Risk Analysis:

Risk of Exporting Exotic Newcastle Disease (END) in Poultry and Poultry Products from Argentina to the United States

Evaluation of the END Status of Argentina

Veterinary Services

National Center for Import and Export

Regionalization Evaluation Services

(May 2004)

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LIST OF ABBREVIATIONS

APHIS: Animal and Plant Health Inspection Service

APMV-1: Avian paramyxovirus type-1

BSL-2: Biosafety level 2

BSL-3: Biosafety level 3

CFR: United States Code of Federal Regulations

CRA: Confederation Rural Agreement

DTA: Animal Transport Document

END: Exotic Newcastle Disease

EU: European Union

HI: Hemagglutination Index

ICPI: Intracranial Pathogenicity Index

INTA: National Farming Technology Institute

OIE: World Organization for Animal Health (Office International des Epizooties)

PCR: Polymerase Chain Reaction

RENSPA: National Sanitary Registry of Ag-producers

SENASA: National Health and Agrifood Quality Service

USDA: United States Department of Agriculture

Figure 1. Map of Argentina and List of Associated Provincial Acronyms

PROVINCES

BUE	BUENOS AIRES
CAT	CATAMARCA
CBA	CORDOBA
CHA	CHACO
CHU	CHUBUT
CRR	CORRIENTES
DOZ	MENDOZA
ERI	ENTRE RIOS
FSA	FORMOSA
JUA	SAN JUAN
JUJ	JUJUY
LAP	LA PAMPA
LAR	LA RIOJA
MNE	MISIONES
NEU	NEUQUEN
RIN	RIO NEGRO
SAL	SALTA
SCZ	SANTA CRUZ
SDE	SANTIAGO DEL ESTERO
SFE	SANTA FE
TDF	TIERRA DEL FUEGO
TUC	TUCUMAN
UIS	SAN LUIS

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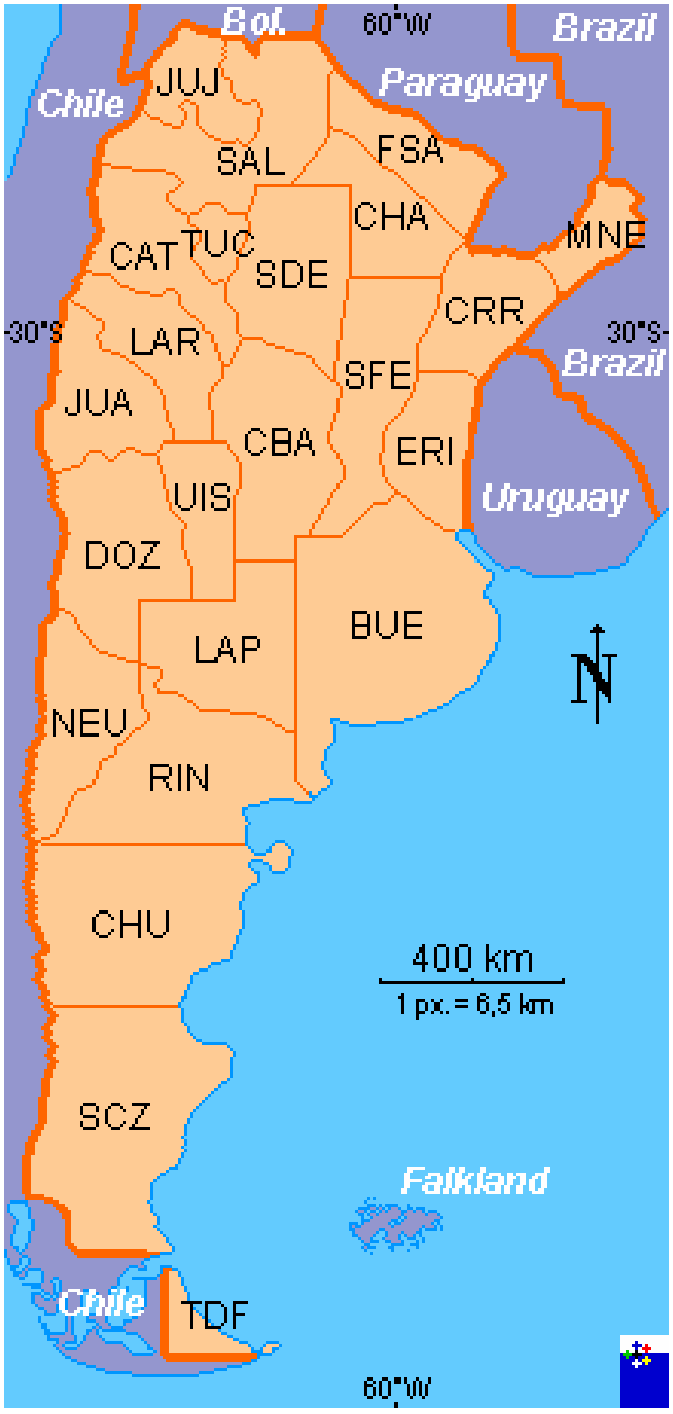


Executive Summary

Argentina has officially requested the United States Department of Agriculture (USDA)/Animal Health and Plant Inspection Service (APHIS) to conduct an evaluation to recognize Argentina as Free from Exotic Newcastle Disease (END). The last outbreak occurred in October 1987. No new outbreaks have been reported since then. Due to the animal health history of END in Argentina, APHIS has decided to conduct a qualitative risk assessment to determine the END status of Argentina.

Argentina's Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA) has submitted information to support the request for recognition of END freedom. APHIS has evaluated the submission and has conducted a site visit to Argentina in June 2003 in order to substantiate the information reported in the documentation and add any new data. The site visit focused on the veterinary and legal infrastructure of SENASA, border control procedures, laboratory and diagnostic capabilities, biosecurity procedures on poultry farms and in slaughter facilities, animal health recordkeeping systems, movement controls, and disease surveillance systems. The final analysis was based upon information obtained from the site visit, the information submitted in writing from Argentina and from published reports.

This document describes the END control system in Argentina, identifies potential areas of risk, and discusses how this risk is mitigated. The following factors were considered of relevant importance in determining the END status of Argentina:

No new END outbreaks have occurred in Argentina since October 1987.

Surveillance programs in commercial and backyard domestic flocks have not detected the presence of the END virus.

Argentina has indemnity provisions written in the law, but these provisions do not appear to be actively disseminated and are not known by producers. Although this lack of communication concerning indemnity payments for destroyed birds might delay reporting if disease were to occur, a public information program should improve that situation. For that reason, APHIS recommended that SENASA attempt to enhance public awareness of the program.

Areas along the borders with Bolivia, Paraguay and Brazil may pose a sanitary risk without effective movement controls due to the lack of effective natural barriers to restrict the flow of potential END-infected animals or animal products

Current laboratory capacity for detection of avian disease appears sufficient for current needs. Training of laboratory and field personnel was determined to be sporadic, although the personnel assigned to the avian section were technically proficient and knowledgeable about END. SENASA does have plans to increase testing capacity, if necessary, to allow increased testing within reasonable time frames if an outbreak should occur.

Argentina is primarily interested in exporting poultry meat and products to the United States rather than live birds. Historical experience in the United States has shown that importation of live birds represents a far more initial exposure pathway than poultry meat or products. The risk of introducing END into the United States via legal importation of live birds is effectively mitigated by the avian quarantine measures in place in the United States.

APHIS considers the legal framework, animal health infrastructure, movement and border controls, diagnostic capabilities, surveillance programs and emergency response systems to be adequate to detect and control END outbreaks within the national boundaries of Argentina. APHIS considers the likelihood of introducing END into the United States via live bird or poultry product exports as low with the following mitigations consistent with those stated in the 9 CFR 94.25 for certain Mexican states (Federal Register Vol. 69, No. 17; Jan 27, 2004):

1. the poultry have not lived in a region where END is considered to exist.
2. the poultry have not been in contact with poultry or poultry products from any region where END is considered to exist.
3. poultry meat or other poultry products have not been in contact with poultry meat or other poultry products from any region where END is considered to exist.
4. poultry, poultry meat or other poultry products have not transited through a region where END is considered to exist unless moved directly through the region in a sealed means of conveyance with the seal intact upon arrival at the point of destination.
5. poultry meat or other poultry products are derived from poultry that meet all requirements of this section and that have been slaughtered in a region designated in 9 CFR 94.6 as free of END at a federally inspected slaughter plant that is under the direct supervision of a full-time salaried veterinarian of the Government of Argentina and that is approved to export poultry meat and other poultry products to the United States in accordance with 9 CFR 381.196.
6. if processed, the poultry meat or other poultry products are processed in a region designated in 9 CFR 94.6 as free of END in a federally-inspected processing plant that is under the direct supervision of a full-time salaried veterinarian of the Government of Argentina.

Although consequences of an END outbreak are potentially substantial, the likelihood of an outbreak occurring via exposure of the domestic poultry population to poultry meat or products imported from Argentina is low.

Background

Argentina has officially requested that USDA/APHIS conduct an evaluation to recognize Argentina as Free from Exotic Newcastle Disease. The last outbreak occurred in October 1987. No new outbreaks have been reported since then. This is the first evaluation of Argentina by the United States for END freedom.

Documentation was submitted by animal health officials of SENASA to support their request for END freedom. A site visit was also conducted in June 2003 to verify and complement the information submitted by Argentina. It focused on the legal framework and veterinary

infrastructure, border and movement controls, avicultural practices, laboratory diagnostics and surveillance programs related to the poultry health program in Argentina.

Objectives

This is an analysis of the risk of introducing END into the United States in poultry and unprocessed poultry products from Argentina. The risk analysis is intended as a decision-making tool for APHIS Managers that will allow development of appropriate regulatory conditions with mitigations to address potential risks of disease introduction following initiation of trade in live poultry and fresh poultry products. It also constitutes an information source for APHIS stakeholders, providing justification for the conditions in the rule. The analysis focuses on the END status and control measures applicable to all of Argentina.

Supporting data

The analysis is based on documentation provided by the Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA) [1-14], observations made by a joint Canadian Food Inspection Agency/APHIS site visit team [15, 16], and published information [17-28]. SENASA, the full title of which translates into English as the National Health and Agrifood Quality Service, is the government agency in Argentina responsible for animal health issues.

Hazard Identification

The Animal and Plant Health Inspection Service has identified several World Organization for Animal Health (OIE)–listed diseases [17] as the primary hazards associated with initiating trade in animals and animal products from foreign regions. The listed foreign animal diseases of primary concern are addressed specifically in APHIS regulations. [19] One of the diseases that is recognized in APHIS regulations as such a hazard is Exotic Newcastle Disease. [29] In this regard, before opening trade in poultry and poultry products with a region or country that APHIS has not previously evaluated for END status, APHIS is obligated to conduct an import risk analysis to support rulemaking. [30]

The hazard identified is the Exotic Newcastle Disease virus. Epidemiological characteristics of the disease agent relevant to the import risk it may pose are described in Appendix 1.

Risk Analysis

This analysis is composed of four components, the release assessment, the exposure assessment, the consequence assessment, and the risk estimation. These components are defined in OIE guidelines and represent the international recommended components for animal health import risk analysis. [17]

Release assessment

For the purpose of this report, release assessment refers to the evaluation of the likelihood that END exists in Argentina and, if so, how likely it would be for the disease to be introduced into the United States through imports of poultry and poultry products from Argentina. The report includes an in-depth evaluation of the 11 risk factors (9 CFR 92.2) [30] identified by APHIS as factors to consider in assessing risk levels of regions. Those factors are the following:

- The authority, organization, and infrastructure of the veterinary services organization in the region,
- Disease status - i.e., is the restricted disease agent known to exist in the region?
- The status of adjacent regions with respect to the agent,
- The extent of an active disease control program, if any, if the agent is known to exist in the region,
- The vaccination status of the region,
- The degree to which the region is separated from adjacent regions of higher risk through physical or other barriers,
- The extent to which movement of animals and animal products is controlled from regions of higher risk, and the level of biosecurity regarding such movements,
- Livestock demographics and marketing practices in the region,
- The type and extent of disease surveillance in the region,
- Diagnostic laboratory capacity,
- Policies and infrastructure for animal disease control in the region.

Risk factors are identified from the information gathered on these topics, and applicable mitigations are discussed.

Background on aviculture in Argentina

Aviculture became intensive in Argentina in 1960. It constitutes a significant industry in Argentina. It is the second largest livestock production industry after cattle. Total poultry meat production in 2001 was 687,653 tons which amounted to 343,826,183 birds. Total poultry meat production in 2002 was 521,766 tons, 260,883,103 birds. Poultry production is mainly geographically distributed in the provinces of Buenos Aires, Entre Ríos, Santa Fe, Córdoba and Mendoza. [2]

Eleven factor analysis

The authority, organization, and infrastructure of the veterinary services organization in the region

Central authority

All regulations related to control of END are based on the General Animal Health Enforcement Law (Law No. 3959/1903). [2] This law, along with its accompanying regulations of 1906,

grants authority to the Government to restrict and regulate individual rights to pursue the general welfare and establishes the measures necessary to protect safety and health. Legal authority for control relative to Argentina's END status is provided, in part, in SENASA resolution numbers 46/2000, 446/1997, 683/1996, and 234/1996. [2] These documents describe control measures to mitigate END risk from imports of fresh poultry meat and poultry products and pose questions to potential trading partners regarding the END status of countries wishing to export poultry and fresh poultry products to Argentina. In addition, they define rules for control and surveillance for END and describe measures taken by Argentina to comply with European Union (EU) requirements for export of poultry and poultry products from Argentina to the EU, respectively.

SENASA is divided into several sections, four of which focus on animal health issues: (1) the National Animal Health Office (DNSA), (2) the National Agrifood Inspection Office (DNFA), (3) the Quarantine, Borders and Certification Unit (CCFyC), and (4) the Laboratories and Technical Control Office (DILACOT). These reflect organizational changes made in 2001 and 2002 [2, 3, 16] to address issues and problems identified during the foot-and-mouth disease (FMD) outbreak in 2001.

Prior to this reorganization SENASA personnel in each province reported to one of three regional directors, each of which administered huge regions. Resources were not allocated to address the regional workload. Specifically, regions with high levels of activity were assigned the same number of personnel as regions with lower levels of activity, so the system was inefficient. Also, there was too much autonomy given to the regional directors.

SENASA's reorganization was focused in three major areas: [16]

(1) Structure
(2) Financial resources
(3) Human resources

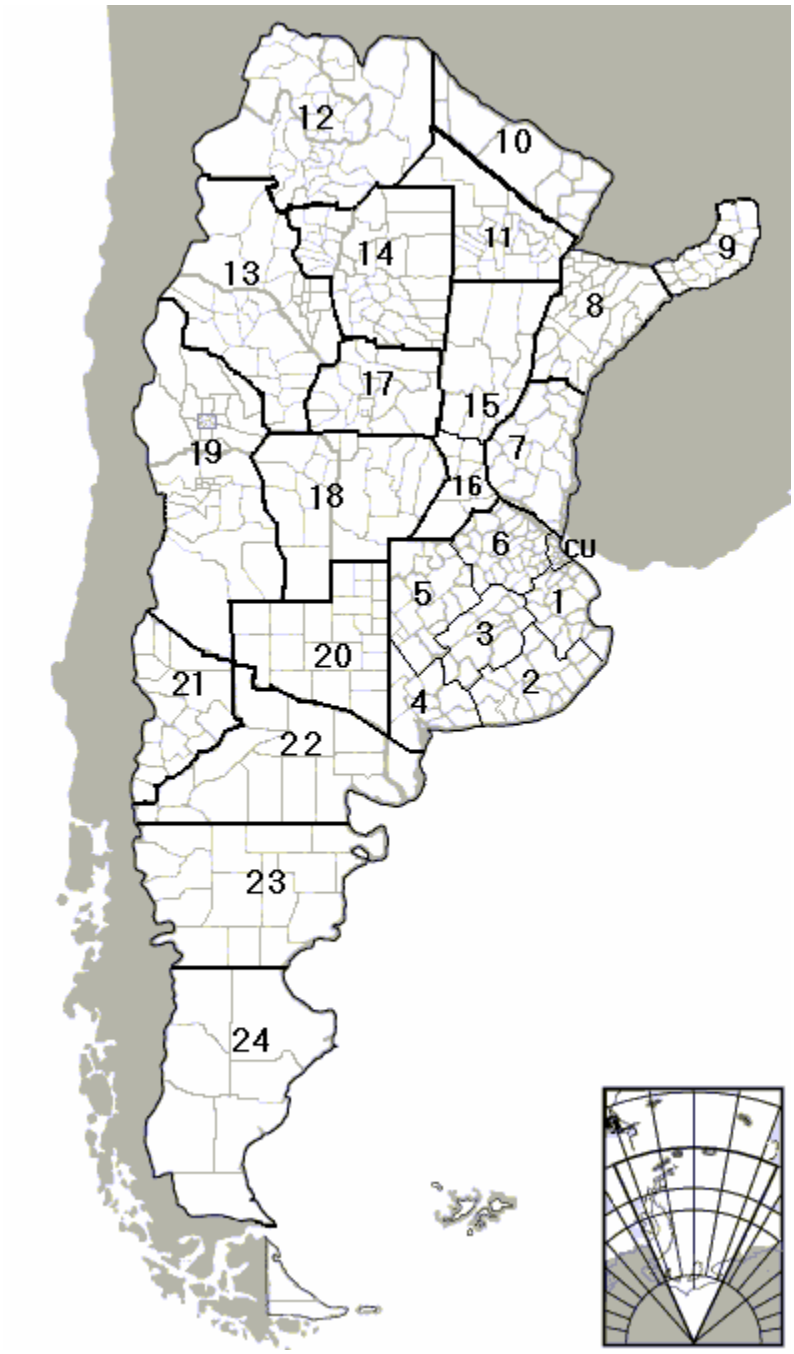
Structure:

