

## IN-FLIGHT TRANSMISSION OF FOODBORNE ILLNESSES: CREW MEMBERS RELATED ASPECTS

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### Abstract

*Aircrafts are recognized as important vehicles for foodborne outbreaks and for the rapid spread of foodborne diseases. Most of the in-flight foodborne illness events can go unrecognized and their identification is challenging, thus hindering the reporting to the appropriate health agencies. The rare food-related incidents must be documented and used as an opportunity to re-draft and improve the food safety standards in the airline industry. Airlines training in the area of food safety does not fully address the crew members' particular role in on board safe food handling. When the cabin crew members display a careless practice of food-related duties, and unhygienic behavior, cabin crew can be responsible for spreading foodborne illnesses-agents among their colleagues, passengers, and throughout the aircraft. To overcome this problem, the airlines must analyze the training needs for crew members and implement standard, HACCP system-based training that is harmonized internationally.*

**Key words:** food safety, aircraft, in-flight foodborne diseases, crew members.

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## 1. INTRODUCTION

Air travel is a popular form of travel which due to its specific characteristics such as short preparation times between flights, large number of travelers and employees who are confined to airports and aircrafts for long hours, high density of passengers into the aircrafts, cabin crew members multitasking during a flight. These represent a unique set of risks from foodborne illnesses standpoint. Additionally, increased size of airports both for production and sales spaces, and spaces for passenger access, increased number of airlines, aircrafts, and daily flights with the increase in demand for low-cost travel, the fabrication of larger aircrafts with the potential of carrying up to 800 passengers (i.e.: Boeing 747, Airbus 340 and 380) pose multiple challenges to food safety in air travel. Historically, foodborne illnesses associated with air travel are uncommon but when they occur may have serious implications for passengers and even for the crew [McMullan R et al., 2007]. If the crew members (i.e.: pilots) are affected this has the potential to threaten the safety of all passengers and the aircraft. As in

any safety failure scenario, these rare food-related incidents are documented and used as an opportunity to re-draft and improve the food safety standards in the airline industry.

The airline catering sector relies on high standards of food preparation, transportation, storage, and serving. These food safety standards apply to the entire chain: from airport kitchens or catering establishments to ground source transport vehicles to aircraft, and inside the aircraft. Over the years, the foodborne outbreaks that marked the airline industry were the result of different failures along of this food chain and the in-flight handling of the food and beverages represent a weak point. Additionally, due to existing legal loopholes and regulatory differences between the catering and food industries, some catering companies do not consider themselves to be “food producers” and, consequently, consider that they are not fully obliged to comply with the strict food safety rules that are imposed to the food industry. Over the past decade, decisions taken by many reputable European airlines - perhaps following

the budgetary rationale of low-cost carriers - to stop offering free in-flight meals have led to the elimination of many economy class foods, both domestically and internationally (the so-called short-haul international flights). In turn, these decisions may incentivize many passengers to bring their own food and drinks into the aircraft; this could also represent a future challenge for in-flight foodborne outbreaks. In this instance, the various foods and beverages, either bought from different places or home-prepared, and subsequently consumed during the flight might not respect the strict food safety rules of an airline or an airline catering provider. Therefore, regardless of the source of consumed food on a flight entering an international food chain once food safety is compromised during that flight and an outbreak of foodborne illness occurs this could also pose a public health concern for the destination country or the international community (in the case of journeys involving multiple flight changes) or could play an underestimated role in the security of the airline industry [Mangili A and Gendreau MA, 2005; Enserink M, 2006]. Given the characteristics of air travel, an epidemiological investigation cannot always be possible after an in-flight foodborne outbreak due to the difficulty in sampling the suspected food (i.e.: lack of incriminated specimen), due to inappropriate on-board storage conditions of the sample, fast preparation times of the aircraft for a new flight, or because the inability to timely identify the affected passenger(s) (i.e.: passengers are not reporting the incident in relationship with air travel and, instead, they continue their journey). In addition, in-flight illnesses are underreported because these often occur after passengers or crew left the aircraft, are difficult to differentiate from those acquired during a pre-flight exposure, or simply because ill people do not seek healthcare [Grout A and Speakman EM, 2020].

Since many studies indicate that cabin crew on-board behavior could cause a great risk to food safety, the cabin crew members must be viewed as a part of the existing food safety problems. Therefore, further analysis of cabin crew

training needs will help airlines to improve their specific training programs on food safety and personal hygiene.

