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Microbiological detection of bacteria in animal products seized in baggage of international air passengers to Brazil

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ABSTRACT

Airline travel favours the transmission of diseases, given the short time it takes to travel long distances. In this study, animal products without health certificates seized in international air passengers' baggage at Guarulhos (GRU) and Galeão (GIG) airports in Brazil underwent a microbiological evaluation. Analyses (1610) were carried out on 322 seizures to test for the presence of total and thermotolerant coliforms, as well as *Staphylococcus aureus* counts and the presence of *Listeria monocytogenes* and *Salmonella*. Most seizures analysed showed coliform contamination and coliforms were present above acceptable limits in 83.4% (40/48) of the products that had some type of contamination. The second most prevalent microorganism found was *L. monocytogenes* in 22.9% (11/48) and *S. aureus* was cultivated in 14.58% (7/48) of seizures. Among the items seized in the present work, *Salmonella* was found in one seizure of pig sausage. Contamination of animal products with microbiological pathogens of importance to public health and indicators of the bad quality of the food were shown in the present study.

1. Introduction

Infections caused by bacteria in humans are often dangerous and may be occasionally lethal. *Salmonella* are enteric microorganisms and clinical symptoms may vary from asymptomatic carriage to life-threatening systemic infections (Elad, 2013). Among the food-borne illness,

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salmonellosis is the most prevalent worldwide (Funk et al., 2005).

Listeria monocytogenes can cause sporadic meningitis in humans, before being recognised as an opportunistic, food-borne pathogen of human, cattle and wild animals. Listeriosis can constitute a life-threatening disease in the elderly and in immunocompromised patients; in pregnant women, can cause still-birth or frequently lethal neonatal infections (Cossart and Lebreton, 2014). *Escherichia coli* can cause diarrhoea, urinary tract infections, respiratory illness and pneumonia, as well as other symptoms in humans, while *Staphylococus aureus* are important bacteria that cause infections in a wide range of conditions in humans and animals, from mild skin infections to life-threatening bacteremia, economic losses in both terms of animal and human health (Leonard and Markey, 2008; Williams et al., 2013). Over time, the transport and dissemination of pathogenic bacteria in food has caused health problems over the world (Yilmaz et al., 2009; CDC, 2014).

Animal products in baggage introduced illegally do not follow any specific sanitary standard, thereby creating a risk to public health. Air travel can lead to a quick global dissemination of bacteria and airports are currently areas of high flow of individuals coming from various parts of the world, where diseases may be introduced and disseminated (Wilder-Smith et al., 2003; Hartnett et al., 2007; Schneider, 2011).

The International Airport of São Paulo (Guarulhos – GRU Airport) is the busiest airport in Brazil, and it also has the second highest number of international flights in the Southern Hemisphere, behind Sydney International Airport. In terms of cargo, it is the largest in Latin America and 66th in the world. The International Airport of Rio de Janeiro (Galeão Airport – GIG) is the second busiest in Brazil for international passenger flights. It is the main gateway to Brazil, considering that about 40% of foreign tourists choose Rio de Janeiro city as their destination (Infraero, 2014).

Brazil will also be the host of upcoming major sporting events, such as the Olympics and Paralympics in 2016, which will increase passenger movement, as well as the risk of introduction of strains of infectious agents through airports. Therefore, strategic measures need to be taken to restrict the entrance of infectious agents into the country in baggage of international air passengers.

Brazilian authorities work to study and expand veterinary surveillance in international airports to evaluate the introduction of agents that may compromise public health. The objective of this study was to analyse microbiologically seizures of animal products in air passenger baggage on international flights, for faecal coliforms and *S aureus* (as indicators of the degree of safety of the products) and, *L. monocytogenes* and *Salmonella* under the perspective of public health.

2. Materials and methods

2.1. Products seized at airports and transport to the laboratory

Animal products without health certificates in international air passenger baggage were seized at Guarulhos (GRU) and Galeão (GIG) Airports in Brazil. The minimum sample size was calculated according Thrusfield (2004), in accordance with a confidence level of 95%, desired absolute precision of 5% and an observed prevalence of 10%. Previous studies on observed prevalence in animal products showed an observed prevalence of approximately 10% (range of 9.1–11.9%) based on studies by Jonnalagadda and Bhat (2004) – *Salmonella* spp. in 11% shrimp samples in India; Busani et al. (2005) – *Salmonella* and *Listeria* was detected in 10.3% in raw pork in Italy; de Boer et al. (2009) – *S. aureus* in 10.6% (cattle beef) and 10.7% in pork; Lee et al. (2009) – *E. coli* contamination in fresh beef, poultry, and pork resulting in an overall isolation rate of 9.1% in Korea, and Di Pinto et al. (2010) – *L. monocytogenes* in 105/1045 (10%) ready-to-eat (RTE) foods from supermarkets in Southern Italy. Therefore, 138 seizures per airport were determined as the minimum number. Nevertheless, a higher number was effectively collected (322 items – dairy and meat) were seized in the two airports for laboratory analysis.

The seizures were carried out on twelve occasions from April 23, 2010 to August 19, 2011 (six missions in each Airport) to obtain the illegal products in international air passenger baggage. Together with the International Agricultural Surveillance of the Ministry of Agriculture, Livestock and Supply (VIGIAGRO/MAPA), following routine procedures, baggage was inspected using a non-invasive scanning equipment. Those with organic products were intercepted, and those products of animal origin were seized for the laboratory analyzes. Other products, such as those of plant origin, that were not of interest for the present work, were destroyed using the standard protocols at each airport.

Passengers from 119 international flights of 35 air companies were intercepted by the official service in these two airports, according to Brazilian standard protocols (Brasil, 2006). After seizure, no packaging was violated to avoid contamination and all products remained under refrigeration until analysis. All seizures were catalogued and packaged in biosecurity boxes (BVQI Bureau Veritas Certification, ISO 9001:2008) according to IATA (2010) for air transport of dangerous cargo, monitored by the project coordinator and authorised by the Brazilian Official Veterinary Service. These were transported immediately by air to the *National Agricultural Laboratory* (LANAGRO-MG/MAPA) in Minas Gerais, Brazil, to perform bacteriological analyses, following protocols listed below and with official permission of the General Coordination of Laboratory Support (CGAL/MAPA).

2.2. Application of tests in the laboratory

We determined total and thermotolerant coliforms, *S. aureus*, *L. monocytogenes* and *Salmonella.* These bacteria were chosen because laboratory analyses for these pathogens were well established in LANAGRO-MG/MAPA and had undergone accreditation criteria according to ISO 17025/2005 (INMETRO, 2005). The tests could not be changed to provide reliable laboratory analyzes for all products, maintaining sensitivity and specificity. In LANAGRO-MG/MAPA, a total of 1610 analyzes were performed on the 322 products to verify the presence of