

Assessment of the Risk of Introducing Foot-and-Mouth Disease into Panama via a Ferry Operating between Cartagena, Colombia and Colon, Panama

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INTRODUCTION

Although foot-and-mouth disease (FMD) is enzootic in much of South America, and occurred earlier this century in the United States, Mexico, and Canada, the disease has never been reported in Panama and Central America. Direct spread from South America has been prevented by the Darien Gap, approximately 100 kilometers of impassable territory shared by Colombia and Panama, which makes direct contact between cattle populations difficult.

FMD entered South America in 1870 by a cattle importation from Europe, with disease occurring simultaneously in Argentina, Brazil, Chile, and Uruguay.¹ Throughout the 1950s, numerous outbreaks occurred in most South American countries, becoming enzootic in the major cattle-raising areas by the 1960s, including Colombia. Colombia experienced its first FMD outbreak in 1950.

A comprehensive list of the modes of transmission of FMD and their categorization into low, medium, or high hazard has been developed.² Ninety-nine animals and 97 animal products or fomites were identified as possible sources of FMD transmission. Several of these animals, including domestic livestock, camelids, capybaras, and peccaries, and most of these food and nonfood animal products, are present in South America. Live animals, bovine semen, fresh meat, salted hides, garbage, and contaminated shoes were ranked as high hazard; cheese and pasteurized milk as low to medium hazard; and vehicles as medium hazard.

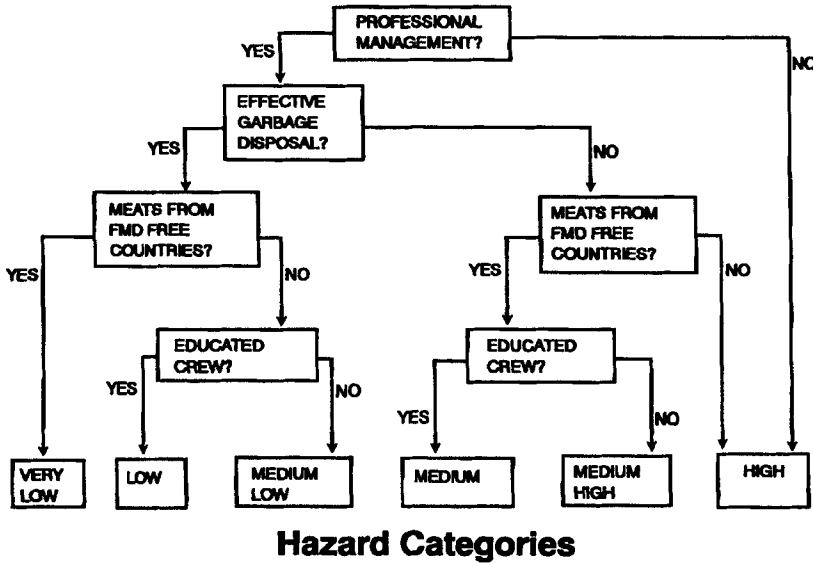


FIGURE 1. Methodology for hazard categorization of ferry operations.

The Crucero Express ferry is a cruise ship that advertizes itself as the connecting link to the Pan American Highway, as a vacation cruise, and as a business cruise for Colombian merchants to shop in the duty-free zone in Colon, Panama. The ferry began operation December 4, 1994, and carries passengers, cargo, and vehicles, but Panamanian policies now prevent vehicles from traveling to Panama. The ferry makes three round trips per week, and has a local Cartagena cruise on Saturdays for relaxation and on-board duty-free shopping.

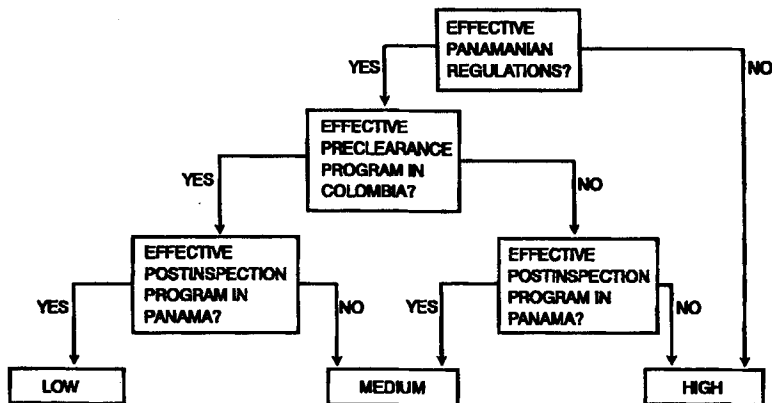
In August 1994, the Executive Director of the Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA) requested that the US Department of Agriculture (USDA) perform a risk assessment for the introduction of FMD into Panama by the ferry. An on-site visit of the ferry and ports of Colon and Cartagena was performed in March 1995 in preparation for the risk assessment.