The reorganization was defined by Decree 394/2001 (referenced in Res. 819/2002). [3] In the new structure of SENASA, not only are the units no longer based on political borders, but also the chain of command has been changed to address issues that arose during the FMD outbreaks. The reorganization was intended to increase the efficiency of the existing geopolitical system and address international perception that SENASA had not been transparent with its trading partners about its FMD situation. In fact, SENASA failed to report the disease for several months after it had been detected. [18]

Issues addressed also included centralization of command and control of the animal health programs. Apparently, the regional directors had too much discretion in carrying out the orders from the central office, and the field people had such a wide range of duties, they had trouble focusing on animal health. Relative to the transparency issue, many of the reorganization elements addressed issues of internal monitoring, accountability, and compliance with national policies. However, the reorganization also addressed international standards, certification requirements, and an increased emphasis on border controls. [16]

In the reorganization, boundaries of regional units were redefined in order to assign personnel to them appropriate to the level of activity occurring in the region. For example, the province of Buenos Aires, which constituted a very busy single region before the reorganization, was broken into six separate units. This increased the efficiency of the system by distributing the workload more evenly. [16]

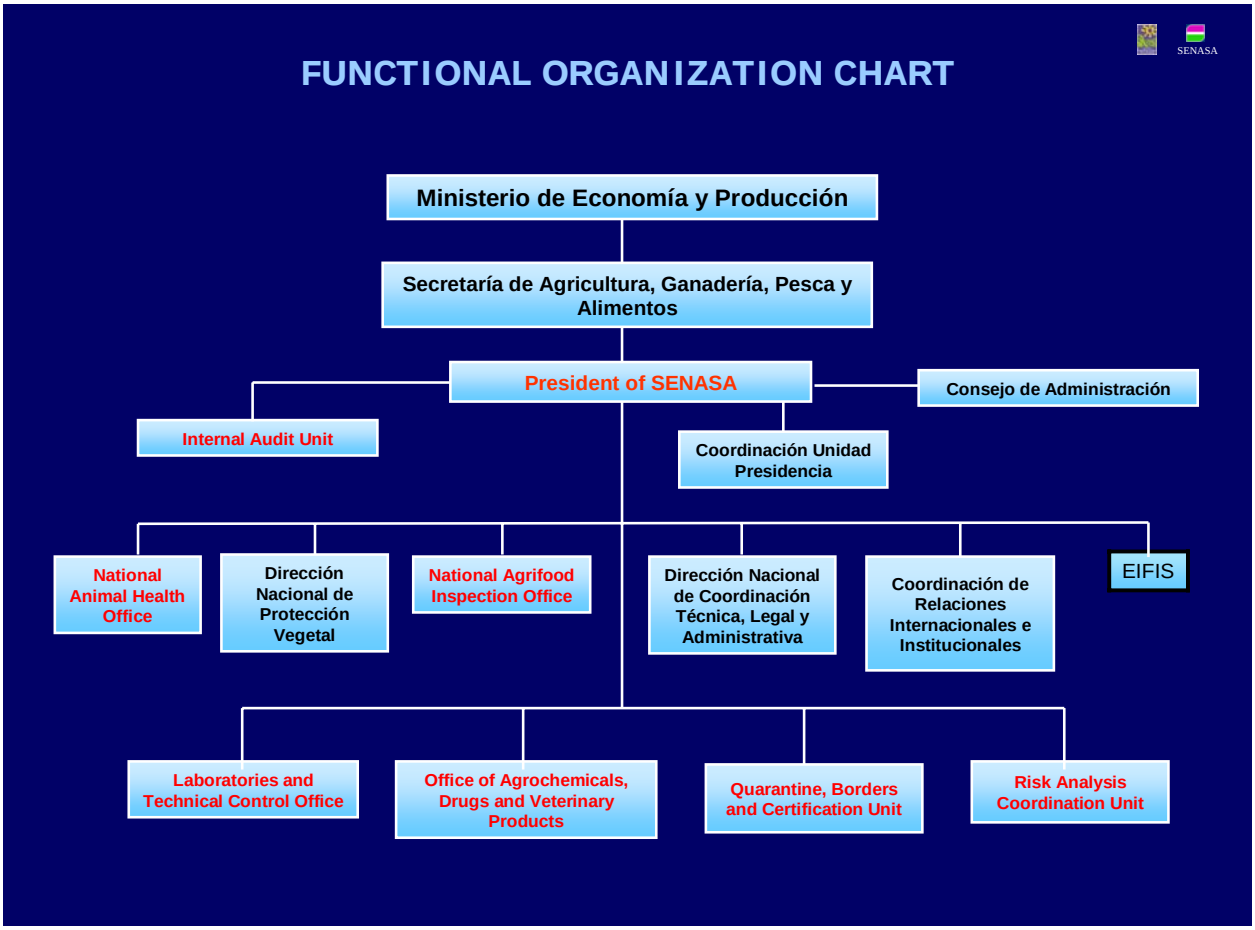
Figure 2. Map of SENASA Regional and Local Units



In addition, the reorganization involved the creation of several new units, including ones with a primary focus on compliance and one focused on auditing. In June 2003, the compliance unit

contained 20 people. It was designed to operate outside of SENASA rules, giving it an element of independence.

Figure 3. Functional Organization Chart of SENASA



Financial resources:

SENASA reported that its 2003 budget was 117 million pesos [16] (approximately $39 million US dollars). SENASA officials described the system as self-sufficient because user fees are required for almost every service SENASA provides, including slaughter surveillance, issuances of certificates, and laboratory tests.

Human resources:

In June 2003, SENASA reported a total of 3479 employees, including personnel who deal with plant issues. Of these 2558 are permanent staff members, of which 572 are veterinarians. Rules

are in place for employees to address conflict of interest issues. For example, plant and field inspectors are not allowed to own or sell beef.

SENASA can expand its staff, when necessary, by hiring contract personnel, including veterinarians and animal health technicians. These are individuals who are employed on the basis of a standardized profile defined by SENASA for 4-month increments of time, and contracts are renewable. Permanent and contract veterinarians have the same authority.

In 2003, SENASA reported a complement of 921 contractors, of which 219 were contract veterinarians. This staff was expanded significantly during the time of the FMD outbreaks. Four thousand additional people were employed by SENASA during this period. [16]

SENASA can also broaden the scope of its activities through agreements with outside parties. For example, it has entered agreements with some academic institutions to cooperate in activities such as conducting risk analyses. Other agreements have been implemented with enforcement agencies like the border police, who assist with security at border control points all along the border by land or water. Border police also assist SENASA with enforcement of quarantines. They played a significant role in security during the FMD outbreak. Security forces that work at slaughter facilities also assist in the disease control program. [16] SENASA can call upon many border police and other security forces to help protect entry of disease into Argentina.

Field offices and premises identification

In 2003, SENASA had 25 regional offices. These represent 24 numbered regions and a twenty-fifth region (Buenos Aires) that is not numbered. Regional supervisors provide oversight for field offices, of which there is a total of 316. Field offices deal with local prevention and control measures, census information, eradication, compliance, emergency actions, health actions (e.g., vaccination), premises identification, movement controls and record-keeping. Many of these responsibilities are controlled through the registration of and assignment of a unique premises identification number (called a RENSPA number), which, in addition to other information on premises, is maintained in a national database. The team that visited Argentina in 2003 visited field offices in Brandsen and in San Miguel del Monte in the Buenos Aires region and saw a demonstration of the database.

SENASA requires that all premises holding cattle and all commercial poultry premises register with SENASA and obtain a RENSPA (Registro Nacional Sanitario de Productores Agropecuarios - National Sanitary Registry of Ag-producers) number. [10] This is an alphanumeric identifier that encodes information about individual premises. The structure of the RENSPA number is such that it identifies the province, the municipality, the premises, and various aspects characterizing a particular premises, such as ownership, rental status, or shared occupancy. For example, if an individual owns more than one premises or if there are multiple producers using a single premises, the number code identifies this. Also, the number can also be coded to indicate whether a premises is rented, as well as the number of people participating in the ownership or rental. [17]

The name of a responsible veterinarian must be included on the application for a RENSPA number and is entered into the database. The veterinarian is held accountable for failing to report problems that he or she might observe on the premises. Veterinarians named on registration documents are required by law to report problems on the premises, such as unusual numbers of sick and dead birds. If the veterinarian does not report and there is a disease outbreak, indemnity will not be paid. This can be a significant loss, since the indemnity paid is typically the market value of the animal. In addition, a fine is levied on the veterinarian, the owner, or both depending on who fails to notify SENASA. It is common for veterinarians who work for commercial poultry operations to be specialized in poultry and poultry diseases.

In association with the RENSPA number, census information on all species on the premises, permit information showing animal movements, as well as other data are included in the database maintained by field officials. The database also records the END test status of the premises, as defined by the national surveillance program. Monthly statistical reports are generated from this database.

Registration is required for commercial poultry premises, but not specifically for backyard flocks. However, many premises with backyard flocks have cattle, and the premises must be registered to move cattle. Registration must be renewed on a yearly basis.

Compliance with the requirement to register premises is controlled by at least three mechanisms, and SENASA considers compliance with this requirement to be good. In this regard, SENASA officials stated that any premises that were not registered probably were in urban, rather than rural areas. SENASA felt that birds being housed on unregistered premises were intended primarily for home consumption. [16]

First, all premises with bovines must vaccinate for FMD. The vaccines are administered by personnel authorized, controlled, and audited by SENASA, which are contracted by the FMD foundations. In these areas, the premises must be registered in order for the cattle to be vaccinated. The official vaccinator counts the animals and updates the census. SENASA veterinarians visit premises for other purposes also. The veterinarian is expected to update a census of all animal species on the premises during his visit and report the information to the field office. Since FMD vaccines are administered twice yearly, census information on premises containing cattle can be updated twice yearly. If premises do not have cattle or are located in the non-vaccination zone, census information comes from a private veterinarian or through other official herd health practices. Use of the tax census for updates has been done, but the accuracy is questionable.

Second, premises must be registered in order to obtain a permit to move animals for commerce. The RENSPA number must appear on the permit. The Animal Transport Document (DTA) is required for all animal movements and must accompany the shipment. [11] Owners must apply for a permit within 30 days of movement for either beef or poultry and pay user fees associated with the movement.

Third, SENASA considers it likely that neighbors of unregistered premises with animal health problems will report the unregistered premises to the authorities.

An office in Brandsen in the province of Buenos Aires was visited as an example of a representative field office. [16] The region covered by the Brandsen field office covers about 115 hectares. Most of the livestock in the region are cattle. There are 122,000 layers in 2 production units in Brandsen. This area contains 6 registered broiler premises with 170,000 birds and only 214 backyard premises with about 3,668 backyard birds.

Another local office in San Miguel de Partido was visited. This jurisdiction had 43 registered poultry farms with 2 breeding hen farms and 14 broiler farms approved to raise broilers for export to the EU. There were about 200,000 breeding hens and 3 million broilers. [16]

At the field level, local units belong to the Confederation Rural Agreement (CRA). These local units represent geographically characterized areas. They are not officially in the surveillance system but are extremely important aspects or components of the surveillance system since they act as surveillance sensors in the field. The local units consist of farm owners and are financed by local sanitary entities. They maintain a close relationship with SENASA and, in Brandsen, they are located in the same office building as SENASA officials. [16]

Movement controls within Argentina

A movement permit is required when animals go to slaughter, go to market in Patagonia (which SENASA considers to be FMD-free without vaccination), cross provincial lines or are exported internationally. [16] These permits are required in order to establish that the farm of origin is registered so that tracing can be conducted quickly. They record the identification numbers of both the premises of origin and the premises of destination. If a registered farm attempts to ship more animals than the census would predict and the discrepancy is noted when the permit application is being processed, then the shipment does not get a movement permit.

All birds moved in commerce must originate from premises registered with SENASA. Birds from unregistered premises cannot be sold, moved or taken to slaughter houses. They can only be used for household consumption.

All vehicles carrying commercial shipments must also be registered with and approved by SENASA and issued a number. Typically, the number issued by SENASA is painted on the trucks, and the driver must show proof of the authenticity and validity of that number. Trucks must be cleaned and disinfected before every transportation and must show a proof of truck disinfection in the form of a bill issued by a SENASA-approved facility. There is only one bill per movement. No dirty animal trucks are allowed on the road or they will be cited.

Broilers move under a farm registry along with the whole history of their vaccine records and the daily mortality from their production farms. Those forms accompany birds to the slaughter houses where they are collected. This document is in addition to the DTA that is required for the movement of other birds. [16]

Other birds need a DTA for movement which must designate the number of birds being moved, their origin and the receiving premises. If the birds are going to slaughter, the slaughterhouse should be designated. The number of birds that the DTA indicates as being moved is used to adjust the census information for that premises.

Conclusions

Argentina has the veterinary and regulatory infrastructure to adequately monitor and control any incursion of END into the country. There is sufficient monitoring of animal premises and movements to permit effective surveillance and detection programs that would result in sufficient administration of eradication efforts, if needed.

Disease status-i.e., is the restricted disease agent known to exist in the region?

Exotic Newcastle Disease was first diagnosed in Argentina in 1961. However, Argentina has not recorded an outbreak of END in domestic flocks since October 1987. Reporting of END cases became mandatory in 1967 when the disease was included in Section 6 of the General Animal Health Enforcement Law Regulations by Decree No. 254/67. [2]

There have been three additional END outbreaks in Argentina since the first outbreak in 1961 (1 each in 1966 and 1970 and 2 in 1987). The last two outbreaks occurred in August and October of 1987. [2] A virulent strain of paramyxovirus type-1 was isolated from wild pigeons in 1999 and reported to the OIE. [16]

The outbreak in August 1987 occurred in 4 backyard premises in Ayacucho, Province of Buenos Aires. Approximately 300 hens were affected. [2] The infection originated in unvaccinated backyard birds that were at an exhibition and developed clinical signs during the show. The infection spread to other birds at the exhibition site. The outbreak was controlled by slaughter and disinfection. The virus isolated was a velogenic strain.

The outbreak in October 1987 occurred in Concepción del Uruguay, Province of Entre Ríos. Approximately 180,000 commercial broiler birds were affected, 9 poultry farms with 2 sheds each, housing 10,000 birds per shed. [2] The origin of the infection was unknown, but the time between infection and detection was about 4 days. The outbreak was controlled by slaughter, disinfection and vaccination. Steps in the control and the eradication of the disease included: disinfection of premises; collection of blood samples for serum testing; necropsy of all animals dying on neighboring premises within a radius of 25 Km for the following 35 days; and application of stringent biosecurity measures (e.g. access controls at the farms, destination of waste material, testing of wild birds). The virus isolated was a velogenic viscerotropic strain.

SENASA estimates that approximately 80% of the poultry in Argentina are vaccinated. [2] Therefore, 20% of the population serves as sentinel birds. It is likely that clinical disease would be observed in the susceptible population if END were present in Argentina. Also, since most

broilers are vaccinated only once within 14 days of age, their immunity has diminished greatly by slaughter age so they may serve as sentinels also. [16]

Federal, provincial and municipal authorities, veterinarians in private practice and citizens must report any signs of disease, the existence of suspect cases of this disease, or the positive test results for this disease to the local animal health authorities or to the National Animal Health Office of SENASA (Law No. 3959/1903, Decree No. 254/67, SENASA Resolution No. 683/96). [1, 2] There will be no indemnification for destroyed animals if the disease is not reported, and the one who fails to report the disease as stated above will be fined.

Conclusions

The last END outbreak in Argentina occurred in 1987. There is no evidence that there are poultry or other birds infected with the END virus in Argentina.

The status of adjacent regions with respect to the agent

Argentina is bordered by Paraguay in the north, Bolivia in the northwest, Uruguay and Brazil in the northeast and Chile in the west. [2] Only Chile is considered by APHIS, Veterinary Services, to be END-free [29], so exports into Argentina from each of the other countries listed might be considered, by APHIS, to pose some risk.

Chile and Uruguay are recognized as END-free countries by Argentina, but Argentina does not recognize its other neighbors (Bolivia, Paraguay, and Brazil) as END-free. [2]

Brazil and Bolivia had reported outbreaks of END in 2001 and 2002, respectively. [31]

Conclusions

There is no evidence that END has been transported from surrounding countries into Argentina. However, only Chile is recognized as END-free by APHIS and outbreaks have been reported in the past few years in some neighboring countries. Exports from other surrounding countries may pose an animal health risk.

The extent of an active disease control program, if any, if the agent is known to exist in the region

Although there is no evidence that disease exists in the country, there is a plan for active and passive surveillance methods to detect the presence of disease in the region. [2] Key elements of this plan include:

1. A disease notification system, whereby government officials, veterinarians, producers, and the general public can notify SENASA officials of possible disease outbreaks.
2. Official SENASA involvement in reported and suspect cases, requiring immediate investigation of such cases and supported by SENASA's Central Laboratory.

