



Original Article

Milk and dairy product interceptions due to agricultural product transport inspections carried out in Maranhão State

Interceptações de leite e produtos lácteos em fiscalização de trânsito agropecuário no estado do Maranhão

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ABSTRACT

The aim of the current study is to perform a systematic investigation about the interception of milk and dairy products during agricultural product transport inspections carried out in Maranhão State. A retrospective study was conducted over a five-year period; it recorded 90 mobile monitoring events that together intercepted 3,500 liters of milk, 500 liters of kitchen butter, 2,836 kg of cheese, 1,700 kg of yogurt and 100 kg of yogurt ice cream. Most of these products (n = 13/16; 75%) were intercepted during their transportation from one city to another. The most recurring law violations regarded products transported in inappropriate vehicles (e.g., in the trunk of passenger buses and minibuses and in trucks used for animal-feed transportation) and in inappropriate packages such as garbage bags, rice-packing bags, cardboard boxes and non-reusable containers for micronutrients. All law violations recorded during the interceptions resulted in product confiscation, in fine issuing and, in specific cases, in product destruction through povidone iodine application. Fines issued due to irregular transportation of animal products during the assessed period accounted for R\$ 11,688.00. It was possible concluding that the transportation of milk and dairy products in Maranhão State is not in compliance with the Brazilian legislation (ordinances, decrees), a fact that may endanger public health in the investigated State, as well as in other Brazilian cities that trade these products. It is essential intensifying these inspections to help suppressing the illegal trade of milk and dairy products.

RESUMO

Objetivou-se com o estudo realizar uma avaliação sistemática das interceptações de leite e produtos lácteos no estado do Maranhão por meio de fiscalização de trânsito agropecuário. Para isso, foi realizado um estudo retrospectivo no período de cinco anos em que se constatou a realização de 90 volantes agropecuárias e interceptação de 3.500 litros de leite, 500 litros de manteiga de garrafa, 2.836 kg de queijos, 1.700 kg de iogurte e 100 kg de sorvete de iogurte, oriundos em sua maioria (n=13/16; 75%) do trânsito intermunicipal. A infração de trânsito mais recorrente foi o transporte dos produtos em veículos inadequados (bagageiro de ônibus e de micro-ônibus de passageiro e em caminhão para transporte de ração animal) associados ao acondicionamento de forma incorreta (acondicionamento em sacos de lixo, sacos para o envase de arroz, caixas de papelão, tambores de micronutrientes não reutilizáveis). Todas as infrações lavradas, resultantes das interceptações, resultaram na apreensão dos produtos, multa e em casos específicos, inutilização dos produtos com iodo

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povidine. No período do levantamento, foram contabilizados R\$ 11.688,00 em multas por transporte de produtos de origem animal de forma irregular. Conclui-se que o trânsito de leite e produtos lácteos no Maranhão é realizado em desconformidade com o requerido em legislações brasileiras (portarias, decretos) o que pode colocar em risco a saúde pública no estado, bem como de cidades brasileiras que estabelecem o comércio desses produtos. Considera-se que as fiscalizações de trânsito agropecuário devem ser intensificadas como forma de coibir o comércio ilegal de leite e produtos lácteos.

INTRODUCTION

The illegal entry of animal products (AP) into a given territory, and its association with the introduction of different diseases in it, have been the object of several studies, mainly of international studies such as the ones conducted by (HUESTON; TRAVIS; VAN KLINK, 2011; MUR; MARITENZ-LOPEZ; SANCHEZ-VISCAINO, 2012; SMITH *et al.* 2012; DE MELO *et al.*, 2016; and DE MELO *et al.*, 2018). Research about APs entering Brazil without health certification, as well as about the risks of this practice and its possible consequences for public and animal health, remain scarce (DE MELO *et al.*, 2014a; DE MELO *et al.*, 2014b; DE MELO *et al.*, 2015; EIDT *et al.*, 2015).