The purpose of this paper is to describe the methodology and results of the risk assessment. Because of the nature of the project, a qualitative method using hazard categorization methodology was selected.²

METHODS

Hazard Categorization of Crucero Express Ferry Components

Four ferry components were identified as FMD hazards: management of the ferry and transport of passengers, cargo, and vehicles. The methodology for categorizing the hazards is in FIGURE 1 (ferry operations) and FIGURE 2 (passengers, cargo, and



Hazard Categories

FIGURE 2. Methodology for hazard categorization of passengers, cargo, and vehicles.

vehicles). Each of the four components was assigned a hazard category based on how the questions in the diagrams were answered.

Ferry Operations: FIGURE 1

Information on the owners and management of the ferry was obtained through interviews with the General Director of the Crucero Express, employees at Crucero Express office in Cartagena, and the ferry and crew members. An on-site inspection was also made of the ferry, the Cartagena and Colon ferry terminals, and the Crucero Express office in Cartagena.

Four questions were asked with regard to the hazard presented by the operation of the ferry. Firstly, is the operation professional, experienced, and financially stable? Secondly, does the ferry have an effective garbage disposal system that would protect Panama's shores from the threat of FMD virus contaminated animal products? Thirdly, does the ferry purchase its meat and dairy products for passenger and crew use only from FMD-free countries? Fourthly, have the boat crew, managers, and owners been educated regarding modes of transmission, clinical signs, and potential economic consequences of an FMD outbreak to Panama, Central America, and North America, and have the crew been informed not to bring meat and dairy products from FMD-affected countries for personal consumption?

Passengers, Cargo, and Vehicles: FIGURE 2

Information on passengers, cargo, and vehicles was gathered through interviews and data requests from agricultural officials, and by an on-site visit to the ferry and ferry terminals in Colon and Cartagena.

Three questions were asked regarding the hazards of passengers, cargo, and vehicles. Firstly, are Panamanian regulations effective: do they restrict the entry of FMD-susceptible animals, animal products, and animal by-products from FMD-affected countries; are regulations enforced and are there penalties for breaking such regulations; and are import permits, health certificates, and cargo manifests required for entry of animals and animal products from any country into Panama?

Secondly, is there a preclearance program in Colombia for passengers, cargo, and vehicles? For passengers, is there a professional and thorough baggage inspection, are confiscations monitored by the Colombian Agricultural Institute (ICA) at the port, and are passengers warned not to bring plant and animal products on their voyage to Panama? For cargo, does the Port Authority at Cartagena maintain control over movement of the Crucero Express ferry and the cargo it carries? For vehicles, are they closely inspected for smuggled animals and animal products, and is there an effective cleaning and disinfection program?

Thirdly, is there a postinspection program in Panama for passengers, cargo, and vehicles? Elements for postinspection are similar to those of preclearance, e.g. is baggage thoroughly inspected; do Panamanian authorities closely examine cargo manifests and declarations, and are dirty containers cleaned and disinfected when leaving the ferry; and are vehicles closely inspected, and cleaned and disinfected?

Passenger Profile

A short questionnaire was administered to help define demographically the type of passenger using the Crucero Express, and to determine if passengers within two weeks of departure had contact with FMD-susceptible animals. The questionnaire was administered once, on a Sunday departure from Cartagena, Colombia, and was given when all the passengers were assembled during the safety presentation soon after departure. Interviews with Crucero Express management were also performed to identify the type of passenger targeted by marketing campaigns for the ferry.