3. Emergency response involving health and sanitary measures in case of a possible outbreak.
4. Serological monitoring of commercial production, backyard or non-commercial, and wild birds and messenger pigeons.
5. Ante-mortem and post-mortem sanitary inspection of birds for slaughter.

Procedures and operating standards for the diagnosis and control of END outbreaks are recorded in the *Procedures Manual for Newcastle Disease* and established in SENASA Resolution N° 683/96. Resolution N° 614/97 establishes minimum bio-security and hygiene standards for poultry farms and treatment of poultry waste. [2] These appear to be adequate to the situation.

Any Argentine citizen is responsible for reporting disease. Compensation is provided only when disease is reported, a situation that should serve to encourage reporting. Indemnities are paid at market value. However, SENASA indicated that information on this indemnity program was not actively disseminated. The fact that indemnities could be paid was not well-known by the public. When questioned by site visit team members, producers were not aware of the indemnification program that provided compensation for lost birds as a result of an END outbreak. [16]

Conclusions

Argentina appears to have a structured system of notification and official involvement to investigate any suspect END cases. Argentina also maintains an active surveillance program to monitor viral activity in various poultry and bird populations.

Argentina has indemnity provisions written in the law, but these provisions do not appear to be actively disseminated and are not known by producers. Although this lack of communication concerning indemnity payments for destroyed birds might delay reporting if disease were to occur, a public information program should improve that situation. For that reason, APHIS recommended that SENASA attempt to enhance public awareness of the program.

The vaccination status of the region

Vaccination for END is voluntary with the exception of messenger pigeons. Vaccination of messenger pigeons is required by law (SENASA Resolution N° 723/2000).[1] Vaccination of pigeons is required because virulent Newcastle disease virus has been isolated in wild pigeons (especially urban pigeons) and the messenger pigeons have the potential of contact with wild pigeons which might carry disease. [2]

Vaccination regimens vary with the type of production or use of birds. Programs have been developed for production birds, breeding birds and ornamental birds in markets and exhibitions. Backyard domestic fowl are not generally vaccinated, except when they are in exhibitions or fairs. Vaccination coverage reaches about 80% of the country's poultry population.

Standard vaccination plans for different uses include: [2]

Broilers: up to 2 doses up to 55 days of age, with at least one dose given (During the 2003 site visit, officials noted that about 10% of the broilers receive no vaccine.)

Breeders and Layers: 4 to 5 doses, applied before 20 weeks of age with a revaccination every 60 days during production

Messenger pigeons: vaccinated twice a year with a specially-produced vaccine for pigeons or every two months using the chicken vaccines

These plans were identical or very similar to the producers' vaccination regimens observed in records at farms that were visited during the June 2003 site visit.
Newcastle vaccines used in Argentina are controlled by SENASA. Only the use, manufacturing, import and trade of vaccines manufactured with non-pathogenic strains of Newcastle disease are authorized (e.g. La Sota, B1, VG/GA). The use, trade or importation of live or inactivated virus vaccines manufactured with pathogenic strains is prohibited (Resolution N° 465/96). The resolution allows inactivated vaccines to be manufactured using exclusively lentogenic strains, with an intracranial pathogenicity index (ICPI) value less than 0.7. Live virus vaccines manufactured with non-pathogenic strains such as B1 or La Sota can also be imported (Resolution N° 690/75). Newcastle vaccines for pigeons should be manufactured with the pigeon paramyxovirus strains. [2]

The Bureau of Laboratories and Technical Control performs the testing of all the vaccines traded in the country. Inactivated vaccines undergo safety and sterility tests and a viral activity test measuring seroconversion by the hemagglutination inhibition (HI) technique. Live virus vaccines also undergo safety and sterility tests. The pigeon vaccine also undergoes a potency test. [2]

Conclusions

Vaccination for END is voluntary with the exception of messenger pigeons. Argentina appears to have adequate vaccination programs for commercial, breeding, and ornamental birds. Generally, backyard birds are not vaccinated. Vaccines are controlled by SENASA and undergo adequate safety testing. There was no evidence that unacceptable biologics were used for the vaccination programs. It appears that END vaccination programs are performed appropriately.

The degree to which the region is separated from adjacent regions of higher risk through physical or other barriers

The geographic description of the Argentine borders follows below: [3]

1. Chile (West and South)
2. Bolivia (North)
3. Paraguay (Northeast)
4. Brazil (Northeast and East)

5. Uruguay (East)

CHILE

Total length of the border: 4,591 km
Inland border: 4,591 km

- The Andean Range makes up a natural border.

BOLIVIA

Total length of the border: 765 km
River coastline border: 385 km

- Along the Pilcomayo River: 40 km (Province of Salta)
- Along the Grande de Tarija River: 120 km (Province of Salta)
- Along the Bermejo River: 125 km (Province of Salta)
- Along smaller rivers: 100 km (Provinces of Salta and Jujuy).

Inland border: 380 km

- The altitude along the border with Bolivia decreases from West to East (Average of 3000 m in the West and 400 m in the East). The climate and topography also change from more mountainous in the West to flatter lowlands towards the East.

PARAGUAY

Total length of border: 1,570 km
River coastline border: 1,570 km

- Along the Paraná River: 630 km (Provinces of Corrientes and Misiones)
- Along the Paraguay River: 290 km (Provinces of Formosa and Chaco)
- Along the Pilcomayo River: 300 km (Province of Formosa)

Inland border, deviated course of the Pilcomayo River: 350 km (La Estrella Lowlands, also know as the Pantalón System)

- The inland border lies to the West. The flat topography of the Province of Formosa continues into Paraguay with no natural barriers.
- The Pilcomayo River enters Argentina again to the East, in the town of Palmar, Salto.

BRAZIL

Total length of the border: 1,079 km
River coastline border: 1,021 km

- Along the Uruguay River: 695 km (Provinces of Misiones and Corrientes)
- Along the Pepirí-Guazú River: 134 km (Province of Misiones)
- Along the San Antonio River: 94 km (Province of Misiones)
- Along the Iguazú River: 129 km (Province of Misiones)

Inland border: 27 km (Bernardo de Irigoyen area)

- To the North, the border with Brazil runs along the Iguazú River and continues to the South along the Uruguay River.

URUGUAY

Total length of the border: 866 km
River coastline border: 866 km

- Along the Uruguay River: 491 km (Provinces of Corrientes and Entre Ríos)
- Along the De la Plata River: 375 km (Province of Buenos Aires)
- The border is clearly defined by the Uruguay River to the North and continues along the De la Plata River.

The Province of Entre Ríos is currently the major exporter of poultry products. This province is separated from the rest of the country by rivers in the South, East and West. To enter the province from any of directions, one must cross the Zarate Bridge or the Paraná-Santa Fe subfluvial tunnel. In the North, the province is connected to the Province of Corrientes by two routes, Routes 12 and 14. [2]

Conclusions

Most of the Argentine border is adequately protected by effective natural barriers to reduce the unrestricted flow of animals and animal products from areas of higher risk. There are large areas on the borders with Bolivia and Paraguay and a small region in the Bernardo de Irigoyen area on the Brazilian border that have few effective natural barriers.

Risk Factors

Areas along the borders with Bolivia, Paraguay and Brazil might pose a sanitary risk due to the lack of effective natural barriers to restrict the flow of potential END-infected animals or animal products. Unless there are effective movement controls in these areas, the risk is high for introducing END from adjacent areas of higher risk.

The extent to which movement of animals and animal products is controlled from regions of higher risk, and the level of biosecurity regarding such movements

Border controls are administered by the SENASA's Quarantine, Borders and Certifications unit. [3] Importations of live animals, genetic material, animal products and animal by-products are allowed only under permit issued by SENASA. Animals and animal products may enter the country legally by means of 45 authorized border stations which include terrestrial, maritime and fluvial ports and airports. International border crossings authorized by SENASA are listed below:

CHILE

- Jama Crossing (Province of Jujuy)
- Cristo Redentor Crossing (Province of Mendoza)

- Cardenal Samoré Crossing (Province of Neuquén)
- Huemules Crossing (Province of Chubut)
- Coandhaique Crossing (Province of Chubut)
- Integración Austral Crossing (Province of Santa Cruz)

BOLIVIA
- Salvador Mazza Bridge (Province of Salta)
- Aguas Blancas Bridge (Province of Salta)
- Horacio Guzmán Bridge (La Quiaca, Province of Jujuy)

PARAGUAY
- San Ignacio Loyola Crossing (Fraternidad Portal, San Ignacio Loyola Bridge, and ferry, Clorinda, Province of Formosa)
- San Roque González de la Cruz Bridge (Posadas, Province of Misiones)
- Puerto Rico: this crossing is for cross-border traffic only (Province of Misiones)

BRAZIL
- Tancredo Neves Bridge (Port of Iguazú, Province of Misiones)
- Bernardo de Irigoyen Crossing (Province of Misiones)
- San Javier Bridge (Province of Misiones)
- Integración Bridge (Santo Tomé, Province of Corrientes)
- Port of Alvear (Province of Corrientes)
- Presidente A. Justo Bridge (Paso de los Libres, Province of Corrientes)

URUGUAY

- Salto Grande Bridge (Concordia, Province of Entre Ríos)
- José G. Artigas Bridge (Colón, Province of Entre Ríos)
- Libertador San Martín Bridge (Gualeguaychú, Province of Entre Ríos)
- Port of Buenos Aires (Ferrylineas and Buquebus)
- Jorge Newbery Airport (City of Buenos Aires)

SENASA officials are assisted at border control points by various security forces, including the National Border Patrol, the Argentine Coast Guard, and the National Aeronautical Police. National Border Control agents assist in the northernmost provinces of Corrientes, Misiones, and Formosa. The numbers of personnel stationed in these areas are 1200, 1600, and 1200, respectively. Coast Guard personnel assist at seaports and Aeronautical Police at airports. Permanent SENASA personnel at border crossing points number 394, including veterinarians, agricultural engineers, and administrative personnel. [9] Cooperation with these groups occurs under the terms of official agreements. [9, 16] Other groups assisting with border inspections include the National Customs Bureau and Provincial and local institutions. SENASA considers agreements with the security forces to be critical to the control program. Argentina port authorities check and confiscate products prohibited for movement domestically (e.g., because of

potential FMD risk to Patagonia, which Argentina considers to be FMD-free without vaccination) and internationally.

Commercial imports of poultry and poultry products

SENASA allows importation of poultry and poultry products from other countries partially on the basis of answers provided in response to a questionnaire concerning the END status of regions intending to export poultry and poultry products to the Argentine Republic (SENASA Resolution 446/97). Countries must answer the questionnaire in order to receive authorization to export to Argentina. [2] To obtain that authorization the potential exporting region must agree to and fund a site visit by SENASA officials. [16] Importation of live birds or poultry products from countries or regions with Highly Pathogenic Avian Influenza is banned.

The assessment of the information provided in response to the questionnaire will result in the exporting countries assigned to one of the following categories:

For poultry products (SENASA Resolution 46/2000)

- Country not authorized to export (e.g. China, Mexico).
- Country or region authorized with Model B of the Animal Health Certificate (testing to exclude the presence of END virus required). (e.g. Paraguay and part of Brazil)
- Country or region authorized with Model A of the Animal Health Certificate and for which testing as mentioned in item above is not required (e.g. Chile and some States of Brazil)

For live birds (non-commercial, ornamental birds)

- Non-authorized country (e.g. China, Paraguay, India, Mexico).
- Authorized country, mandatory quarantine required at SENASA-approved facilities where the birds are tested for END, avian influenza and others (salmonellosis, mycoplasmosis).

For one-day-old birds and hatching eggs (SENASA Resolution 221/95)

- Non-authorized country
- Authorized country, quarantine required at the farm of destination. When these birds enter the country they are sampled to test for mycoplasma, salmonella, END and avian influenza.

Imports of commercial hybrids (one-day-old birds and hatching eggs for incubation), broilers for fattening and/or commercial laying hens are banned, and only importation of one-day-old breeding birds of grandparent or parent lines is authorized, specifically, importation of light weight breeding hens, grandparent and great-grandparent breeding stock, and thoroughbred hens (SENASA Resolutions 498/2001 and 529/2002). [2]

Most imported baby chicks arrive through two ports - the airport at Ezeiza and the border port at Iguazú. Ezeiza handles 95% of this traffic and Iguazú handles the remaining 5%. In comparison, most chicken meat originates from Brazil [8, 16] and enters primarily through land ports. [7]

Ezeiza airport is open 24 hours per day. During peak traffic hours, at least 3-5 veterinarians are on duty. Auxiliary personnel are available, also. These are assigned duties by the veterinarians. If shipments arrive before or after the hours routinely staffed by SENASA, the shipment either waits until SENASA offices are open, or the importer makes arrangements for SENASA personnel to be present. User fees are charged for this service.

Import procedures are generally as follows:

1. The import application is approved at the Central Level, which communicates to the local veterinary level, at the port of entry, and designates a quarantine area.
2. A general inspection of the lot is performed. Samples are collected and submitted to SENASA's laboratory, and transit documents are issued for the imported merchandise. Transport of the imported lot to the place of destination is carried out in closed and sealed vehicles approved by SENASA.
3. Post-entry quarantine control is carried out by the local veterinary official of the place of destination of the imported lot.
4. Release of the imported lot occurs once negative results from the laboratory are received. This is carried out by the Live Animals and Reproductive Material Certification Area.
5. In general, there are approximately 20 days from when the imported lot enters the country to when it is released.

A computerized database is maintained that contains import and export data. Information is available on origin of the material, type of product, entry point, and inspector. Monthly reports of statistics are generated, and special reports can be generated upon request. [16]

Live birds, hatching eggs

Live birds and hatching eggs are imported into Argentina under a permit issued by SENASA. [2, 16] To obtain the permit, a potential importer sends a request to SENASA to import the designated commodity or commodities into Argentina through a particular port at a specified time. If there is insufficient history provided with the request, the request is forwarded to the SENASA quarantine section for review. Permits are issued for a 30-day period. Live imports are allowed to proceed to destination for quarantine on arrival.

Imports are allowed only from a region approved by SENASA. Approval of the region requires an inspection and evaluation of the region's animal health status by SENASA. Imports are refused until SENASA completes its inspection. The importer must pay the cost of the inspection.

Countries that exported birds or eggs to Argentina in 2001 and 2002 included Peru, Brazil, Chile, Uruguay, the United States, Germany, Great Britain, France, Belgium, Canada, the Netherlands, and Mexico. Commodities ranged from hatching eggs and one-day old chickens, turkeys and ducks to adult poultry and pheasants. [2]

The shipment must be accompanied by the permit when it arrives at the border. Most imports are subject to control measures, which usually include quarantine for live animals. If the permit is authorized, the permittee is contacted and informed of any permit restrictions. The conditions of the permit are determined based on information provided on the importer. The importer pays all fees, including one for the permit.

Live poultry (with the exception of pet birds) is subject to a 30-day quarantine irrespective of origin. Several designated quarantine facilities are inspected and registered by SENASA. Baby chicks are sent to quarantine areas located in commercial establishments. These facilities are also inspected and approved by SENASA. Fertile eggs imported through Ezeiza airport are hatched at the airport and sampled there before being sent to the designated quarantine facility. In transit flights (e.g. flights that originate in Spain arriving in Argentina through Chile) are considered low risk although they may be coming from a higher risk country since all live birds are quarantined. In transit land travel of live birds through Argentine territory requires a permit to allow the shipment to pass through Argentina. [14]

Samples are taken from baby chicks the day after they arrive for serological testing during the quarantine period. Samples from imports of hatching eggs are taken after the eggs hatch at the import facility in Ezeiza airport, and the birds are then sent to the quarantine facility. Tests are conducted for END, avian influenza, mycoplasmosis, and *Salmonella enteriditis*. Shipments are released when the test results are completed. This may take approximately 10 days. Testing is actually duplicated in many instances since commercial importers will often have private veterinarians conduct tests in addition to the tests conducted by SENASA.

Most of the permitting problems are associated with importation of ornamental pet birds. Commercial shipments of exotic birds are usually handled by 5-6 importers, all of which are known to SENASA.

Pet birds (companion animals) are subject to home quarantine. However, if pet birds comply with import regulations and have the proper certificates, depending on the country of origin and the conditions in which the birds were housed in that country, quarantine is usually not required. Birds that are quarantined are generally held at the owner's address for a period of thirty days. An official of SENASA inspects the birds to verify their health status. [2, 16]

Airports [16]

The site review team visited two airports as representative import (and export) centers for poultry and poultry products. These were Ezeiza Airport in Buenos Aires, which is the major international airport in Argentina and the only airport through which live birds enter, and Aeroparque airport, also in Buenos Aires, which receives international flights, but only from

Uruguay. Aeroparque is somewhat unique in that it handles a significant level of traffic to Patagonia, which Argentina considers to be FMD-free without vaccination. Worthy of note is that a number of safety measures are implemented to prohibit the export of potentially risky material to Patagonia. The fact that these measures are taken provides an example of the consideration taken by SENASA to controlling risk of movement among regions with varying animal health status within the country.