According to De La Rocque *et al.* (2011), multiple routes such as active and passive dispersion of vectors, international mobility of infected humans, animal transmigration and freight transport, can introduce different pathogens in a given territory. Based on Blancou; Pearson (2003), etiological agents can be displaced from any part of the planet, in any type of package such as a mailing envelope, plastic bottles or nose wipes; which, by the way, was the way the Viral Hemorrhagic Disease (VHD) agent spread in New Zealand in 1996.

Therefore, the irregular trade and transportation of APs through means in non-compliance with health regulations in force can lead to worrisome situations. For instance, the 2001 Foot-and-Mouth Disease (FMD) crisis in the United Kingdom, whose losses were estimated at £ 4 billion (THOMPSON *et al.*, 2002); as well as the case of dioxin found in pork meat in Ireland in 2008, which resulted in economic losses of approximately € 100 million (WALL *et al.*, 2009).

Given the lack of studies about this subject and the unprecedented nature of this work in Maranhão State, the aim of the current research was to carry out a retrospective study on the interception of milk and dairy products during agricultural product transport inspections conducted in the aforementioned state.

MATERIALS AND METHODS

Maranhão State

Maranhão State, whose geographical area covers 331,983.293 km², is located Northwest of the Brazilian Northeastern Region. State population is estimated at

6,103,327 inhabitants, who are distributed in 217 counties (IBGE, 2017).

Maranhão State Agency of Agricultural Defense (AGED-MA - Agência Estadual de Defesa Agropecuária do Estado do Maranhão) is the organ responsible for monitoring animal and AP transportation. This important health defense activity is based on sanitary barriers such as Agricultural Inspection Stations (AIS), roadblocks and mobile agricultural inspections, which approach vehicles carrying food products. Besides asking for the documentation of the transported lot, inspectors evaluate the transportation conditions. Non-conformities can lead to penalties such as notices, fines, as well as to the confiscation and destruction of the transported products.

Retrospective Data on Agricultural Inspections

The herein analyzed retrospective data were collected in AGED-MA's agglomeration sector. Collection procedure was based on conversations with the person in charge of the agency, as well as on information found in AP confiscation terms recorded by mobile agricultural inspection teams during inspections supported by a specific and active surveillance structure. It did not include activities performed by AISs and roadblocks carried out by Local Animal and Plant Health Units (ULSAV).

Data about the interception of all milk and dairy products by state agricultural inspectors in Maranhão State highways for five years (from October 2013 - when the mobile agricultural inspections started in Maranhão State - to November 2017) were stored in Microsoft Office Excel spreadsheets.

According to Decree N. 30608 - from December 30th, 2014 -, products and by-products of suspected and infected animal origin, or transported without animal health certification, or in non-compliance with provisions set by the federal law, must be confiscated and destructed (MARANHÃO, 2014).

Variables analyzed in this retrospective study comprised the number of performed mobile inspections, origin of the transported cargo, law infringement type, legal framework, places where mobile inspections were carried out and value of issued fines.

Data Analysis

The collected information was stored in a database developed in Microsoft Access® software. Descriptive statistical analysis based on absolute and relative distributions was used to express the collected data.

Study Permits

The Board of Directors for the Defense of Animal Health Inspection (DDISA / AGED-MA) and AGED-MA's agglomeration sector authorized the study. Information that could violate carriers' privacy was not accessed in the study.

RESULTS AND DISCUSSION

The current study recorded 90 mobile agricultural inspections from October 2013 to November 2017, which intercepted milk and dairy products, fish and fish products, meat and meat products, bee and veterinary products, among others (miscellaneous). Milk and dairy products, which are the object of study in the present research, were intercepted 16 times during the assessed period.

Intercity transportation was the main origin of intercepted milk and dairy products (n = 13/16; 75%). Bacabal, Bom Jardim, Caxias, Igarapé Grande, Imperatriz, Pedreiras, Poção de Pedras, Santa Luzia do Tide, Timon and Vitorino Freire counties were the origin of the intercepted products (milk, cheese, yogurt and yogurt ice cream). These counties, except for Caxias and Timon, are part of the large dairy producer region in Maranhão State.

