .00^{x}	4.565	.004
Sanitary Operations						
Physical facilities maintained in good repair & cleaned as often as necessary to keep them clean.	.23 ± .48^{w}	.10 ± .37^{x}	.11 ± .38^{x}	.12 ± .36^{x}	5.290	.001
A licensee shall immediately discontinue operations and notify the regulatory authority if an imminent health hazard exists.	.04 ± .19^{w}	.01 ± .11^{wx}	.02 ± .15^{wx}	.00 ± .00^{x}	3.311	.020

Note: Means with different superscripts (w, x, y series) differed significantly by Scheffe's post hoc test, $P < 0.05$

[a] Results from Analysis of Variance (ANOVA)

*Denotes that the item is considered a critical violation per Kansas Food Code