Passenger baggage: It has been SENASA's policy to scan all luggage since 1999. In addition, beagle dogs, trained to detect both animal and plant products in luggage, work for 6 hours per day. To the extent possible, the hours worked by the dogs are scheduled for the period during which the riskiest flights are likely to arrive. Confiscated material is chemically treated to inactivate the virus and then buried in a landfill, since there are no incinerators.

The sequence of passenger baggage control steps at Ezeiza airport is the following: The first checkpoint is immigration. Signs are posted in the arrival area prominently indicating that certain commodities are not enterable, including animal products. Second, while passengers are retrieving their baggage, it is being inspected by beagles. Dogs are trained to detect organic matter of both animal and plant origin. Ezeiza has four beagles and four handlers. Several puppies are being trained.

If the beagle identifies a bag as containing prohibited material, the bag is marked. Passengers go to customs with their luggage regardless whether their luggage has been marked or not. Passengers must declare certain items on a form provided by customs officials. [12] Bags then go through a scanner. While the bags are being scanned, they are monitored both by a SENASA inspector and a customs representative. There are 23 inspectors employed at the facility. SENASA inspects the marked bags by hand search. The inspector can also target unmarked bags if he/she thinks they may contain risky material.

Prohibited material is confiscated and subjected to chemical treatment prior to disposal. Approximately 2 tons of material (primarily plant, but includes animal also) is confiscated per month at Ezeiza airport.

Land ports

Argentina has borders with 5 countries and terrestrial border stations along these borders as follows: [16]
6 border stations with Chile (West and South – border length is 4,591 km)
3 border stations with Uruguay (East – border length is 866 km)
6 border stations with Brazil (East and Northeast – border length is 1,079 km)
3 border stations with Paraguay (Northeast – border length is 1,570 km)
3 border stations with Bolivia (Northeast – border length is 765 km)

Permanent SENASA personnel are stationed at each port. However, SENASA is not the only group responsible for biosecurity at borders. The number of personnel available for border control is supplemented through agreements with security forces like the gendarmeria. In this

regard, 14,000 officials are stationed along 9,370 miles of border. [16] As previously mentioned, SENASA is assisted at import centers by several designated security forces. SENASA officials emphasized the importance of the national forces (i.e., the land, water and border police) in identification of illegal imports. [16] If needed, SENASA also has the authority to call upon local police to assist.

Some of the entry points have scanners capable of detecting organic products. The review team that visited Argentina observed one in operation in Iguazú in Misiones Province. [16] Statistics describing types of imports, rejections, confiscations have been provided by port authorities. [7-9] Rejections and confiscations could be due to missing or incomplete paperwork or entry of prohibited substances without authorization.

Two control points in Salta have scanners for organic material (shared between SENASA and customs). At the time of the site visit, both scanners appeared to be working properly, and the technicians were proficient in their operation. The scanners are used during heavy traffic periods; otherwise, the custom officers inspect the bags manually. [20]

There are only four official terrestrial commercial ports in Misiones Province. Only three of these allow commercial/animal products transports and are staffed by veterinarians. They only operate from 7:00 a.m. to 7:00 p.m. There are other ports which allow human traffic. These are staffed by various authorities such as police and immigration officials. These authorities inspect for drugs and other illegal substances but are also trained to inspect for animals and animal products, if necessary. These officials also check passengers and scan their luggage for vegetable and animal products and other contraband. In Misiones province, 90% of the borders is shared with Brazil and Paraguay. The Argentine province of Corrientes shares the rest of the border.

The site review team visited the Iguazú (meaning "big waters") station in the province of Misiones. Iguazú is a gated border control station on the road crossing the river separating Argentina from Brazil. There are two separate inspection areas; one for commercial and the other for private vehicles. SENASA officials are assisted at this port by personnel from Gendarmeria Nacional, the i.e., National Border Control. Review team members observed cars being stopped and contents examined, although not all cars are examined at all times. Buses were stopped, and all luggage was scanned. Trucks were stopped; paperwork was provided to inspectors; and trucks were inspected to insure that the contents were correctly described in the paperwork. Each shipment was entered into a computerized database that records the origin of the material, the type of commodity introduced (usually poultry products). It takes about 1 day to complete the necessary paperwork to cross the border at Iguazú, half a day on each side. The APHIS team did not have an opportunity to observe the inspection process on the Brazilian side of the border. On average, 20 trucks come through per day.

Only a small amount of poultry enters through Iguazú. The import statistics of this checkpoint show that the border station at Iguazú had received only 3 poultry imports during the first six months of 2003. This number of poultry imports was already larger than the number of imports

in all of 2002. In 2002, there was only one legal shipment that came through this bridge crossing.

SENASA checkpoint officials are notified approximately 15 days before the shipment arrives. This minimizes potential problems with customs authority and helps facilitate and expedite the process. All exporters and importers must be registered with SENASA. The shipment must be accompanied by a permit and must originate from an approved location. Both the origin and the destination of the product appear on the permit.

Shipments can be rejected if documentation is incomplete or if it appears to be falsified. There are no fines for commercial shipments that are rejected because the paperwork is incomplete; however, the shipments are denied entry. Sometimes SENASA may confiscate and destroy the product. In comparison, if SENASA detects deliberate falsification of documents, a fine of 800 pesos is levied. This is equivalent to one-month salary. [16]

Border patrol police on land, water and at the ports are the primary personnel responsible for identifying illegal shipments. The number of illegal shipments has been reduced significantly since the economic collapse in Argentina in 2001. SENASA has monthly meetings with these border patrols to discuss issues and procedures.

General information on prohibited material, provided as guidance to the public, was available in the form of a brochure. However, it did not appear that the brochure was actively promoted to enhance public awareness due to budget constraints. There is a section on the customs declaration document that SENASA has included for travelers to fill out when entering the country. [12]

There appeared to be little formal communication between SENASA and neighboring countries about illegal shipments or illegal activities at the local level. However, there is a global communication between all these countries at a higher level. In this regard, in addition to implementing its own border control measures, SENASA is addressing border challenges in cooperation with veterinary officials in adjacent countries.

During the initial site visit, the APHIS team identified the need to evaluate some of the potentially risky border crossings, like those between Argentina and Bolivia. Therefore, an additional site visit was conducted in November 2003 by APHIS staff member Pablo Kálnay, Agricultural Scientist, International Services, Buenos Aires. He visited the provinces of Salta and Jujuy to evaluate the border posts and movement control procedures near the Bolivian border and wrote a report on his observations. [20] Three border sites were visited: Salvador Mazza and Aguas Blancas in Salta and La Quiaca in Jujuy. The border control points are manned by three different entities: Gendarmeria Nacional (the border police), Customs, and SENASA. There is heavy local traffic between the towns on both sides of the border in all three locations. Local people, most of them native populations, carry their own food supply (this is a strong cultural habit), so the most common organic item intercepted at the border were small amounts of local food staples (corn, potatoes and other tubers, cured dried meat –charqui- faba beans and some greens). There were a few events of people carrying eggs in plain sight. Traffic was heavier

from Argentina to Bolivia than in the other direction. Bolivians have been buying supplies, cereals, and durable goods in Argentina since the economic collapse of December of 2001, where the Argentine peso ratio to the Bolivian peso went from 1 to 8 to 1 to 3. Little material that would pose a significant level of risk to aviculture appears to be carried across the border into Argentina.

The two control points in Salta have scanners for organic material (shared between SENASA and customs). The scanners are used during heavy traffic; otherwise, the custom officers inspect the bags manually. La Quiaca in Jujuy did not have a scanner, and all inspections were done by customs officers and SENASA technicians.

All interceptions were confiscated, immediately sprayed with methylene blue or a similar solution to denature them, and later incinerated. Records of interceptions for two years were available at the local offices (older records were filed at regional offices). Records were consistent. The types of items confiscated depended strongly on the season (flowers around All Saints Day, honeycombs from wild bees during the spring, or rainy season, fresh seasonal produce). Most of the items were food for personal consumption. SENASA technicians mentioned that local people seemed indifferent to the fact that their food supplies were confiscated over and over again. The people kept carrying them, fairly openly, all the way to the control points. The authorities mentioned that they had abandoned the option of telling the carrier to turn back and leave the intercepted items at home because the carrier would just give the items to someone else who, in turn, would try to cross the border with them.

There were two events of interceptions in La Quiaca (over a period of the last two years) listed as "birds" on the official interception records. It turned out to be small amounts (less than 3 or 4 pounds total) of chicken. Some smuggled items intercepted by Gendarmeria included eggs (people carrying 8-12 dozens on foot) that were intended for local sale. There were no interceptions of live birds for any of the three crossing points on record, or any other live animals. Illegal crossing is actually quite common and easy, although the local officials were confident that most of the smuggling was under control.

After the border checkpoint there are several more control points manned by Gendarmeria, many of them with SENASA presence since the last FMD outbreak. These extra checkpoints may act as a safety net along the porous borders to prevent incursions of illegal substances that slipped through the border points. At each checkpoint the vehicles are stopped. Passenger buses are subject to a cargo area inspection. The passengers have to walk through the control point and board the bus at the other side, after it has been inspected. There are no international bus lines; all vehicles depart from the Argentine side. Newer, air-conditioned units have reduced the chance of local people carrying small live animals with them since the bus drivers will not allow animals to board. The newer units are those with longer routes while the local buses are still old.

There are three control points after leaving Salvador Mazza, two after Aguas Blancas (one in common with Mazza) and two after La Quiaca (these two in Jujuy do not have SENASA technicians since the emergency area set up during the FMD outbreak was in Salta; only the one in La Quiaca had SENASA personnel). All the border checkpoints had two sprayers to treat the

vehicles, one with an iodine solution (10%) and the second one with a pyrethroid (the latter to prevent cotton boll weevil entry). Four of the checkpoints in Salta also had a high pressure sprayer to wash trucks during the initial stages of the sanitary emergency and sanitary carpets with sodium carbonate (the sanitary carpets had since been removed).

All three border posts have only one road (route 34 from Salvador Mazza, route 50 from Aguas Blancas and route 9 from La Quiaca) with no alternative roads that move inland. The control points are hard to avoid, unless the interested party has a well equipped 4X4, which is unlikely for petty smuggling. Local roads were in acceptable condition, but not enough to allow egg transport in the cargo space of a bus or small truck. SENASA technicians at these checkpoints had records of animal movement at the post and records of confiscation at the regional offices (two records due to lack of documentation). All records were for cattle movement, there were no bird movements on record.

Border with Chile: As previously mentioned, Argentina is separated from most of Chile by the Andes Mountains. In addition, Argentina is working with Chile on joint surveillance and wants to implement a satellite surveillance system of people movement across the border (i.e. monitoring transport of prohibited materials/animals by people crossing the border). The responsibility includes aspects of disease prevention and animal movement. Much of the movement control focus is directed toward FMD. In this regard, since the OIE recognizes Chile as FMD-free without vaccination, SENASA does not consider Chile as a high risk region.

Border with Bolivia: The border along Bolivia basically has few geographic barriers. Rivers can be crossed easily, and there are large stretches of open, dry land. Many informal border crossings are present also. [20] SENASA considers Argentina's border with Bolivia to be a high risk region and has several layers of movement control posts to prevent incursions of illegal substances and to prevent spread of exotic diseases and pests. However, smuggling does occur and is a concern in that region.

Border with Paraguay: The border with Paraguay has some geographic barriers, but there are some areas that have none. SENASA considers Argentina's border with Paraguay to be a relatively high risk region. SENASA is addressing operational issues with Paraguay to address the risk, and SENASA reports that there has been significant progress made in the last year. One approach is through a shared epidemiological surveillance program. There is a 35 km section of the border in which all premises have been identified. Officials in Misiones indicated that there was a designated veterinary contact in Paraguay with whom issues of mutual concern could be raised. [16] The last END outbreak reported by Paraguay to the OIE was in 1997, so END may not constitute a significant risk. [31]

One of the main border areas of concern with Paraguay is Formosa. The port of Clorinda is a major crossing which presents a perceived FMD risk. Several new posts have been established in this area to address FMD risk, and the movement controls are strict.

Border with Uruguay: The border with Uruguay runs along the Uruguay and De la Plata Rivers which are effective geographic barriers. There are three land border posts and one

nautical border post along the Uruguay River. Since Argentina recognizes Uruguay as END-free, it considers the region along this border as low risk. Relevant to this, the last time Uruguay reported an END outbreak to the OIE was in 1984.

Border with Brazil: As previously mentioned, most of the poultry meat enters Argentina through land ports from Brazil. [7, 8] SENASA officials indicated that there was contact with veterinary officials in Brazil when issues of mutual concern arose. The regional supervisor did have a list of contact numbers for his veterinary counterparts in Brazil for informal contact. As an example, officials in Misiones stated that they had informed Brazil of receipt of information about an illegal shipment of material planned to move from Argentina to Brazil. [16] There is also a regular meeting between the gendarmeria of both countries but not a similar meeting of SENASA and the Brazilian counterpart.

Boat crossings: Some of the boat crossings do not have permanent SENASA staff. However they are staffed by customs officials and land forces, as required by Argentine law. The primary focus of these inspections is drugs and other contraband, but inspectors also look for prohibited plant and animal substances. The nautical component of the gendarmeria patrols the rivers.

Record-keeping

Records of imports and exports were reviewed at Aeroparque and Ezeiza airports and at the Iguazú, Misiones border crossing. [16] The records show individual shipments by type of product, origin, airline flight number if by plane or shipper if by truck, amount in kilograms, date, and inspector.

At Misiones, a photocopy of all documentation is kept for one year if there are no problems and for five years if there are problems or if products are confiscated for any reason. The information from these documents is transferred to a computer the day after the data are gathered. Almost all information is captured and kept in electronic format indefinitely, but the actual paperwork is kept only for one year. Summary reports may be generated as necessary. [7, 8] The records appear quite complete and the information is maintained on file.

Illegal traffic

The extent of illegal traffic from adjacent countries is heavily influenced by financial considerations like the exchange rate. In this regard, when poultry and poultry products were more expensive in Argentina than in Brazil or Paraguay, illegal movement into Argentina was common. Under the economic conditions existing in 2003, however, the currencies are generally equivalent, and the amount of illegal traffic coming across the bridge was considered to be very small. [16] There were no commercial crossings of animal products in the year 2002 at Iguazú.

SENASA officials believe that there is little smuggling through the Iguazú checkpoint. If smuggling does occur, SENASA officials stated that illegal shipments are likely to be for local use and consumption. [16] SENASA made similar claims about the border crossings on the

Bolivian border. [20] SENASA may obtain information regarding illegal material from outside sources. For example, SENASA has received assistance in identifying illegal birds from a provincial veterinary service in Iguazú that is independent from SENASA.

SENASA described the events associated with an illegal entry into the Misiones area of 160 canaries that had been identified approximately 18-20 months prior to the site visit. The birds were sacrificed in accordance with SENASA policy on illegal entries. The incident was related to the public. The subsequent public outcry was so great that SENASA discarded the policy of stamping out in certain situations. In this regard, officials later discovered another 160 parakeets without legal papers. Judging by the numbers, SENASA hypothesized that these birds were intended for sale in Posadas, which has a population of 250,000, and the population of Misiones was considered too small to absorb that number of birds. In this instance, SENASA quarantined the birds and took cloacal swabs for testing. The birds were diagnosed as clean and released in a park.

In a separate event, neighbors of a hatchery that had been out of production notified SENASA that the facility had become active. Officials went to the facility to look into the reports but were refused entry. The facility was quarantined by a guard at the entrance who prohibited movement to and from the property until a Federal judge issued a warrant. SENASA found several stages of hatching eggs without appropriate documentation. The premises was depopulated and subjected to cleaning and disinfection. The resulting material was rendered. [16]

Training of personnel

SENASA personnel conduct training of security and other forces working on border security. At the time of the site visit, the training program was not standardized or structured. However, there is a border procedures manual (*Manuales de Procedimientos de Frontera)* [13] that is applicable at a national level for all types of border crossings. [3] The manual includes descriptions of the following:

- The legal framework
- The national and international zoosanitary status
- A glossary of terms
- The list of officials that are authorized to sign the international certificates and a list of authorized border control posts throughout the country
- An epidemiological characterization of the Border Posts (in the process of implementation)
- Import and export procedures

In addition to the procedures manual SENASA has a product manual that lists products allowed to enter the country (Resolutions 295/99 and 299/99 list approved plant and animal products). The policies and guidelines in these documents are applicable at a national level and define a standardized approach for border personnel.

Laboratory personnel and field officers did not appear to have much opportunity for continuing education courses.

Conclusions

Argentina appears to have adequate controls at ports of entry for legal commercial importation of live birds and poultry products. It also has the legal framework, proper coverage of borders and adequate staffing to monitor the influx of animals and products via foot or passenger traffic from adjacent areas of higher risk. Areas along the borders with Bolivia, Paraguay and Brazil may pose a sanitary risk due to the lack of effective natural barriers to restrict the flow of potential END-infected animals or animal products; however, it appears that Argentina has added increased biosecurity in those areas where local traffic can cross the borders easily. APHIS considers the movement controls and biosecurity as sufficient to mitigate the risk of introducing END into Argentina.