Among the aforementioned counties, only Caxias and Imperatriz have milk and dairy product establishments registered in either State (SIS) or Federal (FIS) Inspection Services; thus, they are officially authorized to trade with other counties in Maranhão State and with other states, respectively. This information characterizes the illegal transportation of milk and dairy products in Maranhão State, as well as highlights the likelihood of having clandestinely manufactured dairy products that lack origin-associated documents such as health certificates. Even dairy products from Imperatriz County, which has legalized dairy establishments, were intercepted because they did not have their origin confirmed.

It is important highlighting that underground manufacturing is featured by two premises that often come together, namely: (i) non-inspection by sanitary inspection services; and (ii) tax evasion. Food production in "illegal establishments" account for costs that go beyond tax collection and unfair competition over legally operating companies. Moreover, the intake of contaminated APs can lead to the development of several diseases, and it can add significant costs to health systems and impairs one's work capacity. Accordingly, laws (standards and ordinances) were drafted to curb, or

even eliminate, illegal food production; however, underground food production "subsists" and remains competitive.

It was possible noticing the irregular interstate transportation of milk and dairy products (cheese and kitchen butter) to Teresina County, Piauí State. The carrier failed to present documents proving the origin of the product in a specific cheese interception case.

According to Eidt *et al.* (2015), knowing the origin of animal products is essential to help estimating the risk posed by their irregular entry in a given territory. Based on these researchers, trading activities between countries, regions and cities have been going on since the dawn of human civilization, both formally and informally; however, informal trade can be established illegally, extra legally or in parallel markets. Data recorded in the present study allowed identifying the illegal trade of milk and dairy products between counties in Maranhão State, as well as with Teresina County, Piauí State.

According to Hueston; Travis; Van Klink (2011), smuggling is a typical example of illegal trade - a given product ends up entering the country despite the ban on it. On the other hand, parallel markets are the ones often outside of regulatory jurisdictions, such as animal collectors who exchange specimens. Extralegal trade is the technically illegal trade, which ends up being ignored. An example of this trade type was identified in the current study: food products such as artisanal cheese - whose entry in the country is regulated, although authorities do not always intercept them - were transported in passengers' luggage. Despite the awareness about the risks posed by the informal trade of these products, they remain poorly evaluated.

In total, 3,500 liters of milk, 500 liters of kitchen butter, 2,836 kg of cheese, 1,700 kg of yogurt and 100 kg of yogurt ice cream were intercepted from 2013 to 2017 (Table 1). The variety and number of products listed in the current study show the relevance of inland animal-product transportation to animal and public health defense.

Cheese confiscation stood out during the investigated period - 2,836 kg, in total. According to some confiscation terms, curdle cheese was the most intercepted type.

Curdle cheese was likely the most intercepted dairy product because it is a typical product in Northeastern Brazil. According to Dantas *et al.* (2013), this cheese type integrates daily meals, either as food supplement or delicacy, and it presents relevant socioeconomic and cultural value, whose foundations are rooted in its own history, given its cultural transfer from parents to children.

Table 1. Type and amount of milk and dairy products confiscated during agricultural product transport inspections carried out in Maranhão State from 2013 to 2017.

Intercepted Milk and Dairy Products	Amount					Total
	2013	2014	2015	2016	2017	
Fresh milk (liters)	00	3,500	00	00	00	3,500
Dairy products						
Kitchen butter (liters)	00	300	00	250	00	550
Cheese (Kg)	00	2,556	00	00	280	2,836
Yogurt (kg)	1,700	00	00	00	00	1,700
Yogurt ice cream (kg)	00	00	00	100	00	100

If one takes into consideration that products were intercepted due to some non-conformity in transportation, such as lack of origin certification, it was possible perceiving the significant risk of having these products transmitting different pathogens to consumers. In addition, since Maranhão State is endemic to *Brucella abortus* (CARVALHO *et al.*, 2016), these products can be associated with the state's health status. According to Sugiura; Murray (2011), determining whether, or not, a given pathogen is likely to be found in the place of origin of a certain product, and identifying the product spreading such pathogen, is essential to help classifying microbial agents as hazardous.

