Draft Report

Import Risk Analysis: Domestic Guinea Pigs, *Cavia porcellus*, Imported from Australia

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Heather O'Neill: New Zealand Veterinary Nurse, who has been breeding and exhibiting guinea pigs for 10 years.

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A copy of this document can be found at
http://hintlink.com/guinea_pigs/NZriskanalysis.pdf

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2.0 Glossary of Abbreviations

BSA	Biosecurity Act (1993)
Code	Terrestrial Animal Health Code of the Office International des Epizooties 13th Edition
CTO	Chief Technical Officer
FAO	Food and Agriculture Organization of the United Nations
IHS	Import Health Standard
MAF	Ministry of Agriculture and Forestry
MoH	Ministry of Health
OIE	Office International des Epizooties
SPS	Agreement on the Application of Sanitary and Phytosanitary Measures (WTO, 1995)
WHO	World Health Organization
WTO	World Trade Organization

3.0 Taxonomy

Order: Rodentia
Suborder: Hystricomporpha
Family: Cavidae
Genus: Cavia
Species: procellus
Common name: Guinea pig

(Wilson and Reeder, 1993)

4.0 Definitions

4.1 Risk Analysis

The process composed of hazard identification, risk assessment, risk management and risk communication (OIE, 2004a).

4.2 Hazard Identification

The hazard identification involves identifying the pathogenic agents, which could potentially produce adverse consequences associated with the importation of a *commodity*. The potential hazards identified would be those appropriate to the species being imported, or from which the *commodity* is derived, and which may be present in the *exporting country*. It is then necessary to identify whether each potential hazard is

already present in the *importing country*, and whether it is a *notifiable disease* or is subject to control or eradication in that country and to ensure that import measures are not more trade restrictive than those applied within the country (OIE, 2004a).

4.3 Risk Assessment

The evaluation of the likelihood and the biological and economic consequences of entry, establishment, or spread of a pathogenic agent within the territory of an *importing country* (WTO, 1995; OIE, 2004a).

4.4 Risk Management

The process of identifying, selecting and implementing measures that can be applied to reduce the level of risk (OIE, 2004a).

4.5 Risk Communication

Risk communication is the process by which information and opinions regarding hazards and risks are gathered from potentially affected and interested parties during a risk analysis, and by which the results of the risk assessment and proposed risk management measures are communicated to the decision-makers and interested parties in the *importing* and *exporting countries*. It is a multidimensional and iterative process and should ideally begin at the start of the risk analysis process and continue throughout (OIE, 2004a).

5.0 EXECUTIVE SUMMARY

This document is a qualitative analysis of the biosecurity risks posed by domestic guinea pigs, *Cavia porcellus,* imported into New Zealand from Australia.

A search of the scientific literature between 1975 and July 2005 yielded no reference to domestic guinea pigs transmitting disease to livestock.

In addition, there is no evidence that domestic guinea pigs released into the wild are likely to become pests and cause environmental damage.

There is evidence that guinea pigs can transmit diseases and parasites to other guinea pigs. In addition, domestic guinea pigs carry zoonotic diseases that have a remote likelihood of infecting humans. However, guinea pigs do not carry any OIE List A or B notifiable diseases or any exotic diseases.

Safeguards and sanitary measures are recommended to manage the risks of importing domestic guinea pigs from Australia for the purpose of breeding or pets.

6.0 Introduction

It is acknowledged that New Zealand's biosecurity programme is world leading. In 1993, New Zealand passed the Biosecurity Act (BSA), which was the first law specifically to support systematic protection of all valued biological systems - introduced and indigenous - from the harmful effects of pests and unwanted organisms. The purpose of Part III of the Biosecurity Act (1993) is *"to provide for the effective management of risks associated with the importation of risk goods*". MAF is the Ministry responsible for the administration of the BSA and its Chief Technical Officer is responsible for issuing import health standards (IHS), which specify the requirements to be met before risk goods may be imported. MAF's Biosecurity policy is that all new and revised import health standards must be based on a risk analysis (Murray, 2002). Risk analysis is the discipline through which major biosecurity policy is developed and reviewed. The objective of risk analysis is the prevention or control of the entry, establishment or spread of pests and diseases that will or could cause significant damage to human beings, animals, plants, other aspects of the environment, or economic activities (OIE, 2004a).