Livestock demographics and marketing practices in the region

Poultry production is the second largest livestock industry in Argentina. Most of the poultry in Argentina is located in the Buenos Aires and Entre Ríos provinces. Census information indicates that Argentina has a population of 96,225,000 birds. There are 43 nationally-approved slaughter plants and approximately 10 non-approved slaughter plants. [2] There are no facilities certified for export of fresh poultry meat to the United States. Census data are taken from the *Registro Nacional Sanitario de Productores Agropecuarios* (RENSPA), the National Livestock Census (INDEC) and information gathered from the poultry industry.

Farms and properties with birds are registered with the following classifications: [1]

1. Commercial Production Farms
    - Reproduction farms
    - Broilers
    - Hatcheries
    - Layers
    - Other commercial bird farms (e.g. turkeys, pheasants, quail, etc.)
    - Farms of organically-raised chickens
2. Premises with birds
    - House birds kept mainly for consumption of meat or eggs by families
    - Purebred birds that routinely gather at bird shows, including fighting birds.
    - Messenger pigeons
    - Ornamental birds (e.g. turkeys, non-edible pheasants, other birds, parrots and zoological birds)
    - Field birds which are produced semi-intensively for self-consumption by owners

The following is the distribution of commercial bird populations per province: [1]

- Entre Ríos (46%)
- Buenos Aires (44%)
- Córdoba (approximately 3%)

- Santa Fe (approximately 3%)
- Rest of the country (approximately 4%)

The following is the number of birds per type of production: [2]

- Commercial broilers 70,000,000
- Heavy breeding flocks 3,300,000
- High yielding hens 18,000,000
- Light breeding flocks 500,000
- High yielding stocking hen 4,300,000
- Turkeys 125,000

Most of the commercial farms have a vertical integration system where breeding flocks, incubating farms, broilers, feed mills, slaughter plants and the diagnostic laboratory are all under the same company name.

Commercial broiler production farms have an average of 4 to 5 barns, each with a bird population density of 10-12/m^2. Within the same farm, birds are the same age so that the farm is emptied when birds are sent to slaughter (all in, all out). The broiler farms that were seen during the site visit were structured in a similar manner with typical management standards. According to the June 2003 submission [2], breeding operations have a nucleus of 2 or 3 barns on a farm with 4 or 5 females per male and per m^2. The birds are the same age in the nucleus. The parent breeding farm visited in Entre Ríos was a little larger with 4 production units on the same farm and had a higher female to male ratio. [16]

Poultry slaughterhouses in Argentina are national or provincial. Argentina does not have municipal slaughterhouses for poultry. [16] Products produced in provincial slaughter facilities cannot cross provincial lines. Argentina meets the requirements for export of poultry and poultry products to the EU. Requirements for poultry slaughtered for export are listed in SENASA Resolution N° 969/97. [2]

Biosecurity procedures for exported products are defined in Resolution 969/97. These are designed to ensure compliance with standards required for export to the European Union. Aspects of this include:

- Poultry exported must come directly from commercial farms that are responsible for complying with strict sanitary and vaccination rules and with chemical or drug withdrawal protocols.
- Poultry farms producing birds for export must be registered at the National Sanitary Registry of Ag-producers, the Exporter Poultry Farms Registry and a Breeder Registry.
- Poultry farms registered for export must be inspected by a veterinarian of the National Bureau of Animal Health periodically, or by personnel appointed by him.
- Poultry transported to slaughterhouses for export must be properly identified and accompanied by the proper health and movement certificates.

- Poultry farms registered for export that also have breeders or hatcheries must have these production units recorded in the National Program to Control and Eradicate Avian Mycoplasmosis.
- The National Bureau of Agri-food Inspection will maintain a current list of slaughterhouses approved for slaughter and export to the EU and make it available to the National Bureau of Animal Health.

Biosecurity at commercial facilities is not controlled by SENASA. However, it is in the interests of the commercial operations to maintain secure facilities. SENASA does have legislation addressing standards of biosecurity and hygiene for avian establishments (Resolution 614/97), such as disinfection procedures, personnel movements, incineration and minimal distance from other farms; however, it is not clear how these measures are enforced. There appears to be good compliance with sanitary guidelines. All the facilities visited during the site visit have vehicle wash stations where vehicles are cleaned before entering and leaving the premises. [16] Personnel also practice good hygiene. One parent breeding farm has a down time period in the barns of 6 weeks, while the broiler farms have a 3-week period of the same. Dead birds are either incinerated or composted. Employees are not allowed to own birds, and their homes are inspected occasionally for signs of birds. [16]

As previously mentioned, vehicles transporting poultry must be cleaned and disinfected at facilities registered and inspected by SENASA. Trucks must be cleaned and disinfected before a movement permit is allowed. Large commercial units routinely have their own washing facilities that are approved by SENASA. In addition, slaughterhouses commonly have washers. Drivers can have the truck cleaned before leaving. This facilitates compliance with the regulation that prohibits the presence of dirty trucks on the highway.

Live bird markets may constitute a place where infected birds could mingle and spread disease. However, SENASA indicated that Argentina does not have markets in which live birds are traded for consumption. [1, 2, 16, 20] Rural markets are exposition fairs where poultry producers meet to show, and possibly sell, their pure-bred breeders. These expositions are rare and only occur in certain regions of the country. Local SENASA officials must be notified when these expositions are held, and sanitary controls for all the animals must be in place.

Small, non-commercial farms purchase day-old chicks in bird shops or livestock supply stores that are inspected by veterinarians of pertinent districts. Small numbers of birds are also purchased at hatcheries of commercial poultry breeding farms. Movement of live birds from these small farms to other provinces requires a DTA.

Backyard and non-commercial flocks usually are for consumption by the owner only. These owners generally raise their own birds and don't sell them. Uncaged birds do not tend to live if they wander far off the farm because a predator bird (carancho) is likely to eat them. [16, 20]

Conclusions

Large commercial poultry operations and export-approved slaughter facilities are likely to be the source of poultry and poultry products exported to the United States from Argentina. The poultry industry in Argentina appears to be well-organized and committed to the production of quality product. Sufficient biosecurity measures and controls at major production facilities should be effective in the prevention of END outbreaks. There appears to be high awareness and compliance with these measures. Processing facilities are under adequate official control and inspection. APHIS did not identify significant risk pathways to consider commercial poultry operations as a likely source for introducing END into the United States.

The type and extent of disease surveillance in the region

Poultry Surveillance

Argentina has two types of poultry surveillance, passive and active. Resolution 683/96 principally deals with passive surveillance, but not exclusively, and sets forth the standards and procedures for controlling END. This resolution mainly discusses steps to take in case of an outbreak and sampling techniques and tests to perform for confirmation.

An active surveillance program has been developed by the National Bureau of Animal Health to systematically survey the bird population in Argentina for the purpose of detecting cases of infected birds without clinical signs. The program is outlined in the June 2003 submission [2] and consists of permanent sampling of commercial production birds, backyard or non-commercial production birds, messenger pigeons and wild birds. Samples are taken to test for viral activity via virus isolation techniques or for END-specific antibodies by HI. The HI test was conducted to estimate the level of immunity in vaccinated commercial birds. This program is evaluated yearly and modifications to the plan are based on an annual risk assessment, on test results obtained from the year before and the practicalities of testing (e.g. costs, personnel availability, etc.). For example, after taking almost 50,000 samples from commercial production farms between 1996 and 1998 and almost 18,000 samples between 1999 and 2000, with negative results, SENASA concluded that its efforts should be focused on controlling the levels of vaccine protection in commercial birds and to concentrate on non-commercial birds for possible viral activity. In 2001 and 2002, surveillance has been targeted principally to non-commercial bird flocks in provinces that border Brazil and Paraguay. [2]

Surveillance sampling from 1996 to 2000 targeted commercial production flocks to detect any possible Newcastle viral activity. A large number of cloacal and tracheal samples were taken for virus isolation. All samples were either negative or were positive with the vaccine strains of the Newcastle virus. [2, 5] No END virus was detected.

In 2001, sampling of commercial flocks was performed at slaughter facilities to measure levels of vaccine protection. Also, non-commercial flocks from rural markets and exhibitions in the provinces of Buenos Aires, Córdoba, Entre Ríos and Santa Fe were sampled for virus isolation. All samples were negative for the END virus. Two samples were positive for vaccine strains of the Newcastle virus. [2, 3] SENASA commented that samples taken in 2001 were mainly from

the four provinces above because that is where the country's commercial poultry facilities are concentrated and, thus, considered higher risk areas.

In the 2002 – 2004 active surveillance program, there are two target populations: [2]

Population 1 - Non-commercial bird flocks

1. wild
2. zoo
3. backyard
4. imported

Population 2 – Commercial bird flocks

1. breeding grandmother and parent, heavy and light
2. high-yielding hens
3. commercial broilers

Criteria used in the sampling design are as follows:

Target Population 1

Non-commercial (backyard or farm) birds: The epidemiological unit of sampling is (1) the jurisdiction or (2) towns in a jurisdiction associated with a single SENASA local office or the rural exhibition. These birds live in small population units, having direct or indirect contact with people, no type of isolation, high susceptibility to END and usually no vaccination history.

Surveillance samples are collected in two zones. Zone A consists of provinces bordering Paraguay and Brazil. Zone B consists of all other provinces.

This surveillance sampling design assumes a prevalence of 1% and has a confidence level of 95%. It requires that ten samples of cloacal or tracheal swabs from each district are taken if the number of birds in the district is greater than or equal to 10. Of note is that this number is less than the sampling number stated during the site visit, which was 20. The sample size will be reduced to 10 in 2004, which was considered sufficient to meet the criteria defined in the design. Samples from all birds are taken if the number is less than 10. Two batches per local office are taken from Zone A and one batch per local office are taken from Zone B for a total of 497 batches. Viral isolation will be performed on these samples with typing via polymerase chain reaction (PCR) testing.
Wild or ornamental birds: The epidemiological unit of sampling is the zoo or area where wild birds were collected. Samples are submitted by personnel of official agencies, Departments of Wildlife, other non-governmental agencies responsible for controlling and protecting wildlife, or zoo officials. All imported birds are sampled during compulsory quarantine.

Target Population 2

Commercial flocks: Serology is performed using HI testing.

Grandparent and parent breeding flocks: The epidemiological unit of sampling is the nucleus, an isolated unit which usually is comprised of 2 or 3 barns with birds of the same age and type of management and that are attended by a single individual.

Twenty samples per breeding nucleus (15 samples from females, 5 samples from males) are taken. These criteria are for populations of over 1,000 birds with an estimated prevalence of 15% at a confidence level of 95%.

High yielding hens (commercial eggs) and commercial broilers: The epidemiological unit is the batch for slaughter. Samples are taken at the slaughter facilities. Thirty samples per batch are taken once a month throughout the year. These criteria consider flocks of over 10,000 birds with a confidence level of 95% and an assumed prevalence of 10%.

The results of serological sampling of purebred chickens from rural expositions and backyard birds in 2003 (through September 2003) are presented in Tables 1 and 2, respectively. [1]

Table 1. Serology results of END surveillance in purebred birds from rural expositions in the year 2003 (through September 2003)

Type of bird	Origin	Number of serum samples	Negative results	Positive by HI test
Purebred chickens	Palermo	131	117	14 Titers 1:8 to 1:256
Purebred chickens	Tres Arroyos	124	124	0
Purebred chickens	Dorrego	43	43	0
Purebred chickens	Bahía Blanca	61	61	0
Total		359	(96%) 345	(4%) 14

Table 2. Serology results of END surveillance in backyard birds (Province of Entre Ríos) in the year 2003

Type of bird	Origin of the samples	Number of serum samples	Negative results	Positive by HI test
Chickens	Entre Ríos	607	575	32 Titers 1:8 to 1:128
Ducks and Geese	Entre Ríos	21	21	0
Turkeys	Entre Ríos	23	21	2 Titers 1:8
Wild Pigeons	Entre Ríos	10	10	0
Total		661	(95%) 627	(5%) 34

In general, exposition and backyard birds are not vaccinated against END. Ninety-six percent of purebred chickens sampled at expositions and 95% of backyard birds had negative serum titers for the END virus. Those birds that were positive had been vaccinated with the La Sota strain vaccine. Cloacal and tracheal swabs were taken for viral isolation to confirm the identity of the virus strain.

SENASA is in the process of updating and expanding its surveillance and control programs. In this regard, Argentina is developing a program with similarities to the National Poultry Improvement Program in the US. Under this program, to qualify as a parent or grandparent facility, the premises must be certified as free from salmonella and mycoplasma. For this certification, birds must be tested twice, once by a SENASA laboratory and once by a private veterinarian. Active epidemiological surveillance for END and avian influenza is also included in this plan. Flocks must also meet other designated criteria to be designated free. After being certified, flocks must be tested annually. Other viruses may be monitored in commercial flocks at the discretion of the private veterinarian. These requirements were implemented in 2002 in Resolution 882/2002. [2]

Conclusions

APHIS considers Argentina to have sufficient passive and active surveillance programs to detect any END outbreaks or viral presence in domestic poultry flocks. Sampling of non-commercial flocks by SENASA and commercial flocks participating in the National Poultry Improvement Plan will support efforts to detect incursions of END into Argentine aviculture.

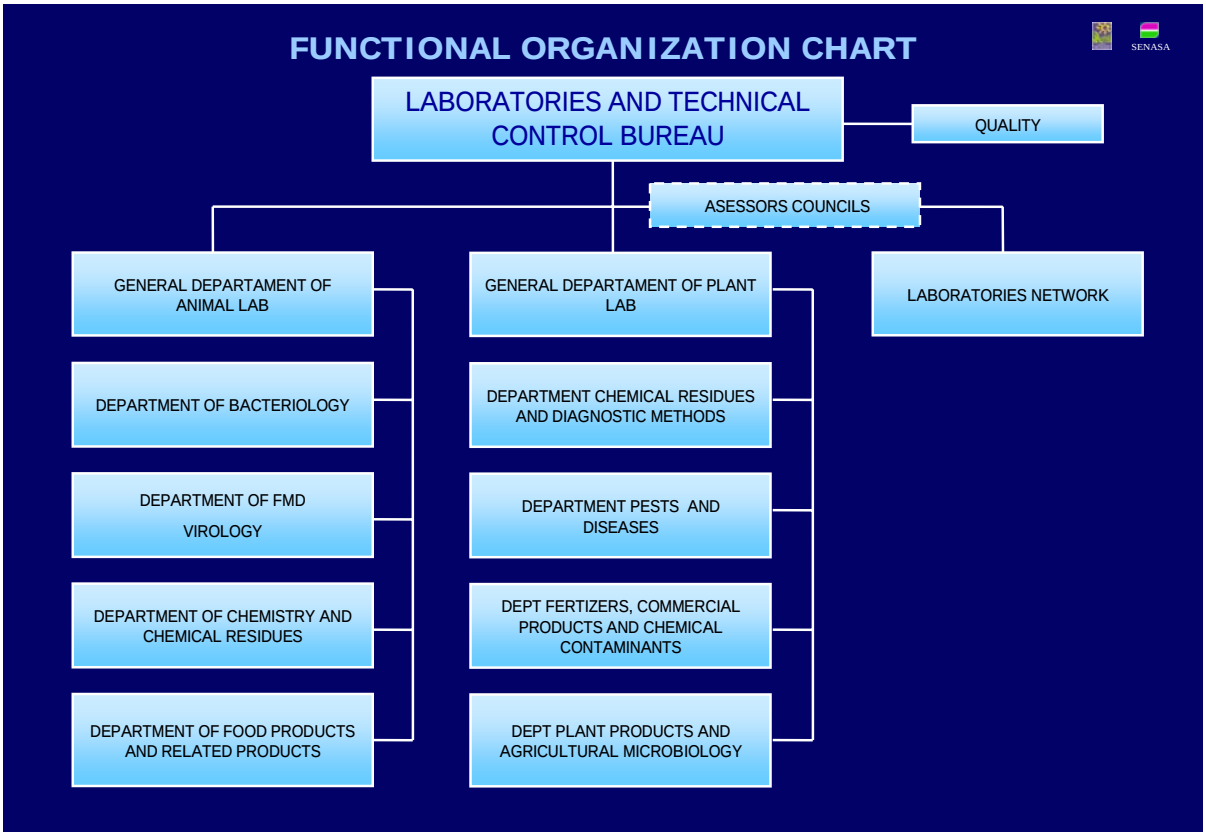
Diagnostic laboratory capacity

Laboratory support for diagnosis of END in Argentina is provided by the central SENASA laboratory in Buenos Aires and is supplemented by five laboratories designated as network laboratories. Three of the network laboratories are located in the Province of Buenos Aires and one in Entre Ríos. Of note is that these are the two Provinces where more than 90% of the commercial poultry is raised. One additional laboratory, the National Farming Technology Institute (INTA), provides technical services to SENASA for sequencing isolates of avian

paramyxovirus type-1 (APMV-1) and is involved in testing wild birds for presence of Newcastle disease virus and avian influenza virus. The SENASA laboratory does not perform routine diagnostic tests but is responsible for developing official testing protocols for the network laboratories. However, the central SENASA laboratory does conduct official tests of suspect END cases and conducts virus characterization studies on suspect isolates from the network laboratories. The laboratory also evaluates serological monitoring conducted by the network laboratories and oversees the use of avian vaccines. [16] The central SENASA laboratory is the only laboratory that can officially confirm a diagnosis of END. [2]

The central SENASA laboratory is divided into 10 departments, five of which deal with animal diagnostics and five with plant issues. The five departments for animal diagnostics include laboratory animals, bacteriology, virology, chemistry, and food safety. A total of 30 people (12 professional, 5 technical, 12 administrative people and 1 support person) work in the diagnostic laboratory; three are assigned to the avian section. All three persons in the avian section are veterinarians.