It is essential mentioning that precautions taken, or not, during AP manufacturing are associated with the risk of contamination in different food production and handling stages; consequently, they cannot be neglected. Thus, it is necessary conducting strict sanitary inspections in food industries, as well as making systematic reviews of food production processes in order to assure safe products. With respect to safe production, pasteurization is mandatory for all milk and dairy products manufactured in Brazil, since it helps eliminating spoilage and pathogenic microorganisms.

Table 2 presents the law infringements that have resulted in the interception and subsequent confiscation of milk and dairy products.

Table 2. Agricultural product transportation law infringements identified in mobile inspections carried out in Maranhão State from 2013 to 2017.

Infringement	Milk (liters)	Kitchen butter (Liters)	Cheese (kg)	Yogurt (kg)	Yogurt ice cream (Kg)
1. Lack of sanitary documents + inappropriate packaging	3,500	00	00	00	00
2. Lack of sanitary documents + transport in inappropriate vehicle + inappropriate packaging	00	00	515	00	00
3. Transport in inappropriate vehicle + inappropriate packaging	00	550	2,320	1,700	100

The association between inappropriate vehicle and inappropriate packaging was the most recurring law violation recorded for milk and dairy product transportation in Maranhão State. The most often product transportation law infringements concerned transport in inappropriate vehicles such as passenger buses and minibuses, and trucks used for animal-feed transportation. Inappropriate packaging comprised garbage bags, rice-packing bags, cardboard boxes and non-reusable micronutrient containers.

Six (85.70%) out of seven confiscations resulting from product transportation in inappropriate vehicles were associated with the transport of dairy products in luggage racks of buses and minibuses - the weight of the transported cargo ranged from 48 to 300 kg, which likely means that products were transported for commercial purposes. It is necessary intensifying the inspection on these vehicles in Maranhão State. The confiscation of

milk and dairy products transported in suitable vehicles resulted from lack of documents proving the origin of the products or from lack of refrigeration (refrigeration unit was switched off).

According to Evangelista Barreto *et al.* (2012), health issues caused by AP intake mainly result from poor production, transportation and storage practices. This is the reason why food security has been gaining space and global attention due to the incidence of foodborne diseases (FBDs).

Transport of food for human consumption purposes, whether refrigerated or not, must prevent product contamination and deterioration. Thus, it is necessary highlighting Ordinance n. 15 issued by the Sanitary Surveillance Center (CVS - Centro de Vigilância Sanitária) in November 7th, 1991, according to which: (i) it is essential controlling the hygiene conditions, the cold

temperature and the transport time; (ii) food and foreign substances that may contaminate or damage such food cannot be kept in the same container or transported in the same compartment in a vehicle. This requirement is not applicable to food packed in hermetically sealed, waterproof and resistant containers, except for toxic products; (iii) Transported food products must clearly and visibly display on their right and left sides (within a 30-cm-high by 60-cm-long rectangle) the following information: Food Transportation, Company Name, Address and Telephone Number, Perishable Product (whenever applicable) (BRASIL, 1991).

With respect to milk and dairy product packaging in non-reusable containers for micronutrients, it is worth mentioning Decree N. 4074 from January 4th, 2002 (BRASIL, 2002), which forbids reusing pesticide packaging to pack any type of food or liquid for consumption purposes. This prohibition is based on the risk of having residues transferred from the packaging to the food, as well as of poisoning consumers.

All law infringements resulting from interceptions and recorded by official veterinary service during the assessed period (2013 to 2017) resulted in the confiscation of transported products, in fine issuing and, in specific cases - such as obvious signs of food deterioration - in the destruction of the transported products with 2.6% povidone iodine.

In total, the issued fines accounted for R\$ 11,688.00. On December 30th, 2014, Decree N. 30608 came into force in Maranhão State; it repealed Decree N. 20036, from November 10th, 2003 (MARANHÃO, 2014). This new legal apparatus rose the value of fines.