## 2. DISCUSSION

To ensure the safety of passengers and aircraft, airlines are obliged to carry cabin crew members [ICAO, 2017]. However, among others, the responsibilities of crew members include also food handling tasks such as receiving, storing, serving meals, collecting food waste. If the cabin crew members display a careless practice of food-related duties, and they adopt unhygienic behavior, cabin crew can be responsible for up to 80% of in-flight foodborne illnesses outbreaks and allergic reactions [Abdelhakim AS, 2016]. Regardless the prior training sessions, in some instances, cabin crew members were not able to handle incidents of in-flight food allergies [Greenhawt M et al., 2013]. Because the standard food safety guidelines are not harmonized with the existing conditions provided by aircrafts, cabin crew members food safety training must focus on several issues such as:

- aircraft design and passengers' density,
- type of the flight (i.e.: short-haul flight versus long-haul flight),
- type of in-flight food service (hot foods versus cold foods; foods that require in advance preparation before serving, presence of possible allergens etc.),
- type of cabin-class services (i.e.: business class versus economy class) [Grout A and Speakman EM, 2020; Abdelhakim AS et al., 2019].

It is recognized that the on-ground standard food safety guidelines and training programs are not harmonized with the conditions offered by an aircraft or with the specific hazards related to crew members' food handling on board [Grout A and Speakman EM, 2020; Abdelhakim AS et al., 2019]. To overcome these problems, over the years, International Air Transport Association (IATA) issued comprehensive guidelines that emphasize the importance of hygiene and sanitation, personal hygiene, food safety, suspected food poisoning, allergen management, potable water and ice [IATA

2016a and 2016b]. However, even IATA indicates that cabin crew must be trained following similar food safety programs and guidelines as on the ground food handlers, crew members' adherence to these guidelines is difficult due to certain aircraft-related barriers. In this regard, it worth mentioning the crew members adherence to hand hygiene practices depend on the number of available lavatories, and their location: whether handwashing facilities are near the workstations and whether handwashing facilities are properly equipped for maintaining proper hand hygiene. [Abdelhakim AS, 2016; Deyneko A, 2016].

Several main barriers to cabin crew food safety training can be summarized as follows [Grout A and Speakman EM, 2020; Abdelhakim AS, 2016; Deyneko A, 2016]:

- absence of harmonized legislations enforcement - each country enforcing its own food safety legislation;
- the extra cost of food safety training - for airlines, the costs of crew members training is viewed as a major issue since the food safety represents only one area of training;
- time constraints – it is difficult to have all the crew members of an airline to undergo at the same time a food safety training session due to their busy schedule. Online crew members food safety training and certification seems to be a solution to this problem.

Given the high incidence of foodborne illnesses due to contaminated food handlers' hands, cabin crew members can act as a reservoir for in-flight pathogens transmission [Widdowson MA et al., 2005; Mangili A et al., 2015]. In addition, the cabin crew performing their tasks during the flight can increase the risk for disease transmission throughout different places inside the aircraft [Mangili A et al., 2015; Thornley CN et al., 2011]. The contamination of crew members' hands could depend on:

a) *Personal hygiene and handwashing habits.* Crew members' failure to wash hands after using the toilet or after touching the soiled surfaces contribute to in-flight disease transmission. Handwashing with soap and water is the viewed as the most important hygiene

measure to prevent the spread of pathogens and, in this regard, World Health Organization (WHO) and International Air Transport Association (IATA) provide in-depth guidance documents on hygiene practices [IATA, 2019; WHO, 2009]. The use of hand sanitizing products is also encouraged but only after handwashing. Because the sanitizers alone do not increase hand hygiene compliance and proved inefficient against norovirus, these products are not to be considered as a replacement of handwashing with soap and water [Abdelhakim AS, 2016; Kampf G and Ostermeyer C, 2004; Muto CA et al. 2000].

b) *Aircraft layout.* The aircrafts design should be done with focus on the number of lavatories and the ease of access to lavatories prior to handling and serving food and beverages. Because airlines establish their own set of rules and standards, for aircraft there are no requirements for a minimum lavatory: passenger ratio, and no requirements for crew-designated handwashing points. Holmes and Simmons (2008) shown the high densification of passengers into an aircraft, especially in economy class zones, namely one lavatory serving 35 economy class passengers compared to one lavatory per 11 passengers in business class can double the risk of gastrointestinal illnesses among passengers [Holmes J and Simmons G, 2009]. As indicated, the passengers' densification within aircraft for commercial benefits represents a significant barrier to the usage of lavatories in sanitary conditions by both passengers and crew members. In addition, the aircraft galley design could influence the crew's handwashing practices. After the aircraft is airborne, the aisles become very busy and crowded with passengers going to lavatories while crew members are preparing the meals or driving the trolleys for distributing food and beverages. Under these conditions, crew members are provided with limited opportunities to wash their hands prior to meal service [Grout A and Speakman EM, 2020; Abdelhakim AS et al., 2019].