Figure 4. Functional Organization Chart of SENASA Laboratory



The central SENASA laboratory is in the final stages of a $3 million renovation and new construction project that has given the laboratory a pleasant appearance and seems to be functioning well. The laboratory is operated as a BSL-2 (bio-safety level 2) facility, with the avian diagnostic laboratory occupying three small rooms within the main laboratory complex. One of the avian rooms is equipped to perform virus isolation procedures using embryonating chicken eggs, another to perform serologic procedures such as the HI test for Newcastle disease, and the third serving as an office where laboratory records are stored and data is entered into the laboratory information management system. A laboratory coat is required to enter the laboratory work areas. A separate BSL-3 (bio-safety level 3) facility is available to conduct chicken inoculation experiments. The BSL-3 facility is located in the basement of the building near the FMD diagnostic laboratory.

The laboratory is working toward accreditation by the Argentine Accreditation Organization (Organismo Argentino de Acreditación – OAA) under ISO 17025 standards. It has made significant progress toward that goal. SENASA expects the food safety department to be accredited by October 2003 with other departments targeted for accreditation in 2004. Protocols were available for review and documentation of equipment calibration was clearly visible to site

team members visiting the facility. Training of laboratory and field personnel appeared to be sporadic, although the personnel assigned to the avian section were technically proficient and knowledgeable about END. It was not determined if laboratory personnel had practical experience with END in the laboratory or whether historical isolates are available for training. All three veterinarians working in the laboratory have been hired since the last report of END in 1987. However, virulent Newcastle disease virus had been isolated from feral pigeons (presumed to be pigeon paramyxovirus type-1) in recent years, suggesting that some personnel had worked with virulent virus.

The laboratory had an impressive bar coding system to track samples. The system was designed so that samples submitted for routine serologic testing could be tested blindly without the technician knowing the origin or owner of the samples. This eliminates any bias in reporting results. Samples arriving at the laboratory are opened and the sample identification is compared with the accompanying paperwork to verify accuracy and document sample quality. If discrepancies are discovered the submitting veterinarian is immediately notified and additional samples requested. Individual samples are then labeled with a bar code sticker before being sent to the appropriate laboratory for testing.

The laboratory network system in Argentina was developed in 1997 to supplement the central SENASA laboratory. The five laboratories were authorized to conduct virus isolation for END to meet export requirements to the EU. Testing to qualify exports to the EU was stopped in March, 2000 as it was no longer required. Each of the network laboratories is inspected and must pass an annual proficiency test (virus isolation) consisting of 4 samples, some of which are positive and some negative for APMV-1. Currently, the five network laboratories are suspended from official testing until they become accredited under ISO 17025 standards, which is supposed to occur by the end of the year 2003. The central SENASA laboratory can handle the present level of testing, but if an emergency situation arose, the network laboratories could be called in to help with any additional testing load.

The Coordinating Department of Quarantine, Borders and Certifications sends import/export samples to the laboratory in a period of between 1 and 3 days after the birds arrive. The diagnostic process varies from 15 to 20 days. Samples are processed and kept in liquid nitrogen at –70 ºC until they can go through the diagnostic procedures as the work load allows. [2]

The number of laboratory tests performed for virus isolation and serology from 1999 through 2003 are presented in Tables 3 and 4, respectively.

Table 3. Number of samples tested and isolations of APMV-1 by year and laboratory performing the test

Year	Origin of Samples	No. Samples	Total Samples	Isolations
1999	SENASA	1,357	15,567	3 isolates from wild birds – lentogenic by PCR
	Wild birds	830		
	Network (EU)	13,380		4 isolates from feral pigeons – 2 lentogenic, 2 virulent by ICPI/PCR
2000	SENASA	1,343	2,551	1 lentogenic strain from chickens (ICPI=0.1)
	INTA-wild birds	128		
	Network (EU)	1,080		1 lentogenic strain from turkey (ICPI=0.1)
2001	SENASA	470	614	2 isolates from wild birds – lentogenic by PCR
	Wild birds	144		
2002	SENASA	1,549	1,585	2 isolates from feral pigeons – virulent by PCR
	Wild birds	36		
2003	SENASA	632	637	1 isolate from feral pigeons – virulent by PCR
	Wild birds	5		

Table 4. Number of serums tested in 2002-2003 for antibodies to APMV-1 by the HI test

Origin	Number of Samples
Exposition birds	1,039
Ducks/slaughter	510
Broilers/slaughter	10,926
Breeders	1,694
Backyard birds	70
Wild birds	328
TOTAL	1,4587

The virulent strains identified (Table 3) were found only in feral pigeons. In 1999, these cases were reported to the OIE. [31]

Isolations of APMV-1 from domestic sources are sent to the central SENASA laboratory for confirmation. Intracranial pathogenicity index tests in day-old chicks are performed by SENASA but the molecular pathotyping is sent to the National Farming Technology Institute laboratory, which is located about 1 ½ hr drive from the central laboratory. Funding for the INTA laboratory is separate from funding for the SENASA laboratory. INTA provides services for the SENASA laboratory but is administered separately. The site visit team expressed concern about INTA's response to testing priority samples for SENASA, but team members were assured that INTA was committed to be responsive to SENASA.

The site visit team also raised questions about the ability of the laboratory to meet the demands necessary if an outbreak of END occurred. SENASA assured the team that the operative capacity can be increased if needed by hiring qualified and trained temporary personnel and to assign testing to Network labs that have updated their facilities, equipment, and personnel according to the established Standards of Quality and Biosecurity (possibly ISO 17025 standards). SENASA plans on re-instating the Network under the new accreditation standards by the end of 2003. Also, SENASA reiterated that it had the cooperation of the National University, the national poultry industry organizations and chambers, and the veterinary specialists' associations to assist in an outbreak. The Central laboratory expects to implement molecular techniques in its network laboratories in the future. [1]

The quality assurance program consists of annual testing of two vaccine strains (B1 and La Sota as positive and negative controls) in SPF susceptible embryos. Sensitivity of the isolation technique in embryos is 90%; specificity is 98%. Sensitivity of HI test is 98% and specificity is 90%. [16]

The projected increase in testing of backyard flocks throughout Argentina was not implemented in 2002 because FMD was detected in Argentina. Resources were redirected to deal with the FMD outbreak. However, when questioned about meeting the expectations for sampling in 2003, SENASA thought it could meet the predicted level of testing.

Conclusions

APHIS considers Argentina to have the diagnostic capabilities to adequately test samples for the presence of the END virus. In this regard, quality control activities within the laboratories are sufficient, laboratory equipment is routinely monitored and calibrated, sufficient staff is available, and there is an efficient and effective recordkeeping system for storage and retrieval of data.

Policies and infrastructure for animal disease control in the region

Elements of the disease control program are provided in the *Procedures Manual for Newcastle Disease*. [2]

According to the law, any citizen is required to report disease. If disease is not reported, indemnity is not paid. If a premises has been identified to SENASA officials as potentially

containing illegal material, SENASA can inspect the premises to confirm the report. SENASA has the authority to set up an immediate quarantine, but it does not have the authority to enter the premises without permission of the owner. If the owner does not allow SENASA personnel to enter the premises, SENASA can quarantine the premises by posting a guard at the gate and prohibiting traffic to and from the premises. SENASA can then request an order from a judge, at which point SENASA can, with the assistance of the gendarmeria, enter the premises and take appropriate action, such as depopulating.

Conclusions

Argentina has the infrastructure and legal authority to declare an emergency and take appropriate action in case of an END outbreak. The country has a disease control program that is in written form in the *Procedures Manual for Newcastle Disease*. The manual sets forth operating standards and is legally authorized by SENASA Resolution N° 683/96.

Risk Factors and Mitigations

Likelihood of END introduction into Argentina

Risk Factor

1. Legal importation of birds (poultry or others) or poultry products is a potential source of disease that could introduce END into Argentina. Of all the neighboring countries surrounding Argentina, only Chile is considered END-free by APHIS. Argentina does import poultry meat from neighboring countries where there have been reports of END outbreaks in recent years. Therefore, APHIS considers that there is an ongoing risk of introduction of the END virus from adjacent areas into Argentina.

   Discussion: Argentina appears to have adequate controls at ports of entry for legal commercial importation of live birds and poultry products. They also have the legal framework, proper coverage of borders and adequate staffing to monitor the influx of animals and products via foot or passenger traffic from adjacent areas of higher risk. Poultry imports that aren't tested for END virus must come from END-free countries or regions as recognized by Argentina. All other poultry imports are tested for the presence of the END virus. Imports of commercial hybrids (one-day-old birds and hatching eggs for incubation), broilers for fattening and/or commercial laying hens are banned, and only importation of one-day-old breeding birds of grandparent or parent lines is authorized. All live non-commercial and ornamental birds must be quarantined in approved facilities and tested for END and other diseases.

   Since Argentina may have less stringent requirements for poultry, poultry meat, and other poultry product imports than the U.S. and to ensure that SENASA continues to implement the appropriate measures that have been documented to APHIS, APHIS proposes that live poultry, poultry meat, and other poultry products be accompanied by an additional certification by a full-time salaried veterinary officer of the Government of

Argentina. The certification must be presented upon arrival to an authorized inspector at the port of arrival in the United States. The following certification statements, consistent with those stated in the 9 CFR 94.25 for certain Mexican states (Federal Register Vol. 69, No. 17; Jan 27, 2004), should be included:

1. the poultry have not lived in a region where END is considered to exist.
2. the poultry have not been in contact with poultry or poultry products from any region where END is considered to exist.
3. poultry meat or other poultry products have not been in contact with poultry meat or other poultry products from any region where END is considered to exist.
4. poultry, poultry meat or other poultry products have not transited through a region where END is considered to exist unless moved directly through the region in a sealed means of conveyance with the seal intact upon arrival at the point of destination.
5. poultry meat or other poultry products are derived from poultry that meet all requirements of this section and that have been slaughtered in a region designated in 9 CFR 94.6 as free of END at a federally inspected slaughter plant that is under the direct supervision of a full-time salaried veterinarian of the Government of Argentina and that is approved to export poultry meat and other poultry products to the United States in accordance with 9 CFR 381.196.
6. if processed, the poultry meat or other poultry products are processed in a region designated in 9 CFR 94.6 as free of END in a federally-inspected processing plant that is under the direct supervision of a full-time salaried veterinarian of the Government of Argentina.

Per the OIE *Terrestrial Animal Health Code*, exposure or consequence assessments need not be conducted if the release assessment indicates no significant risk. However, APHIS has continued this analysis through the exposure and consequence assessments in the interest of completeness.

Exposure assessment

This exposure assessment is based in large part on an analysis of historical information regarding END outbreaks in the United States, particularly outbreaks that occurred in 2002 and 2003 in several western States. Earlier outbreaks were also examined to the extent that relevant information was available. In this regard, we consider data reflecting real events occurring during outbreaks in the United States to be the most legitimate model for this exposure assessment. Historical information provides valuable insight into the past and potential pathways of entry, exposure, and mechanisms of disease spread in the United States. This exposure assessment therefore uses such historical information to prioritize potential risk pathways for END introduction and spread.

Pathways of END introduction and spread

Historical information from END outbreaks in the United States is presented here in order to identify the most likely pathways of disease introduction, as well as risk factors influencing the

spread of END once introduced. Possibilities for mitigation of identified risk factors are also considered. The historical information is further used to provide a basis for the economic section of the consequence analysis, which is based on the actual costs incurred during at least some of these outbreaks.

Pathways of introduction

The United States has experienced multiple END outbreaks over the last 50 years (Table 5). [22-24, 32, 33] Of note is the fact that disease was most likely introduced through live birds in all cases except for one incident in 1973 involving hatching eggs from Hungary. Live birds implicated in END outbreaks entered the United States through either legal or illegal channels. Introductions through legal pathways declined substantially after regulations requiring quarantine of imported live birds in facilities operated or approved by APHIS were implemented in 1972, and were essentially eliminated after the requirements for approval of private quarantine facilities were strengthened in 1979.

The most extensive outbreaks involving commercial poultry occurred in 1971-1973 and 2002-2003. END was introduced into the United States in November 1971 via a shipment of Mexican double yellow-headed parrots from South America to a pet bird importer located in the city of Fontana, California. There were no quarantine requirements for imported birds at the time. Some of the infected birds escaped and exposed the dense population of backyard flocks and commercial poultry flocks in the area to the END virus. The outbreaks subsequently spread to involve most of southern California before containment in 1973.

Table 5. History of END introductions into the United States

Date	Place of Outbreak	Exposure Pathway
1950 (Apr)	Contra Cost County, CA	Chukars and pheasants imported from Hong Kong
1970 (Aug)	Bronx, NY	Quaker parrots from Paraguay
1970 (Aug)	Clint, TX	Domestic chickens
1970 (Sept)	Blackstone, MA	Domestic chickens
1971 (Apr)	Las Cruces, NM; El Paso, TX	Domestic chickens
1971 (Apr)	Largo, FL	Mynah bird from Thailand
1971 (Sept)	Dade County, FL; Sonoma County, CA	Domestic game chickens
1971 (Oct)	Miami, FL	Commercial and game birds
1971 (Nov)	Manchester, CT	Parrot from Paraguay
1971 (Nov)	Fontana, CA	Parrots imported from South America
1971 (Dec)	Puerto Rico	Commercial and game chickens
1972 (Feb)	Chicago, IL	Parrot of unknown origin
1972 (Apr)	Parker, AZ	Game chickens
1972 (Apr)	Atlanta, GA	Parrot from Mexico

1972 (May)	Kingman, AZ	Fancy chickens
1972 (May)	Dade and Broward Counties, FL	Commercial and game chickens
1972 (June)	Los Angeles, CA	Exotic birds from Thailand
1972 (July)	Los Angeles, CA	Exotic birds from Thailand and Columbia
1972 (July)	Denver, CO	Parrot from Mexico
1973 (Jan)	Los Ebanos, TX	Game chickens
1973 (Sept)	Somerset, KY	Hatching eggs from Hungary
1974 (Feb)	El Paso, TX	Domestic and game chickens
1974 (May)	Hidalgo, TX	Domestic chickens
1974 (May)	Bulverde, TX	Parrots from Mexico
1975 (Mar)	Long Island, NY	Pet bird dealer
1975 (June)	Pharr, TX	Domestic chickens
1977 (Feb)	Charlotte Courthouse, VA; San Diego, CA	Pet birds
1977 (July)	Kaneohe, HI	Pet birds
1980	Florida and 22 other States	Pet birds
1991 (April)	Michigan, Indiana, Illinois, Texas	Double yellow-headed Amazon parrots
1992 (Aug)	North Dakota	Migratory cormorants
1998 (May)	Fresno, CA	Game fowl
2002 (Oct)	California, Arizona, Nevada	Game fowl
2003 (April)	El Paso county, Texas	Game fowl

The October 2002 introduction into California game fowl presumably occurred through illegal importation of infected game birds into the United States from Mexico. Phylogenetic analysis indicated that the California END virus was closely related to an END virus isolated in Mexico in early 2000 and was distinct from the strain isolated from a backyard flock in the 1998 California outbreak. The outbreaks in Arizona and Nevada were most likely seeded from the California outbreak, based on the timeline of detection and the strain of virus isolated. Initial spread was significant but the outbreak was contained in all States by September 2003.

Although overlapping chronologically, the 2003 outbreak in Texas is thought to have resulted from a separate introduction of END, possibly through unauthorized movement of game fowl. This hypothesis is based on the observation that the type of virus isolated in Texas differed from that found in the other States, although it was similar to a strain isolated previously in Mexico.

In summary, the majority of introductions of END into the United States are thought to have been associated with live birds, although one was apparently associated with hatching eggs. None of the introductions have been known to be associated with other poultry products, such as meat. Historical experience in the United States therefore suggests that importation of live birds represents a far more likely initial exposure pathway than poultry meat or products. With regard

to this assessment, SENASA has indicated that its primary interest is in the export of poultry meat rather than live birds.

Commodity factors

Commodity factors that are relevant to an exposure assessment include the type and quantity of the commodity to be imported, the intended commodity use, disposition of the products in the region, and waste disposal procedures. [17] The potential amount of poultry meat imported from Argentina is expected to be relatively low.

Although the precise disposition of the imported meat is as yet unknown, it is reasonable to assume that it will enter common wholesale channels for distribution to restaurants, retail markets, and other institutions. Usage patterns and waste disposal procedures would be expected to follow common practices in the United States. In this regard, exposure of domestic poultry populations through waste feeding to backyard flocks or other channels cannot be precluded. However, APHIS considers this to be a far less likely exposure pathway than introduction via live birds, based on historical data.

Pathways of spread

Historical accounts of END outbreaks in the United States also provide significant information regarding likely pathways and extent of disease spread after introduction. In this regard, the 1971-1973 and 2002-2003 outbreaks are examined here in greater detail.

