



The analysis of food safety incidents in South Korea, 1998–2016



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ABSTRACT

This study uses media reports to analyze food safety incidents in South Korea that occurred between January 1998 and March 2016. The total number of incidents during this period was 975, with an average of 51.3 per year and 4.3 per month. The top five types of food involved were fruits and vegetables, fish and fish products, meat and meat products, beverages, and confectionery. Of the 975 incidents, 406 (41.6%) were related to chemical hazards—such as food additives and pesticides—221 (22.7%) were due to biological hazards, and 199 (20.4%) were due to physical hazards. Through analysis, this study determines at what stage a breakdown in food safety is likely to occur: primary production is the most common stage with 615 (63.1%) incidents, followed by incidents during the handling and distribution stages, at 240 (24.6%) and 65 (6.7%), respectively. The results of this study can be used as data for risk analysis or food safety strategies.

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1. Introduction

Food safety incidents are an important issue in every country and frequently make headlines around the world. China experienced scandals when melamine was found in infant milk powder in 2008 (Xiu & Klein, 2010) and again in 2011 when clenbuterol (a veterinary medicine) was found to be overused in animal food production (Xue & Zhang, 2013). Europe, too, faced controversy when beef was found to contain horsemeat in 2013 (Peng et al., 2017). In recent years, South Korea has faced its own share of food-related scandals: in 2000, crab was found to contain lead, parasites were found in kimchi in 2005, and in 2010, a snack made at a famous food company was found to contain parts of rat carcasses (Yang & Yang, 2013). These food safety incidents have had an impact both locally and internationally, leading to significant economic losses and concerns for human health.

Food safety is obviously crucial to any country. Therefore, there have been considerable efforts to improve food safety worldwide. Governments in many countries have established new institutions, standards, and methods for regulating food safety and have increased their investments in hazard control systems (e.g., good agricultural practices (GAP), good manufacturing practices (GMP), hazard analysis and critical control point (HACCP) facilities, etc.;

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Liu, Liu, Zhang, & Gao, 2015). Recent examples include a qualitative study of food safety awareness and perceptions among artisan cheese makers in southwestern Ontario (Le, Bazger, Hill, & Wilcock, 2014), evaluation of the occurrence of both *Listeria monocytogenes* in cheese (Barancelli et al., 2014; Lee et al., 2017) and *Staphylococcus aureus* isolates in milk (Lee, Cappato, Corassin, Cruz, & Oliveira, 2016; Lee et al., 2012, 2014), the use of pulsed-field gel electrophoresis, and assessment of GMP and introduction of HACCP systems (Carrascosa et al., 2016; Cusato et al., 2013, 2014; Maldonado-Siman, Bai, Ramírez-Valverde, Gong, & Rodríguez-de Lara, 2014; Dias et al., 2012). In South Korea, the department of food safety evaluation at the Korea Ministry of Food and Drug Safety (KMFDS) is in charge of food safety and risk assessment; it has developed official regulations and analytical methods to assess food quality and determine whether food has been adulterated (KMFDS, 2017a). KMFDS believes that the ultimate goal of enhancing food safety is to improve health and nutrition (Peng et al., 2017). Nevertheless, many food safety incidents still occur.

These studies and media coverage on individual food safety incidents are certainly helpful for risk communication and better food safety regulation and management (Xue & Zhang, 2013). However, developing the best strategies for food policy and management requires systematic risk analysis, which should be based on comprehensive studies derived from aggregated data (Liu et al., 2015; Peng et al., 2017; Xue & Zhang, 2013). So far, such studies do not exist in South Korea.

We realized that there are numerous professional reports and media coverage on cases of food safety incidents in South Korea;

this study conducts a comprehensive analysis based on data from these reports. In this study, our focus will be on finding the main causes of food safety issues so that effective food safety policies and procedures can be implemented to suppress the further occurrence of food safety incidents in South Korea.

2. Data source and methods

2.1. Data source

We collected data on food safety incidents that occurred in South Korea between January 1, 1998 and March 15, 2016. Most of the bulletin reports we found were issued by a relevant public institution, including governmental agencies, or professional reports, including those by food safety offices, business corporations, food society journals, etc. We also collected news reports from print newspapers, public TV, electronic newspapers, online magazines, websites, etc. We collected data on a total of 975 cases, defining a “food safety incident” as a single hazard for a single food, and organizing the reports by date. The collected data used has all been verified by both national research institutes (e.g. KMFDS, etc.) and independent researchers. We excluded overlapping reports and completely irrelevant information.