RESULTS

Hazard Categorization of the Crucero Express Ferry

Ferry Operations

Question 1: Professional Management of the Ferry: Yes. The Crucero Express ferry was built in France in 1973 and remodeled in Norway in 1994 (1994 Crucero Express informational brochure). It has a gross weight of 11,676 tons, and is 141.46 meters long by 21.93 meters wide. The ferry is owned by a Norwegian company, Colorline, and is leased for three years by the Crucero Express Company (Mr. Rodrigo Gomez, General Director, Crucero Express, Colon, Panama, personal communication). Effjohn International, ferry transportation specialists from Sweden and Finland who own the Silja and Commodore cruise lines of Scandinavia and Miami, Florida, respectively, were consultants to the ferry from the initial startup until March 1995. The Crucero Express Company is a Panamanian subsidiary of the Flota Mercante

Grancolombiana S.A. (FMG), which has had 40 years experience in international sea transportation in the region. The principal financial backers of the FMG are the Colombian National Federation of Coffee Growers (CNFCG) and the National Developmental Bank (Banco Nacional de Fomento) of Ecuador, contributing 80% and 20% of the budget, respectively.

Question 2: Effective Garbage Disposal: Yes. Mixed garbage from the Crucero Express is collected in plastic bags and placed in 3-m³ dumpsters stored in a room on the vehicle deck. Garbage is collected by a private contractor who drives on board at Cartagena and then delivers the bags to the municipal dump for burial. Disinfection of the ferry deck is performed after the truck leaves, according to Crucero Express officials. Panamanian port authorities allow no off-loading of ferry waste onto Panamanian shores. There is no incinerator on the ferry, at the Colon or Cartagena ports, or at the municipal dumps. The ferry presently averages 9 m³ of garbage per round trip.

Question 3: Buy Animal Products from FMD-Free Countries: No. Panamanian policies prevent the purchase of meat or dairy products from FMD-affected countries by the Crucero Express. When the food lockers were examined during the on-site visit, a few fresh legs of lamb from Cartagena and both fresh and processed sausages from Colombia were observed. In addition, during an earlier inspection in March 1995, a USDA employee observed frozen sausages from Colombia, and fresh and frozen pork purchased that day in Colombia. Crucero Express officials report that the majority of food items are purchased in the Free Zone of Colon where meat products from FMD-affected countries are not allowed.

When docking in Colon, the Crucero Express presents to agricultural quarantine inspectors of the Ministry of Agricultural Development (MIDA) a general declaration, cargo manifest, passenger list, and computer printout of all food stock items. The food stock printout lists the food item, price, quantity, and date purchased, but does not list where the food item was produced or purchased. Also, MIDA port inspectors do not presently look closely at the labels on the meat and dairy items to determine country of origin.

Question 4: Education of the Crew Regarding FMD: No. In conversations with management of the Crucero Express, as well as with the ferry captain and a few crew members, there was a general awareness of the importance of FMD. We were unable to interview any manual laborers, most of whom were Colombian or Filipino. The crew list presented on the day of our inspection had 166 names. There have been no presentations on FMD by ICA or MIDA to the ferry management and crew. However, an information pamphlet that discusses the dangers of FMD and other exotic diseases has been made available by MIDA to the ferry management. Crew members that board at Cartagena are not allowed to bring food products onto the ferry; however the ferry is docked at Cartagena several hours before Customs and ICA agents arrive for duty, and crew members can move freely from shore to the ferry during this period.

Final Rating: Medium Low. The Crucero Express has professional and experienced management with financial backing for the long term. There is an effective garbage-disposal system that would prevent FMD viral contaminated meat from reaching Panamanian shores. Animal products from FMD-affected countries are being purchased in small amounts for consumption on the ferry. And no formal education

of crew members regarding the risk and transmission of FMD has occurred. The hazard category for the ferry operations is medium low.

Passengers

Question 1: Effective Panamanian Regulations: Yes. Decree Number 57 of February 7, 1956, prohibits the importation of FMD-susceptible animals and products. Decree Number 168 of August 18, 1965, requires import permits, official health certificates endorsed by the local Panamanian consulate, and manifests by exporters. Decree Number 15 of May 18, 1967, prohibits the importation of animals and animal products without a permit and authorizes fines of US \$50 to \$5000, and prison, for violators. Fines have been levied against the Crucero Express on two occasions to date relating to a shipment of Canadian-origin pigs feet.

Question 2: Effective Preclearance Program in Colombia: Yes. When passengers enter the ferry terminal at Cartagena, they see a prominent red sign warning passengers not to take animal and plant products on their voyage to Colon due to risks of FMD and other exotic diseases. When receiving their boarding passes, a 2 × 1 inch sticker is attached with a message in red print advising passengers not to take animal and plant materials. A thorough inspection of baggage is performed by the Colombian military for narcotics (two soldiers per table with two tables total) and ICA port officials for agricultural products (one per table with a third inspector boarding and inspecting the ferry at arrival). After inspection, a 3.75 × 3.25 inch ICA inspection sticker is placed on the side of the bag.