As mentioned above, END was introduced into the United States in November 1971 via a shipment of Mexican double yellow-headed parrots from South America, some of which subsequently escaped and exposed domestic flocks. Once the disease was introduced into commercial poultry, it spread rapidly by various means throughout southern California. The disease threatened not only the California poultry industry but the entire U.S. poultry and egg supply.

The 2002 introduction of END into California is thought to have occurred through illegal importation of game fowl. The outbreak was initially limited primarily to backyard flocks, which were defined as flocks raised in small numbers on private premises for hobby, exhibition and personal consumption in a predominantly immigrant community. [32-34] The types of birds involved included game fowl, pet birds, ostriches, and waterfowl. However, the outbreak ultimately spread from backyard flocks to commercial facilities for laying hens as well.

The California outbreak also spread to Arizona and Nevada, most likely through unauthorized movement of infected game fowl. In both States, the primary facilities involved were backyard flocks of game fowl or poultry. No commercial poultry were affected in either State, possibly due to a lack of interaction between backyard flocks and the small number of commercial facilities in the area. Similarly, there was no significant spread as a result of the 2003 outbreak in a backyard flock of game fowl in Texas, and no commercial facilities were affected.

The epidemiological investigations of both the 1971-1973 and the 2002-2003 END outbreaks identified four primary pathways of disease spread: (1) movement of infected birds, (2) movement of infected products (eggs), (3) movement of contaminated equipment, and (4) movement of people. In the 1971-1973 outbreak, there was strong epidemiological evidence that an organized effort to vaccinate all birds in southern California contributed as much to disease spread as any other factor. This occurred as personnel who were untrained in disease prevention methods traveled rapidly between premises, often carrying the virus with them and exposing other premises in the area.

In the 2002-2003 outbreak, strict biosecurity measures were implemented so that task force personnel would not act as vectors for disease spread. In addition, vaccination was not a component of the control and eradication plan. Despite extensive outreach and public education efforts, movement of birds and eggs, equipment sharing among farms, and employee contact with off-farm poultry were subsequently identified as significant factors in disease spread. The extent of the outbreak was further influenced by proximity of neighboring infected backyard flocks and the presence of a commercial poultry industry in the area. A risk factor influencing the likelihood of exposure in a backyard flock was having game fowl on a premises with a large flock size. Presence of feral chicken on the premises may also have contributed to disease spread.

In summary, historical experience in the United States indicates that, once END is introduced into a live bird population, the most significant pathways of disease spread involve movement of equipment, birds, products, and people. The extent of disease spread depends in large part on biosecurity practices and the density of susceptible populations. In addition, backyard flocks and non-commercial birds may play an important role in disease introduction and spread.

Risk mitigation measures

Mitigation measures affecting END introduction

As previously discussed, the most likely pathway of END introduction into the United States is through legal or illegal importation of live birds. Several outbreaks prior to 1972 resulted from legal entry of imported pet and game birds. These introductions occurred at a time when the United States had no quarantine requirements in place for birds from END-affected regions, so infected birds were released without a period of observation for clinical signs.

In March 1972, APHIS published a regulation to enhance its import control measures by requiring live birds to be imported under permit through designated ports and subjected to a 30-day quarantine in facilities operated or approved by APHIS (9 CFR 93.106). [21] The quarantine requirement was further strengthened in 1979 by additional requirements for approval of private quarantine facilities. Of note is that legal introduction by infected birds declined significantly after 1972 and has not been documented since the 1979 quarantine requirement was instituted. Although not confirmed, the 1998 exposure was hypothesized to have resulted from illegal entry of an infected bird.

Except for special provisions for birds from Canada and U.S. returning birds gone for less than 60 days, all live birds must go through a quarantine period when they enter the United States. Birds are kept for a minimum of 30 days in a USDA quarantine facility or a private USDA-approved quarantine facility or home quarantine for U.S.-origin birds gone greater than 60 days. Poultry are brought directly to the quarantine facility in a sealed truck. USDA personnel perform inspections and testing of birds in the private facilities. Cloacal swabs are taken from the birds to test for END and highly-pathogenic avian influenza via virus isolation. If the tests are positive, a re-test is performed. The quarantine period may be extended at the discretion of the USDA management. If the birds test negative, they can be released after the end of the quarantine period. If positive, they may be destroyed. The birds are held for a sufficient period of time that exceeds the incubation period of END. The likelihood that infected birds could remain undetected throughout the quarantine process is very low.

APHIS considers the risk of END introduction through legal importation of live birds to be effectively mitigated by the quarantine measures currently in place in the United States. The risk of illegal importation of live birds would logically be highest where land borders are shared. Illegal importation of live birds from Argentina would be technically difficult because of the travel distance between the two countries and inspection procedures at airports and seaports. APHIS therefore considers the likelihood of illegal introduction of live poultry from Argentina to be low.

Detection of END in Argentina prior to exportation of poultry or poultry products is facilitated by the close interaction between SENASA veterinary authorities and producers, and by the effective census, movement control, and ongoing surveillance programs implemented by SENASA. While END virus can be transmitted in poultry meat, APHIS considers the likelihood that disease would be detected clinically in Argentina prior to arrival of the product in the United States to be relatively high. In this regard, although most commercial poultry are vaccinated routinely for END in Argentina, backyard birds are not and, therefore, serve as sentinel animals for detecting END outbreaks in the poultry population.

Mitigation measures affecting END spread

Epidemiological investigations of the U.S. outbreaks have identified several potential and confirmed pathways of disease spread, most notably movement of people, live birds, products, and equipment. [32, 33] However, the U.S. outbreaks varied significantly in the extent of spread. Epidemiological investigations have suggested that the likelihood of spread after END introduction is increased if the following factors are present:

1. A large commercial poultry industry exists in the region.
2. Backyard flock sizes are relatively large.
3. Backyard flocks are commonly present.
4. Feral chickens (or other wildlife that could serve as vectors) exist in the region.
5. Areas of concentration are common and interrelated.
6. Cockfighting is practiced in the region.
7. Reporting of clinical or suspect cases is slow or delayed.

8. Poultry and poultry products can be introduced illegally from affected regions.
9. Biosecurity measures are ineffective.
10. Movement control measures are insufficient.
11. Surveillance is inadequate.

Specific mitigations have been developed in the United States that address some, but not all, of these risk factors. For example, factors 1-5 have not been subjected to direct risk mitigation measures. Specifically, direct measures such as controlled location and size of commercial poultry flocks, prohibition of backyard flocks, eradication/control of feral chickens, and restriction of movement among interrelated areas (e.g., slaughter operations, backyard poultry, live bird markets, high concentrations of commercial poultry) have not been taken.

Rather, mitigation measures have been indirect and have included implementation of biosecurity measures by producers to reduce the probability of contact with infected birds, conduct of public awareness campaigns to facilitate biosecurity and disease reporting, and cleaning and disinfection of vehicles, equipment, and people moving among facilities. Such procedures, which are routine for commercial poultry facilities, are enhanced significantly under outbreak conditions (for examples, see the U.S. END website at http://www.aphis.usda.gov/lpa/issues/enc/exoticnc.html).

In contrast, factors 6-11 have been subjected to direct risk mitigation measures. For example, cockfighting is now banned in most States in the United States. The Animal Welfare Act as modified by the Farm and Security Rural Investment Act of 2002 prohibits, with certain exceptions, sponsorship or exhibition of animal in an animal fighting venture, if the animal was moved in interstate or foreign commerce. APHIS highlighted this law by publication of a Federal Register notice in 2003 (FR vol. 68, no. 91, Monday, May 12, 2003). However, although this may have some risk mitigating effect, it is likely that cockfighting and the associated movement of game birds continues illegally at an unknown level.

Regarding disease reporting, APHIS has maintained the standard practices and requirements in place for reporting suspect cases of disease at the federal level, and taken actions to increase the willingness and awareness of the need to report among the general public. Under outbreak conditions, APHIS cooperates in outreach programs in affected areas to educate the public in order to facilitate disease recognition and reporting, as well as to emphasize appropriate biosecurity measures (for examples, see notices and summaries available at http://www.aphis.usda/gov/lpa/issues/enc/moreinit03.html).

In addition, APHIS plays a major role in implementing movement controls during outbreak periods. Some of these focus on reducing the interaction level in areas of concentration. APHIS also increases its routine surveillance activities during outbreak periods. All of these activities are taken to mitigate the risk of disease spread and represent aspects of the contingency plans APHIS has in place to facilitate allocation of resources to risk areas during outbreak periods.

In summary, epidemiological investigations of past END outbreaks have identified a number of factors that influence the extent of disease spread. Some of these risk factors have been

addressed by direct mitigation measures, whereas other factors (such as the existence of a large commercial poultry industry, the presence of backyard flocks, and interrelated areas of concentration with significant amounts of interchange) have only been addressed indirectly. While the events in 2002 and 2003 demonstrate that these risk mitigation activities do not eliminate disease spread once introduction has occurred, it is highly likely that they mitigate the extent of spread.

Exposure summary

Given the results of the release assessment, APHIS considers the likelihood of introduction of END-infected birds and products from Argentina to be extremely low. Historical experience indicates that the likelihood of END introduction is substantially higher for live birds than for other commodities, including poultry meat. APHIS considers that the quarantine requirements currently in place are sufficient to mitigate the risk posed by legal importation of live birds. The likelihood of illegal importation of live birds is quite low based on travel distance and current inspection practices. Furthermore, a change in the END status of Argentina is unlikely to substantially impact the risk of illegal importation of live birds.

Significant direct and indirect mitigation measures are currently in place in the United States to address the risk of END spread should introduction occur. Major pathways of disease spread include movement of people, birds, products, and equipment; however, the extent of spread is influenced by a number of other factors. Based on current conditions, and depending on the local circumstances, substantial disease spread could occur if END were introduced to a concentrated susceptible population.

Consequence assessment

The *Terrestrial Animal Health Code* recommends that a consequence assessment include an evaluation of the consequences of importing a foreign animal disease with regard to animal and public health, and also consider relevant environmental and economic factors.

Animal health consequences

END is one of the most severe diseases of poultry throughout the world and its consequences in terms of animal health are significant. [25] Morbidity and mortality rates vary according to the strain of virus, but morbidity may approach 100% and mortality may approach 90% in susceptible chickens. Lesions in chickens primarily occur in the brain and respiratory tract. Neurological signs or severe depression are the most common clinical signs. Egg production in infected laying hens drops dramatically, followed within 24-48 hours by high death losses. Ten to fifteen percent of a flock may die within the first 24 hours of an outbreak. The reproductive system of surviving birds may be permanently impaired and egg production may not return to previous levels.

Public health consequences

In contrast to the severe animal health consequences, direct human health consequences of END are minor [25] and END is not considered to be a significant human pathogen. Disease manifestations in humans are limited to conjunctivitis and recovery is usually rapid.

Environmental consequences

Environmental consequences resulting from END introduction occur primarily when there is a need to dispose of large numbers of carcasses due to death from disease or depopulation of flocks. Disposal of large amounts of litter and manure can also be problematic. The environmental consequences in relation to poultry and poultry product imports from Argentina were considered negligible as the proposed action would not result in significant adverse impacts, including no extraordinary circumstances which might affect the significance of any potential impacts and no cumulative impacts with other related projects that might result in significant adverse impacts. This action is excluded under APHIS' National Environmental Policy Act Implementing Procedures. [28]

Economic consequences

This assessment of economic consequences is largely based on historical experience in the United States relative to END outbreaks. In this regard, we consider that economic data from previous outbreaks in the United States provides the most legitimate approximation of consequences of future outbreaks. Although estimates of the costs of foreign animal disease eradication from other countries are available, information from other countries may not be a good model for the United States. This is because other countries have different production practices and approaches to disease eradication and control. [27]

The outbreaks that have occurred in the United States for which economic information is available can be categorized as relatively limited or relatively extensive. This section examines in more detail the 1950 outbreak in California and the 2002-2003 outbreaks in Arizona, Nevada and Texas as examples of relatively limited outbreaks, and the 1971-1973 and 2002-2003 outbreaks in California as examples of relatively extensive outbreaks. The distinction was made to provide comparative information on economic consequences under conditions of extensive and more limited spread. The discussion of economic consequences of relatively limited outbreaks is restricted to control and eradication costs, whereas the discussion of relatively extensive outbreaks is expanded to include effects on trade and indirect effects on the poultry industry in affected areas.

Relatively limited outbreaks (1950 and 2002-2003 in Arizona, Nevada, Texas)

Control and eradication costs

The 1950 END outbreak was limited to five poultry farms in Contra Costa County, California. The infection was quickly eliminated through depopulation of the infected

chickens. The control and eradication efforts cost approximately $30,000 in 1950, which is equivalent to approximately $229,000 in 2003. [22]

The outbreaks in 2002-2003 in Arizona, Nevada and Texas could each be considered representative of a limited outbreak. In this regard, only a single premises was detected in each of the States of Arizona and Texas, and only ten premises were confirmed as infected in Nevada. By September 28, 2003, approximately $3.5 million dollars had been spent toward eradication efforts in Arizona; $6.2 million in Nevada; and $4.2 million in Texas. [35]

Relatively extensive outbreaks (1971-1973, 2002-2003)

Control and eradication costs

The introduction of END into southern California between 1971 and 1973 resulted in a major outbreak. [22] A reported 1,341 infected flocks were identified and 12 million infected and exposed birds were destroyed. Most of these were laying hens. Eradication activities severely disrupted the operations of many producers and increased the prices of poultry and poultry products to consumers.

The eradication effort was coordinated through a State-Federal Newcastle Disease Task Force. Eradication efforts, which continued throughout 1972 and into 1973, cost approximately $56 million. [22-24] This is equivalent to approximately $232 million in 2003. A total of 3,102 personnel participated in the task force between March 14, 1972, and June 30, 1974. An additional 74 individuals participated as "miscellaneous personnel."

Eradication efforts for the 2002-2003 END outbreaks in California, Arizona, Nevada and Texas were also labor intensive and expensive. Spread within the state of California was the most extensive among the four states affected. Ultimately, birds from 920 premises in California tested positive for the disease, and nearly 4 million birds were depopulated in California alone. As of October 28, 2003, approximately $168 million dollars had been spent on the eradication efforts in all four states. [35] The cost estimates in this sum included expenses for long-term goals and measures such as (1) surveillance and diagnosis; (2) euthanasia, carcass disposal, cleaning and disinfection; (3) administrative and logistical costs; (4) compensation or indemnification; and (5) personnel costs. Personnel were recruited from various federal, state, county, and metropolitan agencies to participate in the effort. Approximately 2,780 personnel contributed from the federal sector alone.

Effects of the 2002-2003 END outbreak on trade

The effects of an extensive END outbreak on U.S. trade can be characterized using information from the 2002-2003 outbreak. Immediately following the confirmation of END in the United States in 2002, trading partners imposed trade restrictions on poultry

products that were perceived as posing a risk of exporting END from the United States. Live birds, fresh, frozen or chilled poultry meat, and hatching eggs from the United States were commonly banned. At the peak of the outbreak, 46 countries had imposed restrictions. [27]

Direct trade impacts of END were calculated for the period between October 2002 and September 2003 for five categories of product: live poultry, ducks and geese, poultry meat and offal, hatching eggs, and table eggs. [27] The total estimated value of all poultry restrictions over the roughly 12 months of the END eradication period was $121 million, or 7% of the trade recorded during that period.

This relatively low percent reduction in trade probably reflects the effects of a regionalization approach taken by most countries for imposing restrictions, in which live birds and products were only banned from areas adjacent to affected areas and/or affected areas alone. The effect of regionalization was most likely to reduce the trade consequences at the national level. However, the economic impact at the local level was significant in terms of trade dollars.

The effects of trade restrictions on individual involved States were estimated from February 7, 2003, through September 17, 2003, as follows [27]:

State	$ million
California	34.18
Arizona	2.01
Colorado (unaffected but adjacent to an affected State)	0.69
New Mexico	0.02
Texas	57.12

These estimates do not account for trade shifting or the movement of production within the United States to avoid export restrictions. In this regard, companies operating in multiple States could have shifted production or processing to States on which there were no restrictions. Products that were restricted from one export country could also have been shifted to alternate export markets or sold at new outlets within the United States. It is possible that the true impact of the trade restrictions is significantly less than the calculated values presented. [27]

Larger scale restrictions logically have greater economic consequences. For example, in 2001, which was the last full year before END trade restrictions were imposed, total poultry and poultry product exports were $2.38 billion. In 2002, that total fell to $1.84 billion, an actual decrease of 22%. This decrease was attributed to significant restrictions on poultry exports imposed by Japan and Russia because of avian influenza (AI) controls. Both of these countries restricted exports of poultry and poultry products from the entire United States. In comparison, END restrictions were regionalized to the involved States (and in some cases, contact States like Colorado), so the total impact was relatively minor compared to the AI restrictions.

While the 22% decrease was not necessarily attributable to the END outbreak, it was caused by restrictions placed because of a disease in poultry and therefore represents a potential outcome of an extensive outbreak. Consequently, this value can also be viewed as a maximized consequence estimate with regard to END.

Indirect effects of the 2002-2003 END outbreak on the poultry industry

Since END does not have a significant human health impact and consumers do not raise a significant concern about consuming products from the quarantine zone, the losses from trade restrictions are generally the most significant cost to the U.S. poultry and allied industries. Within southern California in the 2002-2003 outbreak, the cost to the commercial poultry industry was mitigated by indemnity payments for depopulated birds, equipment and inputs. These costs were reflected in the previously reported eradication and control costs to the federal government.