Agricultural product transport violations recorded in 2013 and 2014 were framed in articles 25 and 31 of Decree N. 20036/2003, which was in force at the time (MARANHÃO, 2003). On the other hand, violations recorded from 2015 to 2017 were framed in paragraphs *g* and *h* of Decree N. 30608/2014, which establish that, respectively: *“Transporting animals of peculiar interest to the state in inappropriate vehicles without the required zoosanitary certificate, or engaging in route or purpose deviation, is hereby forbidden”*; and, *“Transporting products and by-products in inappropriate vehicles, or without animal health certificate, is hereby forbidden.”* (MARANHÃO, 2014).

Maranhão State has a large territory and significant strength in the agricultural scenario; thus, it needs to develop more efficient public policies focused on protecting its livestock heritage, mainly due to multinationalization processes, whose flow of people, goods and information is very intense. Therefore, mobile agricultural product transport inspections are health defense tools that should be systematically used to guide, inspect and monitor AP circulation, as well as to inform carriers about the importance of legally trading relevant products and by-products for agricultural defense.

Health education activities should be carried out with milk and dairy product carriers in Maranhão State, as well as with the general population, since education is an active and continuous process capable of enabling and developing critical awareness in a target group. Therefore, the debureaucratization of legal AP transport regulations, through educational activities, can help minimizing traffic violations and, above all, it can contribute to the consumption of better-quality food.

CONCLUSIONS

The interception of milk and dairy products during mobile agricultural product transport inspections reflects the non-compliance of the animal product transport activity in Maranhão State with national and state regulations. The recurring law violations recorded during the assessed period comprised the transportation of milk and dairy products without health certificate in inappropriate and poorly conditioned vehicles, a fact that compromises the sanitation of these products and exposes the population to the intake of poor sanitary-quality food. Thus, agricultural product transport inspections must be intensified in Maranhão State.

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REFERENCES

- BLANCOU, J.; PEARSON, E. P. Bioterrorism and infectious animal diseases. *Comparative Immunology, Microbiology & Infectious Diseases*, v. 26, n. 5-6, p. 431-443, 2003.
- BRASIL. Secretaria de Estado de Saúde de São Paulo. Portaria Centro de Vigilância Sanitária/ CVS-15, de 7 de novembro de 1991. Normatiza e padroniza o transporte de alimentos para consumo humano. Available at: http://www.mds.gov.br/webarquivos/legislacao/seguranca_alimentar/_doc/portarias/1991/Portaria%20CVS-15-%20de%2007%20de%20novembro%20de%201991.pdf. Access on: July 22nd, 2018.
- BRASIL. Presidência da República. Decreto nº 4.074, de 4 de janeiro de 2002. Regulamenta a Lei nº 7.802, de 11 de julho de 1989, que dispõe sobre a pesquisa, a experimentação, a produção, a embalagem e rotulagem, o transporte, o armazenamento, a comercialização, a propaganda comercial, a utilização, a importação, a exportação, o destino final dos resíduos e embalagens, o registro, a classificação, o controle, a inspeção e a fiscalização de agrotóxicos, seus componentes e afins, e dá outras providências. Diário Oficial [da] República Federativa do Brasil, Brasília, 08 de jan. de 2002. Available at em: http://www.planalto.gov.br/ccivil_03/decreto/2002/d4074.htm. Access on: July 22nd, 2018.
- CARVALHO, R. F. B. *et al.* Frequência de brucelose bovina em rebanhos leiteiros e em seres humanos na região central do estado do Maranhão, Brasil. *Arquivos do Instituto Biológico*, v. 83, p. 1-6, e1042014, 2016.
- DANTAS, D. S. *et al.* Qualidade microbiológica do queijo de coalho comercializado no município de Patos, Estado da Paraíba. *Agropecuária Científica no Semiárido*, v. 9, n. 3, p. 110-118, 2013.
- DE LA ROCQUE, S. *et al.* A review of trends in the distribution of vectorborne diseases: is international trade contributing to their

spread? *Revue Scientific et Technical (International Office of Epizootics)*, v. 30, n. 1, p. 119-130, 2011.