2.2. Coding and analysis

We used coding to systematically classify the key features in the large amount of textual information. First, we arranged our data by time—year and month—cause, food, and substance factors. Second, we classified the causes of food safety incidents according to the food types prescribed by the Korean Food Standards Codex (KMFDS, 2017b). Third, we analyzed the number of food safety incidents that occurred in the food chain. Fourth, we classified the causes of food safety incidents into chemical, biological, physical, and other, according to Codex’s separation of hazard principle (Codex, 1997).

3. Results

3.1. Annual and monthly food safety incidents

Of the total 975 food safety incidents between 1998 and March 2016, an average of 51.3 cases occurred each year (Table 1).

Table 1
Food safety incidents per year.

Year	Number	Proportion (%)
1998	34	3.5
1999	48	4.9
2000	39	4.0
2001	36	3.7
2002	35	3.6
2003	30	3.1
2004	39	4.0
2005	55	5.6
2006	46	4.7
2007	95	9.7
2008	120	12.3
2009	54	5.5
2010	60	6.2
2011	49	5.0
2012	48	4.9
2013	73	7.5
2014	63	6.5
2015	38	3.9
2016. 3	13	1.3
Total	975	100.0

Excluding 2016, for which the collection period was just three months (13 cases), the highest number of food safety incidents—120 (12.3%)—occurred in 2008. 2007 was the year with the next highest number of incidents, or 95 (9.7%). In other years, the number of food safety incidents per year mainly falls between 30 and 73 (Table 1). We also found that before 2008 the average number of food safety incidents was 52.5, however, since 2009 the average has grown to 55.0, meaning that the reporting of food safety incidents is increasing, due to the improved sharing of social information in recent years. (Table 1).

Finally, we found an average of 4.3 food safety incidents per month, with a relatively homogeneous distribution, regardless of the season, over the entire study period (Fig. 1).

3.2. Food categories

We classified the food categories involved in food safety incidents according to the Korean Food Standards Codex 72-2016; in doing so, we excluded 21 cases that involved utensils, containers, or cross-contamination by food packaging. The proportion of food safety incidents due to fruits and vegetables, fish and fish products, meat and meat products, confectionery, kimchi (a traditional fermented Korean food), cereals and cereal products, and Takju (Makgeolli; a slightly sweet traditional Korean alcohol) was 19.8%, 10.2%, 9.4%, 8.8%, 2.5%, 2.3%, and 1.8%, respectively (Table 2). Other food products are also involved in some food safety incidents, including bakery wares (items made in bakery store, e.g., bread, cake, etc.); beverages; composite foods (e.g., chicken noodle soup); dairy products; edible ices, including sherbet and sorbet; foodstuffs intended for particular nutritional uses; ready-to-eat savories (e.g., dried and salted fish and shells, etc.); and sauces, including salts, salads, soups, and spices. Baby food, defined here as soft, easily consumed food intended for children below 3 years of age, accounts for 1.6% of food safety incidents.

3.3. Food chain

There are five stages in the food chain between farm and table. Most of the food safety incidents over the past 19 years (855, or 87.7%) occurred during the food material production (e.g., agricultural products, fishery materials, etc.), and manufacture handling stage (e.g. cleaning, cutting, etc.) (Table 3). Storage and transportation, sales, and consumer handling account for 6.7%, 4.1%, and 1.5% of food safety incidents, respectively. These results imply that human factors are the main or the underlying cause of the majority of reported food safety incidents in South Korea.

3.4. Major hazards

Most food safety incidents over the past 19 years have occurred due to chemical, biological, and physical hazards, and other sources. These account for 41.6% (406), 22.7% (221), 20.4% (199), and 15.3% (149) of food safety incidents, respectively (Table 4). Food safety incidents involving chemical hazards are mainly due to raw, non-food materials that cannot be eaten, such as pesticides, heavy metals, drug residues, marine toxins, etc. Chemical hazards can also involve food additives, including sweeteners, coloring, and preservatives. Most of the incidents caused by chemical hazards are due to illegally added materials or the excessive use of additives. Meanwhile, the most common biological hazards involve contamination by foodborne bacteria such as *Escherichia coli*, *Salmonella*, *Staphylococcus aureus*, *Bacillus cereus*, or *Listeria monocytogenes* (22.7%). Food safety incidents due to physical hazards mainly involve non-edible materials, such as plastic, glass, or metal debris; insects; carcasses; etc. Other hazards involved in some food safety

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