However, the federal government did not indemnify losses to the allied industries that supported poultry production in the area. Affected allied industries included feed mills, egg retailers, replacement hen producers, manure haulers, farmers who used manure for fertilizer, and the trucking concerns that moved feed, manure and eggs in the area.

Potential indirect losses to some of the allied industries in southern California were estimated. [27] The information was gathered from various resources including epidemiological survey information, information gathered from industry experts, and estimates of inputs and outputs for the production of table eggs in southern California. Some of the estimates provide examples of the types of indirect consequences that occur during an outbreak and are described below.

Table eggs

Approximately 52 million table eggs, which normally would have been sold into the local southern California retail market place, were not available because of depopulations. Based on the January-April 2003 average unprocessed table egg price, the value of the 52 million eggs that did not enter the supply chain was $27 million. [27]

Feed impact

During the course of cleaning and disinfection of premises inside the quarantine zone in California, some feed was destroyed because it could not be disinfected and remain safe for feeding. Feed destroyed was valued at $340, 000. [27]

The average amount of feed that would have been needed to produce a dozen table eggs by the 52 million depopulated hens was estimated as approximately 3.7 lbs. Using the number of eggs not produced (as estimated previously), the amount of lost feed sales in

southern California resulting from the outbreak was approximately 4.9 million pounds. The reduced feed demand resulted in a lost value of feed sales of $17 million. [27]

Labor wage impacts

Total labor wages were estimated separately for modern facilities in which eggs were collected on conveyer belts and those in which eggs were collected by hand. The analysis of labor wages lost reflected only those associated with the 3 million hens depopulated that could be matched with egg gathering method. Total wages lost for the automatic hen houses were $6500, and total wages lost for the hand-gathered hen flocks were $3.5 million. These values reflect wages lost from the day of depopulation until July 3, 2003. [27]

Consequence summary

This consequence assessment provides general information regarding the type and magnitude of effects of END introduction into the United States from an historical perspective. The major consequences of the END outbreaks concerned animal health and economic costs of control, indemnity, and lost trade. The consequences of a poultry disease outbreak in a State with a small commercial poultry industry are likely to be relatively minor. However, the economic and animal health consequences of a disease outbreak in a State with a large concentration of poultry are likely to be substantial. While the consequences of some of the outbreaks in the United States have been significant when END was introduced into the country from adjacent regions, APHIS considers the likelihood of introduction from Argentina to be low.

Risk Estimation

APHIS concludes from its release assessment of the risk of introducing END from poultry imports from Argentina that the surveillance, prevention and control measures implemented by SENASA in Argentina are sufficient to effectively minimize risk of exporting END-infected birds or products to the United States from Argentina. APHIS therefore considers the risk of END introduction associated with opening trade with Argentina to be low.

According to OIE guidelines, if the release assessment indicates that there is no significant risk of introduction, the risk assessment may conclude. However, APHIS continued its analysis in the interest of completeness and conducted exposure and consequence assessments based on information available on the history and economic effects of past END introductions into the United States.

Regarding the likelihood of exposure, historical experience indicates that the risk of introducing END via importation of live birds is considerably higher than via poultry products. SENASA has indicated that its primary interest is to export poultry meat, which historically has not been implicated in END introductions into the United States. Legal entry of live birds is satisfactorily controlled through existing quarantine measures in the United States and APHIS considers the impact of opening trade with Argentina on the illegal bird trade to be minimal. Taken together

with the low risk assessed by the release assessment, the risk of exposure from Argentine poultry imports is low.

APHIS continued its assessment further and conducted a consequence assessment that addressed the potential effects of an END outbreak on animal and public health, as well as associated environmental and economic considerations. Consequences of human exposure from END are low. While consequences on poultry health are high, effective disease surveillance and control measures should reduce the consequences by reducing the extent of spread. Consequences to the environment should be within the scope of APHIS resources and authority to manage adequately.

The economic portion of the consequence assessment was based on available information regarding the economic consequences of END introductions into the United States since 1950. This assessment, while demonstrating that the consequences can be significant under certain conditions, also demonstrated that an END introduction does not necessarily result in extensive consequences. If the disease is diagnosed prior to extensive spread, appropriate biosecurity measures are implemented, and the public is educated to look for clinical signs, the consequences can be minimized. Furthermore, because of the outbreak in the western United States in 2002-2003, APHIS has enhanced its END surveillance program in such a way as to increase the likelihood of future detection prior to spread.

In summary, APHIS concludes that the risk of introducing END via poultry imports from Argentina is low. Although consequences of an END outbreak are potentially substantial, the likelihood of outbreak occurring via exposure of the domestic poultry population to poultry meat imported from Argentina is low.

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APPENDIX I

CHARACTERISTICS OF NEWCASTLE DISEASE VIRUS

(Used by permission from the Canadian Food Inspection Agency)

Newcastle disease (ND) is an infectious, highly contagious and pathogenic viral disease which affects chickens, turkeys and many other domestic and wild bird species. Occasionally humans are affected. ND virus (NDV) is an enveloped RNA virus, a member of the *Paramixoviridae* family, *Paramyxovirinae* subfamily and *Rubulavirus* genus (Alexander 1997). Exotic Newcastle Disease is the velogenic form of the disease, and the virus is of the serotype PMV-1.

Clinical Disease

Newcastle disease manifests a great variability in signs depending on viral strain, host, age and environment.

Viscerotropic velogenic: highly pathogenic with hemorrhagic enteritis
- VVND, is the most severe form, with morbidity approaching 100% and mortality of up to 100% in chickens
- in chickens signs may consist of a fall in egg production, listlessness, increased respiration depression, diarrhea, prostration, edema of the head and wattles, nervous signs such as muscular tremors, paralysis and torticollis, and respiratory signs (Alexander 1997).
- the younger the chicken the more severe the signs including sudden death (McFerran and McCracken 1988)
- signs are generally less severe in turkeys (Alexander 1997).
- some species (e.g., finches, canaries) may not show clinical signs (USAHA 1992).

Neurotropic velogenic: high mortality, respiratory and nervous signs
- neurotropic velogenic form (NVND) has been reported mainly from the USA with dramatic drops in egg production, up to 100% morbidity, nervous signs of tremors, torticollis, opisthotonos and paralysis of the legs and occasionally the wings; mortality of up to 50% in older birds and up to 90% in younger birds (Alexander 1997).

Mesogenic: respiratory and occasional nervous signs but low mortality

Lentogenic: mild or subclinical respiratory signs
Asymptomatic: subclinical enteric infection (Alexander 1990)

Incubation Period

- the incubation period of ND after natural exposure has been reported to vary from 2 to 15 days (average of 5-6 days) (Alexander 1997).
- incubation in natural infections is 4-6 days (Fenner 1993).

- neurotropic velogenic Newcastle disease (NVND) virus isolated from racing pigeons in Sweden caused high mortality and a incubation period of 5-11 days in chickens (Engstrom 1985).
- the mean death time for inoculated pigeons was 9.5 days (range 4-25) and virus was shed for up to 20 days (Pearson 1987).

Pathogenesis

In chickens, the virus enters the body via the respiratory and the intestinal tract. Particles greater than 5 microns are caught in the conjunctivae, nose and trachea down to the bifurcation. In the trachea the virus is spread by ciliary action and by cell-to-cell infection. Highest titers are found for 24-96 hours post-infection in the turbinates; titers decrease thereafter, most likely by antibody formation from day 5, but virus is still present by day 12. Virulent virus can be found within 22-44 hours in practically all tissues, with highest titers in the thymus and lowest in muscles and brain. After initial multiplication at the introduction site, virulent virus is carried by viremia to spleen, liver, kidney and lung. There multiplication is usually interrupted for 12-24 hours, from the 36th hour post-infection and virus titers drop. Virus invades the brain after multiplication in non-nervous tissue has ceased (from 60 hours post-infection) whereupon birds start dying. During the second multiplication following the arrest period, virus is once again released into the blood stream (Kouwenhoven 1993).

A persistent carrier state has been demonstrated in psittacine and certain other wild birds for more than a year, while virus can be recovered from most other species for a shorter period of usually 2-4 weeks or less, until antibody is developed (Alexander 1991). Susceptible turkey poults that survived experimental infection with a viscerotropic velogenic strain of NDV shed the virus from the intestinal tract for up to 46 days. NDV was recovered up to 53 days postchallenge from the cloaca of turkey poults that were vaccinated once at 4 days of age and challenged at 1 month of age. Persistent infection was detected as long as 88 days postchallenge in organ cultures of cecal tonsil (Gillette and others 1975).

Fowls of 7 to 20 weeks of age were divided into 3 groups according to their antibody status (high, low, absent) and were infected with a velogenic viscerotropic Newcastle disease virus. To follow patterns of viral replication, birds were killed at regular intervals up to 22 days later and organs were sampled from each bird. In non-immune birds, virus could be isolated from all organs examined. In birds with antibody, virus was isolated most frequently from the proventriculus, cecal tonsil, bursa, and brain. In immune birds, although clinical signs were either mild or absent, widespread virus replication occurred up to 19 days after challenge (Pared and Yound 1990).

Host Range

- Natural or experimental infection with NDV has been demonstrated in at least 236 species from 27 of the 50 orders of birds (Alexander 1997).
- Chickens, turkeys, pigeons, guinea fowl, peacock, pheasants, quail, partridges (Kouwenhoven 1993).

- Geese and ducks are usually regarded as resistant even to NDV strains most virulent for chickens (Alexander 1997).
- Ostriches can become infected (Samberg and others 1988; Huchzermeyer and Gerdes 1993).
- Wild birds represent a potentially important but unknown reservoir.
- Although people may become infected with velogenic viscerotropic Newcastle disease (VVND) virus, the resulting disease is usually limited to conjunctivitis. Recovery is usually rapid and the virus no longer present in eye fluids after 4 to 7 days; infections have occurred mostly in laboratory workers and vaccinating crews; no instance of transmission to humans through handling or consumption of poultry products is known (Alexander 1991).
- 1971-1973 California outbreak involved 391 flocks (86% chickens, 6% exotic birds, 3% pigeons, 2% game birds, 2% turkeys, 1% ducks and geese (Burridge 1975).
- An added complication in the epidemiology of VVND was experienced in outbreaks in Great Britain during 1984 when virulence of the virus from pigeons increased with respect to chickens, only after passage through chickens (Alexander 1985).

Global Distribution

- ND has been reported world wide: Europe, Asia, Americas, Africa, Japan, Australia
- In most countries with developed poultry industries, lentogenic and some mesogenic forms are common, the velogenic forms (viscerotropic (VVND) or neurotropic (NVND)) are less common.
- Alexander (1997) considered three panzootics of ND: 1) slow, worldwide spread from Southeast Asia to Europe in poultry from 1926 to the 1960s, 2) rapid spread from the Middle East to worldwide in the late 1960s to 1973, believed to have originated from imported caged psittacine birds which continued to be an important factor in the spread of the disease, and 3) rapid spread from the Middle East in the late 1970s to the early 1980s, originating from pigeons and doves, including the spread to chickens in Great Britain in 1984 through feed that had been contaminated by infected pigeons.

Examples of specific outbreaks of VND include:
- confirmed in backyard poultry in southern California in October 2002 and in commercial poultry in December 2002; later identified in Nevada and Arizona in January and February 2003, respectively; in April 2003, the disease was also diagnosed in Texas (USDA News Release, Aug. 4, 2003).
- poultry in California 1971-1973, of which the source of infection was considered to have been illegally imported exotic birds (Burridge and others 1975).
- poultry in England 1970-1072 and 1984 (Alexander and others 1984).
- imported cockatoos and love birds appear to have been a source of VVND in Japan in 1980 (Hirai 1981).
- exotic pet birds in five American states April-July 1991; eradicated without spread to domestic poultry; source: Amazon parrots suspected of being illegally imported into Texas (Brunning-Fann and others 1992).
- EU countries 1986-1990, 85 outbreaks, 75 in Italy including 45 in 1988, and trend of increasing EU numbers from 18 in 1991, to 83 in 1992, to 134 in 1993; about 40% of these EU outbreaks have been in hobby birds (Alexander 1995).

- recently in Canada outbreaks of ND in wild cormorants, pelicans, gulls and terns have occurred in 1990 and 1992, with isolation of velogenic virus and neurologic clinical signs in wild birds, but no evidence of transmission to commercial poultry (Wobeser and others 1993, OIE 1990; 1992).
- VND was confirmed in a range flock of 26,000 turkeys in North Dakota in 1992, demonstrating neurological symptoms and located approximately three miles from where a “die-off” of cormorants had occurred (Grow 1992, Meteyer and others 1997).

Modes of Transmission

Transmission occurs by direct contact via ingestion of infective material or inhalation of excreted droplet particles; the success of the inhalation route of transmission will depend on many environmental factors such as temperature, humidity, and stocking density (Alexander 1995). Vertical transmission is controversial; its true significance is not clear. Transovarial transmission may be important especially with lentogenic strains, and virus infected chicks may hatch from virus-containing eggs, cracked or broken eggs, or eggs contaminated with feces can be a source of virus for newly-hatched chicks (Alexander 1997).

Spread

- inapparently-infected carriers are the most likely source for introduction of VVND into ND free countries, including numerous species of exotic pet, game and exposition birds, racing pigeons, waterfowl and domestic poultry (Alexander 1995).
- many species of caged birds harbor VVND without showing clinical signs, so the smuggling of captive birds poses a hazard (Alexander 1988).
- wild cormorants may have been the source of infection for an outbreak of velogenic ND among range turkeys in North Dakota 1992 (Grow 1992), however, NDV isolates from migratory birds are usually of low virulence (Alexander 1995).
- the 1971-73 California outbreak experienced extensive spread between flocks by movement of live birds and mechanical transport of virus by vaccination and service crews on clothes and equipment; there was no evidence of significant wind-borne spread in that outbreak (Burridge and others 1975).
- 19 of 23 outbreaks in Great Britain between February and July 1984 occurred directly or indirectly as a result of spread from diseased pigeons infecting feed stores at port docks (Alexander 1985); the preparation of food for layer and broiler-breeder flocks involved no process which would adversely affect virus infectivity (Alexander 1985).
- outbreaks in Great Britain in the early 1970's indicated windborne spread of up to 8 km; but other outbreaks (e.g., California 1971, England 1984) appeared not to involve windborne spread (Alexander 1991).

pH stability

The pH range of stability is broad. NDV tolerates pH 2 to 10 (Beard and Hanson 1984). The infectivity of the virus is not appreciably modified between pH 4 and 11. It loses some of its

infectivity at pH 3 and almost all at pH 1 and pH 13 (Commission des Communautés européennes 1975).

Thermal stability

Thermal stability depends on the strain but all activity is destroyed at 100 degrees Celsius for one minute. At 56 degrees Celsius destruction of infectivity, hemagglutinating activity and immunogenicity occur within 5 minutes to 6 hours. At 37 degrees Celsius, hours and days may be required, and at lower temperatures (20 and 8 degrees Celsius) the virus can be stable for months and years (Beard and Hanson 1984).

In trials in which the survival of 4 NDV virus strains at differing times and temperatures was assessed it was found that: At 70C the virus was inactivated within 40 to 50 sec.; at 60 degrees Celsius, within 6 to 7 minutes; at 37.5, within 8 to 11 days; at 22 degrees Celsius, within 25 to 42 days. The authors concluded that all strains, whether virulent or avirulent, showed no difference in viability (Foster and Thompson 1957).

Ultraviolet ray sensitivity

Ultraviolet rays destroy NDV similarly to other myxoviruses (Beard and Hanson 1984). The virus is inactivated in 35-45 minutes by a wavelength of 2537 A (254 nm) and in 0.8-1.08 seconds by a wavelength of 1600-1800 A (160-180 nm) (Brandly and others 1946). The sun emits a wide variety of electromagnetic radiation, including infrared, visible, ultraviolet A (UVA: 320 to 400 nm), ultraviolet B (UVB: 290 to 320 nm), and ultraviolet C (UVC: 10 to 290 nm). The only UVR wavelengths that reach the Earth's surface are UVA and UVB. UVA is the predominant ultraviolet light reaching the Earth's surface (tenfold to one hundred fold more than UVB) (National Institutes of Health 1989).

Environmental stability

Stability of the virus in the environment depends on the medium in which it is present: carcasses, feces, mucus, decaying materials, proteinaceous matter. Warm temperatures and solar radiation facilitate destruction of NDV (Alexander 1980). Infectious virus may survive for months at room temperature in eggs laid by infected hens, and for over a year at 4 degrees Celsius. Similar survival times have been observed for virus on feathers, and virus may remain infectious for long periods in contaminated premises (Fenner et al. 1987). In an examination of the ability of NDV to survive in fermented edible waste material, it was found the NDV survived the entire test period at temperatures of 5 to 30 C (Wooley et al 1981; Beard and Hanson 1984). In a further study of the antimicrobial effects of *Lactobacillus* fermentation survival of NDV in infected chicken carcasses was examined in waste material. In two trials NDV survived 4 days at 20 C, 2 days at 30 C and 1 day at 40 C (Shotts et al 1984).

APPENDIX II

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CHARACTERISTICS OF NEWCASTLE DISEASE VIRUS

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