c) *Prior contamination of aircraft.* Passengers or crew members suffering from gastrointestinal diseases (i.e.: incidents of vomiting or diarrhea)

can contribute to prior contamination of different aircraft areas, especially of lavatories (e.g. sink tap, door handles) [Zhao B et al., 2019; Mangili A et al., 2015; Huizer YL et al. 2015; Evans MR et al., 2002]. Since passengers and crew members share the same lavatories, it has been shown that even after routine cleaning contamination from vomiting events is still possible for several days [Zhao B et al., 2019]. The case of one traveler infected with a gastrointestinal virus vomiting in the cabin and in the lavatory led to the infection of other 41 passengers seated near where the vomiting incident took place highlights the potential of lavatories in transmitting gastrointestinal infections [Holmes J and Simmons G, 2009]. Isolation of the sick individual (passenger or crew member), adequate disinfection of lavatories and cabin, and crew members' compliance with appropriate hand hygiene practices could reduce the risk of spreading infection. Evidence suggests that pathogens can survive for hours to months on various surfaces and spread to other individuals via direct or indirect contact. This persistence has been identified in aircraft cabins on tray tables, worktops, sink faucets and washroom door handles [Zhao B et al., 2019]. Larger aircraft built for longer distances and increased passenger capacity will present even greater challenges to food hygiene. To overcome such incidents, aircrafts must be equipped with hot water, soap, and paper towels [Grout A, 2020; WHO, 2009]. Also, to limit the risk of spreading the infections, the passengers' awareness must be increased on the following issues: i) aircraft's surfaces could be a source of infection, and ii) adopting hygienic behavior like handwashing before eating.

Since airlines are facing insufficient recommendations from aircraft manufacturers and WHO - these entities focusing solely on the disinfectants and the aircraft component compatibility - for aircraft disinfection several aspects should be considered [WHO, 2009; Klaus J et al., 2016]:

i) the current lack of harmonization between international regulations and the national lists of

approved disinfectants. In this regard, airlines must be able to use a disinfectant that is recognized and accepted internationally, ii) the disinfectants' compatibility with aircraft and aircraft's components so that the aircraft's operability and safety are not affected. The use of disinfectants must not have negative effects on the structure of the aircraft nor on the individual parts of it;

iii) disinfection must be safe, fast and cost-effective as airlines always face time constraints due to changes in flight schedules such as flight delays or cancellations;

iv) an effective disinfection of aircraft should not affect the safety of passengers and crew.

Currently, only products based on formaldehyde, hydrogen peroxide and alcohol are accepted as efficient disinfectants for aircrafts; these products meet the international requirements and allow the application of different disinfection techniques [Klaus J et al., 2016].

d) *Handling in-flight meals.* During the preparation and serving of meals, cabin crew members could also get involved in other activities necessary to ensure the flight's safety or to attend to other passengers' needs. In this scenario, crew members lack enough time for hand washing and this fact can increase the risk of food contamination or the spread of pathogens throughout other areas of the aircraft [WHO, 1971; WHO, 1976a; WHO, 1976b]

e) *Breach of airline health guidelines.* Cabin crew members' lack of adherence to the airline health guidelines could result in food safety incidents both among crew members and passengers and ultimately can affect the flight's safety. There were instances when ill crew members were the reservoir of pathogens; in this regard, crew members displaying symptoms of gastrointestinal illness boarded the flight despite the airline's health rules [Grout A and Speakman EM, 2020]. It has been indicated that in some instances cabin crew members consumed from meals cooked only for passengers instead of their own meals [Hatakka M, 2000]. The onset of a gastrointestinal illness that incapacitates the pilot will have negative



consequences for the flight's performance and safety especially when the aircraft is far away from an airport and from medical services [Beers KN and Mohler SR, 1985; Hatakka M, 2000; ATSB, 2007]. To avoid the in-flight food safety hazards, airlines ruled that the meals intended for captains must be different from the meals for cockpit, cabin crew members, and for passengers. Despite these rules, between 1967 and 1991, crew members eating leftover foods or from the passengers' meals resulted in 271 infected crew personnel [Hatakka M, 2000].

### 3. CONCLUSIONS

Although there is a widespread perception that airline food suppliers and caterers are the sole responsible for the quality and safety of foods and beverages served on board, passengers and crew members may be involved in food safety incidents.

To avoid in-flight food safety events airlines must recognize and address the potential challenges of serving safe foods on board. In this regard, airlines must review and improve both aircraft layout (i.e.: less space for galleys due to the densification of passengers' seats), lack of assigning lavatories or handwashing stations only for crew members use, crew members facing time constraints and multitasking during a flight. In addition, enforcement of stricter on-board regulations about hygiene of personnel (crew members) and foods could help the overall safety of airlines.

To ensure that crew members possess enough knowledge on how to handle foods safely, the incorporation of a standard, HACCP system-based training, that is recognized and applied internationally, should become part of airlines safety culture. This training should be provided frequently, using methods that easily can be adapted to the busy schedule of the aircraft's crew (i.e.: providing written materials, or online training), and should include a final knowledge assessment.

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