Obligations with respect to measures in import health standards arise from New Zealand's membership in the World Trade Organization (WTO) and the Agreement on the Application of Sanitary and Phytosanitary Measures "SPS Agreement" (WTO, 1995). The SPS Agreement defines two types of risk assessments, disease or pest risk assessments and food safety risk assessments. One of the SPS requirements is harmonisation with the Office International des Epizooties (OIE) *Terrestrial Animal Health Code* (Code), recommendations for sanitary measures to prevent the spread of OIE list A and list B diseases during trade in animals. The SPS disease or pest risk assessment also covers:

1.0 animal or plant health risks arising from pests or diseases, or
2.0 human health risks from diseases carried by animals or plants, or
3.0 human health risks arising from pests (WTO, 1995; Murray, 2002).

Australia is also a member of the WTO and abides by the Agreement on the Application of Sanitary and Phytosanitary Measures. Biosecurity Australia has an online Risk Analysis Handbook, which can be found at www.affa.gov.au/BiosecurityAustralia. The procedures described in this Handbook are consonant with Australian/New Zealand Standards AS/NZS 3931:1998 (*Risk analysis of technological systems—application guide*) and AS/NZS 4360:1999 *Risk management*) (Biosecurity Australia, 2003). In addition, Biosecurity Australia is responsible for reviewing risk analysis reports written by consultants (Biosecurity Australia, 2005).

Furthermore, Biosecurity Australia works with the OIE, which informs member countries of animal disease outbreaks throughout the world, and studies new ways of controlling animal diseases and sets international standards.

6.1 Background

Guinea pigs are herbivorous, montane, rodents from South America that are frequently kept as pets (Quesenberry et al, 2004). British pedigreed domestic guinea pigs, *Cavia porcellu*s, also known as cavy, or cavies are thought to have first been imported to New Zealand as pets and/or hobby breeding stock in 1942 (Krey, K., 2005). Linda Harmon, a New Zealand guinea pig breeder for over 17 years, was granted import permits from the MAF to import breeding stock from Australia in 1995, 1997 and 2000. These imports were documented in a letter to the MAF (Attachment 1). There are approximately 28 Cavy Clubs throughout New Zealand and 790 registered Studs (CCNZ, 2005). Cavy breeders from New Zealand are very interested in obtaining new genetic stock, as cavy imports have not been permitted since 2000. New Zealand cavy breeders contacted the author and asked her to write this risk analysis report. She is a scientist with 22 years experience in operating a shelter for abused and sick cavies.

In New Zealand there are many standard breeds of cavies, such as the, English, Agouti and Peruvian, that have been selectively bred for colour, length and texture of their pelage. Cavies are generally well isolated from farm livestock. They are kept in cages or hutches in homes, garages and sheds called caviaries. New Zealand cavy breeders have developed new breeds that are unique to New Zealand and that are sought after by cavy breeders and fanciers worldwide.

The Peruvian breed of cavy should not be mistaken for guinea pigs from Peru, *Cavia porcellus,* which are raised both as pets and micro-livestock, these domestic guinea pigs have been selectively bred for size (Morales, 1995). The Food and Agriculture Organization of the United Nations, FAO, La Molina National University in Peru and non-governmental organizations such as Heifer International and have Peruvian guinea pig micro-livestock programs in Latin America, Asia and Africa. Guinea pigs provide an inexpensive, readily available and high quality meat for people who traditionally

consume a low protein diet (Nuwanyakpa et al, 1997; Lukefar et al, 1999; Paterson et al, 2001). However, guinea pigs are not at all related to swine (Noonan, 1994).

Cavies are not only bred as pets and for food but they are well recognised worldwide for their contributions to science as experimental or laboratory animals. For example, among mammals, only guinea pigs and primates require a dietary source of ascorbic acid (National Academy of Sciences, 1987). As for experimental infections, confined to laboratories, guinea pig models are established for prion disease, ebola, genital herpes, lymphocytic choriomeningitis, respiratory syncytial virus, and foot and mouth disease (Ahad et al, 2002). Massey University New Zealand doctoral student Robert Sanson (1993) states, "that the guinea pig is the most susceptible laboratory animal to induced foot and mouth disease". However, he noted that "natural infection has not been observed in them and transmission from guinea pig to guinea pig does not occur even under close confinement". Dr. John E. Harkness, a renowned authority on cavy biology states, "to suggest that guinea pigs can transmit by natural routes these experimental infections to livestock is irresponsible without really good evidence to the contrary, which I don't think exists" (John Harkness, pers. comm. [1] ; Attachment 2). New Zealand allows laboratory guinea pigs to be imported from any country (MAF, 2003).

7.0 RISK ANALYSIS METHODOLOGY

The steps in the risk analysis process are: (Murray 2002; Biosecurity Australia, 2003; OIE, 2004a).