A log of confiscations has been kept at the Cartagena ferry terminal by ICA since January 1995 for monitoring purposes. During 28 round trips from January 24 through March 28, 1995, there were 13 confiscations from passengers going to Colon and 10 confiscations from passengers returning from Colon. During this period there were 3307 passengers going to Colon and 3306 passengers returning from Colon. All confiscations were fruits or vegetables. From January 24 through April 21, the only confiscated animal products were a sausage and one half pound of cheese on April 2 from passengers going to Colon.

Question 3: Effective Postinspection Program in Panama: Yes. Five MIDA port inspectors attend to each arrival of the ferry: 1 or 2 board the ferry, 1 inspects the disinfection of cargo containers leaving the ferry, and 2 inspect the baggage. There are two tables with 1 MIDA inspector and 2 customs agents per table. Inspectors going on board examine the general declaration, cargo manifest, passenger list, and food stock list, and then perform a general inspection of the ferry, including the kitchen, food-storage rooms, restaurants, cabins, garbage dumpsters, and cargo containers.

Passengers disembarking the ferry must walk across a "sanitary carpet" to disinfect the bottoms of their shoes before entering customs. The sanitary carpet consists of a 3 × 5 foot piece of outdoor carpeting sitting in a shallow metal reservoir and soaked with an iodophor disinfectant (Vanodine, Pfizer Veterinary Division, Costa Rica). Baggage is thoroughly inspected by Customs and MIDA officials. Any confiscated meat or plant materials are placed back on the ferry for return to Colombia. Confiscations have dropped over time, probably due to preclearance activities.

Final Rating: Low. Effective Panamanian regulations exist to prevent the entry of animals and animal products by passengers, and thorough and professional preclearance and postinspection programs exist in Colombia and Panama, respectively. The hazard category for passengers is low.

Cargo.

Question 1: Effective Panamanian Regulations: Yes. Import regulations for animals and animal products are defined under Decrees 57, 168 and 15 (see Passengers, Question 1).

Question 2: Effective Preclearance Program in Colombia: Yes. According to the Port Authority Captain in Cartagena, the Crucero Express has a permit to carry containers, and it must obey the import regulations of Panama. Before each trip, the ferry provides a cargo manifest and trip itinerary to the Cartagena Port Authority, as verified by a computer printout provided by the Port Authority Captain. The Crucero Express also provided copies of cargo manifests from January 31, when transport of cargo from Cartagena to Colon was first permitted, through March 28, 1995. Sixty nine containers were sent from Cartagena to Colon, with mainly chemical and industrial products, but no animal and plant products were listed on the manifests provided.

A failure in the preclearance program occurred when the Crucero Express attempted to transport to Colon on two subsequent occasions a container of frozen pigs feet originating in Canada that had transitted in Colombia. The container had been transported from Canada to Colombia on a cargo boat owned by the FMG, and then transferred to the Crucero Express for shipment to Panama. The manifest stated the contents of the container. Although it is unclear whether this was a deliberate attempt to bypass Panamanian regulations or simply a misunderstanding of the regulations, it underscores the necessity for better communication between the Crucero Express management and ICA officials. Panamanian regulations do not allow transit of animal products through FMD-affected countries without special permit.

On balance, the preclearance program in Colombia for cargo was given a qualified yes for effectiveness.

Question 3: Effective Postinspection Program in Panama: Yes. MIDA port inspectors examine the cargo and cargo manifest provided by the Crucero Express, and inspect the off-loading and disinfection of containers. Both 40- and 20-foot containers are shipped on trailer beds with wheels, and are driven off the ferry by trucks. The exteriors of the containers are sprayed with a disinfectant-insecticide mixture (Vanodine and malathion) while the wheels of the trailer bed are driven through a trough containing 550 gallons of Vanodine (12 ml per gallon of water) or 4% sodium carbonate. In addition, MIDA inspectors detected the prohibited shipments of pigs feet mentioned above, indicating they are monitoring cargo closely.

Final Rating: Low. Effective Panamanian regulations exist to prevent the entry of animals and animal products in cargo, a moderately effective preclearance program exists in Colombia, and an effective postinspection program exists in Panama. Cargo transported by the Crucero Express contains no animal or plant material as indicated on cargo manifests. The hazard category for cargo is low.