DE MELO, C. B. *et al.* Bacteria in Dairy Products in Baggage of Incoming Travelers, Brazil. *Emerging Infectious Diseases*, v. 20, n. 11, 1933-1935, 2014a.

DE MELO, C. B. *et al.* Profile of international air passengers intercepted with illegal animal products in baggage at Guarulhos and Galeão airports in Brazil. *Springerplus*, v.3, p. 69, 2014b.

DE MELO, C. B. *et al.* Microbiological detection of bacteria in animal products seized in baggage of international air passengers to Brazil. *Preventive Veterinary Medicine*, v. 118, n. 1, p. 22-27, 2015.

DE MELO, C. B. *et al.* Dinâmica da apreensão de produtos de origem animal em bagagens internacionais no Aeroporto de Brasília (AIB-PJK/SBBR). *Revista Brasileira de Medicina Veterinária*, v. 38, n. 3, p. 265-276, 2016.

DE MELO, C. B. *et al.* Apreensão de produtos de origem animal ilegais em bagagem de voos internacionais no aeroporto de São Paulo - Guarulhos (GRU / SBGR). *Ciência Animal Brasileira*, v.19, 1-9, e-39744, 2018.

EIDT, M. J. *et al.* Intercepções de produtos de origem animal em fronteiras terrestres no Brasil. *Ciência Animal Brasileira*, v.16, n.3, p. 388-398, 2015.

EVANGELISTA BARRETO, N. S. E. *et al.* Avaliação das condições higiênico-sanitárias do pescado comercializado no município de Cruz das Almas, Bahia. *Revista Caatinga*, v. 25, n. 3, p. 86-95, 2012.

HUESTON, W.; TRAVIS, D.; VAN KLINK, E. Optimising import risk mitigation: anticipating the unintended consequences and competing risks of informal trade. In: *The spread of pathogens through international trade. Revue Scientifique et Technique (Office International des Epizooties)*, v. 30, p.309-316, 2011.

IBGE. Instituto Brasileiro de Geografia e Estatística. Cidades. 2017. Available at: <<http://www.ibge.gov.com.br>> Access on: May 18th, 2018.

MARANHÃO. Agência Estadual de Defesa Agropecuária do Maranhão. Decreto 20.036 de 10 de novembro de 2003. Diário Oficial [do] Poder Executivo do Maranhão, Maranhão, 10 de nov. de 2003. Available at: <<http://193.43.36.109/docs/pdf/bra139949.pdf>>. Access on: July 22nd, 2018.

MARANHÃO. Agência Estadual de Defesa Agropecuária do Maranhão. Decreto nº 30.608, de 30 de dezembro de 2014. Diário Oficial [do] Poder Executivo do Maranhão, Maranhão, Maranhão, 30 de dez. de 2014. Available at: < <http://www.stc.ma.gov.br/legisla-documento/?id=3753>>. Access on: July 22nd, 2018.

MUR, L.; MARITENZ-LOPEZ, B.; SANCHEZ-VISCAINO, J. M. Risk of African swine fever introduction into the European Union through transport-associated routes: returning trucks and waste from international ships and planes. *Veterinary Research*, v. 8, p. 1-12, 2012.

SMITH, K. M. *et al.* Zoonotic Viruses Associated with Illegally Imported Wildlife Products. *PLoS ONE*, v. 7, p.e29505, 2012.

SUGIURA, K.; MURRAY, N. Risk analysis and its link with standards of the World Organisation for Animal Health. *Revue Scientific et Technical (International Office of Epizootics)*, v. 30, n. 1, p. 281-88, 2011.

THOMPSON, D. *et al.* Economic costs of the foot and mouth disease outbreak in the United Kingdom in 2001. *Revue Scientific et Technical (International Office of Epizootics)*, v. 21, n. 3, p. 675-687, 2002.

WALL, P. *et al.* Report of the InterAgency Review Group on the dioxin contamination incident in Ireland in December 2008. Dublin: Department of Agriculture, Food and The Marine. 2009.