1.0 Hazard identification

2.0 Risk assessment which includes the following four components.

- release assessment
- exposure assessment
- consequence assessment
- risk estimation

3.0 Risk management

4.0 Risk communication

8.0 Hazard Identification

Hazard identification involves identifying the pathogenic agents, which could potentially be introduced into New Zealand from cavies imported from Australia (Murray, 2002; Biosecurity Australia, 2003; OIE, 2004a). The list comprises the infectious diseases affecting cavies that constitute a risk during trans-Tasman trade in cavies**.** Diseases endemic in New Zealand that are not subject to official control are not considered further, fulfilling the SPS Agreement obligation regarding consistency with national treatment. However, for educational purposes the common diseases of the cavy have been reviewed.

Hazard identification was accomplished by reviewing the OIE List of Notifiable Diseases, OIE Handistatus II database, reviewing reports of zoonotic notifiable diseases of New Zealand and Australia, reviewing the published scientific literature, reviewing the list of Australian notifiable animal diseases along with consultation with stakeholders. Murray (2002) suggests that if it is concluded that the likelihood of a hazard being released into New Zealand is negligible, there is no need to undertake an exposure and consequence assessment and explore risk management options. Also, it is not necessary to offer detailed description of clinical syndromes, pathology, treatments etc., unless these have a direct bearing on the likelihood of detecting diseased animals or managing disease risks.

9.0 Risk Assessment

The risk assessment is the component of the analysis which estimates the risks associated with a hazard. Risk assessment is the evaluation of the likelihood and the biological and economic consequences of entry, establishment, or spread of a

pathogenic agent or pest within the territory of New Zealand from importing cavies from Australia. Risk assessments may be qualitative or quantitative. For many diseases, particularly for those diseases listed in the Office International des Epizooties, OIE, Terrestrial Code where there are well-developed internationally agreed standards, there is broad agreement concerning the likely risks. In such cases it is more likely that a qualitative assessment is all that is required (OIE, 2004a).

Risk assessment consists of four inter-related steps:

1.0 *Release assessment*, which consists of estimating the likelihood of an imported commodity being infected or contaminated with a hazard and describing the biological pathway(s) necessary for that hazard to be introduced into a particular environment.

2.0 *Exposure assessment*, which consists of describing the biological pathway(s) for exposure of animals and humans in the importing country to the hazard and estimating the likelihood of those exposure(s) occurring.

3.0 *Consequence assessment*, which consists of describing the relationship between exposures to a hazard, the potential consequences of those exposures and their likelihood.

4.0 *Risk estimation,* which consists of integrating the results from the release assessment, exposure assessment, and consequence assessment to produce summary measure of the risks associated with the identified hazards (Murray, 2002).

10.0 Risk Management

In the process of risk management, measures are identified and implemented that will reduce or minimise the level of risk associated with importing cavies from Australia. The objective is to manage risk appropriately to ensure that a balance is achieved between New Zealand's desire to minimise the likelihood or frequency of disease incursions and their consequences and its desire to import cavies and fulfill its

obligations under international trade agreements with Australia. Four components are identified:

1.0 *Risk evaluation*, where the estimated risk is compared with the importing country's appropriate level of protection.

2.0 *Option evaluation*, where measures are identified, evaluated and selected to effectively manage the risks in line with the importing country's appropriate level of protection.

3.0 Implementation

4.0 *Monitoring and review*, where measures are audited to ensure that they are achieving the results intended (Murray, 2002).

11.0 Risk Communication

Risk communication is the interactive exchange of information on risk among risk assessors, risk managers, other interested parties and stakeholder groups (Murray, 2002; Biosecurity Australia, 2003). The author daily communicates with stakeholders in New Zealand and Australia. It is also the process by which information and opinions regarding hazards and risks are gathered from potentially affected and interested parties during a risk analysis, and by which the results of the risk assessment and proposed risk management measures are communicated to the decision makers and interested parties in the *importing* and *exporting countries* (Murray, 2002).

12.0 Hazard Identification; OIE List A, B and C

Cavies do not carry any infectious diseases listed on the OIE List A and B of notifiable diseases (OIE, 2004a) or any diseases on Australian list of notifiable animal diseases (Australian Government, 2005). They are potential carriers of three diseases listed in the New Zealand and Australian OIE List C Handistatus II database (OIE, 2004b). This is an animal disease status database, which is compiled monthly and annually. The database is part of New Zealand and Australia's animal disease surveillance program.

One of the objectives of the surveillance program is to facilitate the formulation of public health policies for the control of animal diseases that can affect human health. Another objective of the animal disease surveillance program is to develop and establish technically justifiable import requirements for animals and animal products entering New Zealand. Cavies are potential carriers of two zoonotic diseases that are on the OIE List C Handistatus II database. There is no reference in the scientific literature that cavies from Australia carry any diseases that are more virulent then the same strain found in New Zealand (OIE, 2004b; World Health Organization, 2005).