Vehicles

Question 1: Effective Panamanian Import Regulations: Yes. Import regulations for animals and animal products are defined under Decrees 57, 168, and 15 (see Passengers, Question 1). Present Panamanian policy allows movement of vehicles on the Crucero Express from Panama to Colombia only, but not from Colombia to Panama due to FMD concerns. From December 4, 1995, through March 28, 1995, 101 cars were shipped from Panama to Colombia.

Question 2: Effective Preclearance Program in Colombia. A preclearance program does not presently exist for vehicles in Colombia since vehicles do not travel from Colombia to Panama. However, an effective program would consist of a thorough visual inspection of vehicles by ICA port inspectors for live animals and animal products, and thorough cleaning and disinfection. Cleaning could be done using any method to remove organic debris, with special attention given to the tires and undercarriage, e.g. steam cleaning. Disinfection could be done using a noncorrosive disinfectant effective against FMD, e.g., 2% chlorine dioxide (Oxine, Bio-Cide International, Norman, OK) or 4% sodium carbonate with 0.1% sodium silicate. Oxine was very effective against FMD during laboratory trials (Dr. Carol House, USDA-Foreign Animal Disease Diagnostic Laboratory, Plum Island, New York, 1994, personal communication). Sodium carbonate is a controlled substance in Colombia, which will affect its availability as a disinfectant. Vanodine is effective but corrosive.

Question 3: Effective Postinspection Program in Panama. A postinspection program does not presently exist for vehicles in Panama since vehicles do not travel from Colombia to Panama. MIDA presently uses a system based on OIRSA standards for disinfecting cargo containers leaving the ferry, and this system could be adapted for vehicles. In addition, the cleaning and disinfection methods described in Question 2 above would be very effective against FMD and noncorrosive to vehicles.

Final Rating: No risk at present; Low hazard is possible. Since current Panamanian policies prevent transport of vehicles from Colombia to Panama on the Crucero Express, there is no risk. However, if thorough car inspections and thorough cleaning and disinfection procedures described above were implemented in both Colombia and Panama, the hazard category for vehicles would be low.

Passenger Profile

The results of the questionnaire are in TABLE 1. Eighty five of 142 passengers (60%) responded to the questionnaire. Only one passenger from 83 responses (1.2%) identified having had contact with FMD-susceptible livestock within the last two weeks, a housewife with pig contact. Of 83 responses, 41 occupations were listed, but none were agricultural related. Of the responders, 93.3% had middle or upper middle incomes. Finally, passengers on the Crucero Express are probably demographically similar to airplane travelers, since 84% of Crucero Express passengers responding to the questionnaire said they would travel to Panama by airplane if the ferry was not available.

From customs declaration forms, managers of the Crucero Express report that 60% and 40% of the passengers were engaged in business and tourism, respectively.

TABLE 1. Results of "Crucero Express" Questionnaire, April 2, 1995

Variable	Frequency	Percentage
Country of Residence		
Panama	46	55.4%
Colombia	31	37.3%
Canada	2	2.4%
France	2	2.4%
US	2	2.4%
Total	83	100.0%
Days in Colombia		
One	7	15.6%
Two to four	31	68.9%
Five or more	7	15.6%
Total	45	100.0%
Areas visited in last two weeks		
Cartagena only	25	31.6%
Colombia elsewhere	26	32.9%
South America	3	3.8%
Other countries	25	31.6%
Total	79	100.0%
Contact with livestock in previous two weeks		
Yes	1	1.2%
No	82	98.8%
Total	83	100.0%
Age		
Less than 18 years	0	0%
18 to 34 years	31	36.9%
35 to 64 years	49	58.3%
65 years or Greater	4	4.8%
Total	84	100.0%
Sex		
Female	45	53.6%
Male	39	46.4%
Total	84	100.0%
Occupation		
Professional/managerial	47	56.6%
Merchant	14	16.9%
Housewife	7	8.4%
Student	7	8.4%
Laborer services	5	6.0%
Retiree	3	3.6%
Total	83	100.0%
Average weekly income		
Less than US \$100	6	7.7%
US \$100-300	22	28.2%
More than US \$300	50	64.1%
Other modes of travel to Panama you would use		
Airplane	68	84.0%
Would not travel	7	8.6%
Other	6	7.4%
Total	81	100.0%

During the first two months of 1995, 62% of sales were in Colombia and 38% in Panama. The majority of passengers had middle to upper middle incomes. From December 4, 1994, when ferry operations began, through March 28, 1995, a total of 11,945 passengers traveled between the countries (5917 from Cartagena to Colon and 6028 from Colon to Cartagena).

The ferry service is marketed to tourists in both countries as a minicruise with shopping and sightseeing, to Colombian merchants wishing to shop in the Free Zone at Colon, and to corporate groups for conferences on the ferry. Passengers can travel by bus to hotels in Panama City as part of a travel package. Approximately five million potential customers with middle to upper middle incomes are targeted in Colombia (Mr. Rodrigo Gomez, personal communication).

One of the original objectives of the ferry was to serve as the final link for vehicles on the Pan American Highway. However, Panamanian policies have prevented vehicles from entering Panama. This has forced the Crucero Express to solicit cargo containers to replace the expected vehicles. They ship 40- and 20-foot containers faster and more cheaply than regular cargo boats, charging US \$1200 and \$1600, respectively (Rodrigo Gomez, personal communication), compared to the average rate of US \$1400 and \$2200 (Cartagena Port Authority Captain, personal communication).

DISCUSSION

When compared to airplane and cargo boat operations, the risk from the Crucero Express is no doubt lower. Airplanes transport many more passengers and cargo containers to Colombia than the Crucero Express, they serve Colombian origin meats to passengers with the waste incinerated at the Tocumen airport in Panama City, there are no signs in airport terminals warning passengers against bringing animal and plant materials to Panama, and the knowledge of FMD by airplane management and crew is probably no greater than that of the Crucero Express.

Cargo boats ship many more containers to Panama than the Crucero Express, they probably bring meats of Colombian origin for consumption by crew members, and managements certainly had no informational training on FMD.

The greatest risk for the introduction of FMD into Panama from Colombia may not be from the Crucero Express ferry, cargo boats, or airplanes, whose movement and operations are regulated by authorities in Panama and Colombia, but from the large, uncontrolled movement of small boats (1 to 50 tons) from Colombia to Panama. These boats are not controlled in Colombia, and they leave with meat of Colombian origin, and rarely live goats and pigs, for consumption during the trip. These boats trade along most of the Atlantic coast of Panama, including ports in the San Blas District (trade for coconuts), the Cocosolo dock in Colon (buy electronics), and the Upper Coast north of Colon which all have small pig populations. There is also some trade with the lower Pacific coast of Panama. In 1994, 11 confiscations of animals or animal products were made from small boats at Puerto Obaldia on the Atlantic coast, including 4 live pigs during one confiscation.

SUMMARY

It should be emphasized that the proposed ferry hazard categorizations do not represent absolute risks for introducing FMD into Panama, but instead provide a

systematic method for comparing and estimating risks in the absence of quantitative data. A hazard rating of high may not necessarily represent a high quantitative risk for the introduction of FMD, but is high when compared to other scenarios. A low hazard rating may estimate a low quantitative risk of importing FMD, but economic consequences of a potential outbreak should also be considered.

When further data become available, a more complete assessment of the risks of the Crucero Express compared to airplanes, cargo boats, and small boats can be performed. At present, the risk of the Crucero Express is at least as low as the other transport modes described above. Since vehicles are not presently allowed transport from Colombia to Panama, they present no risk to Panama, but with proper cleaning and disinfection procedures, vehicles can be permitted with low risk. However, the Crucero Express can carry 125 vehicles, and thorough cleaning and disinfection of this many cars will require modern and efficient facilities not yet present at either port.

Addendum: When this paper was written, vehicles were not allowed passage on the Crucero Express Ferry from Colombia to Panama. In January 1996, Panama changed its policy to allow entry of vehicles from Colombia and South America on the Crucero Express Ferry. Vehicles must be washed with a hot water vapor spray at a local car wash in Cartagena supervised by an official from ICA. The undercarriage must then be sprayed with Vanodine solution, and the vehicle driven through a disinfectant trough of Vanodine solution just prior to boarding the ship. Panamanian officials from MIDA periodically monitor the vehicle disinfection process.

REFERENCES

1. WOODHAM, C. B. 1991. Prospects for the Exportation of South American Meat and Livestock Products to the European Community after the Advent of New Regulations in 1992. *Vet. Epi. and Economics Research Unit, Univ. Reading. Chp. 4: 4.1.1.*
2. USDA-APHIS-VS. CENTERS FOR EPIDEMIOLOGY AND ANIMAL HEALTH. 1994. *Foot-and-Mouth Disease: Sources of Outbreaks and Hazard Categorization of Modes of Virus Transmission.* Fort Collins, CO.