12.1 Handistatus II OIE C616 "Other Clostridial Infections"

The database reports that C616 "other clostridial infections" are reported in cattle in New Zealand and Australia.

12.2 Tyzzer's Disease, *Clostridium piliforme* in Cavies: Risk Assessment

Etiological agent: *Clostridium piliforme*, a spore-forming, obligate intracellular bacteria (Merck, 2005). Each species of animal seems to have its own strain of *Clostridium piliforme* (Harkness and Wagner, 1995).

Susceptible species: *Clostridium piliforme.* has been shown to cause disease in mice, *Mus musculus„* rats, *Rattus norvegicus*, hamsters, *Mesocricetus auratus*, gerbils, *Gerbillus campestris,* rabbits, *Oryctolagus cuniculus*, horses, *Equus caballus*, cattle, *Bos taurus,* cats, *Felis silvestris catus*, dogs, *Canis familiaris*, and immuno-compromised, young and stressed cavies (Merck, 2005). Tyzzer's disease has been reported multiple times in horses in New Zealand (Nuttall, 1990). It has also been reported in several marsupial species in Australia (Canfield and Hartley, 1991).

Transmission: The organism is transmitted by the faecal-oral route due to contamination of food by wild rodents and other animals. Infectious spores survive for years in bedding, soil or contaminated feed. Factors which predispose to overt clinical disease include the immune status, age, and strain of the cavy host, and physiological

stresses such as concurrent microbial infections, poor housing conditions, or corticosteroid administration (Besselsen, 2004; O'Rourke, 2004).

Clinical signs: Signs of Tyzzer's disease in cavies includes diarrhoea, an unthrifty appearance and acute death (Harkness and Wagner, 1995).

Epidemiology: Infected cavies die within 1 to 4 days after ingestion of spores. Cavies, other pet rodents and pet rabbits eating the same infected food are the other animals that would be likely to contract the disease.

Zoonotic potential: Tyzzer's disease has not been reported in humans, but elevated antibody levels in humans are common therefore humans may be susceptible to clinical disease under certain circumstances (Harkness and Wagner, 1995). Tyzzer's disease is not listed in the Australian or New Zealand Annual Public Health Surveillance Summary (Australian Government, 2004; MoH, 2005).

12.3 Risk estimation

The risk of introduction of Tyzzer's disease is negligible if cavies are brought from safe sources and quarantined appropriately.

12.4 Risk management recommendations

Source of animals: Animals should be sourced from breeders whose stud or caviary have been Tyzzer's disease free for three months.

Treatment: None is available. The condition is fatal.

Quarantine: Quarantine measures would be effective in preventing the introduction of the etiological agent. Cavies destined for exportation to New Zealand should be quarantined on the breeder's premises in Australia for 30 days prior to exportation. Cavies imported to New Zealand should be quarantined on the importer's premises for 30 days after importation.

13.0 Handistatus II OIE C619 Intestinal Salmonella

The database reports that C619 intestinal salmonella infections are reported in cattle in New Zealand and Australia.

13.1 Salmonellosis in Cavies: Risk Assessment

Etiological agents: *Salmonella typhimurium* and *Salmonella enteritidis* are the most common causes of bacterial enteritis in cavies (O'Rourke, 2004).

Susceptible species: The disease is seen in all animals and humans and occurs worldwide (Merck, 2005). *Salmonella typhimurium* infections have been reported in New Zealand farmed deer, *Cervus sp.,* (Wilson, 2002). *Salmonella typhimurium* has also been reported in New Zealand livestock such as cattle, sheep, pigs, horses, goats and cats and dogs (Belton, 1993). *Salmonella enteritidis* has been reported in New Zealand cattle (Belton, 1993).

Transmission: Transmission is by faecal contamination of feed via carrier mice, rats and wild birds (Richardson, 2000). Cavies that are pregnant, stressed, weanlings and aged animals are particularly susceptible (Harkness and Wagner, 1995).

Clinical signs: Clinical signs of salmonellosis include anorexia, rough hair coat, lethargy, weight loss, soft faeces, reproductive inefficiency, abortion and septicemia. Sporadic outbreaks with high mortality are the rule (Clemons et al., 2000).

Epidemiology: Cavies are highly susceptible and develop severe clinical disease usually resulting in death (Harkness and Wagner, 1995). Cavies which recover, are likely to be asymptomatic carriers of *Salmonella* and should be destroyed to prevent further outbreaks of this disease (Richardson, 2000).

Zoonotic potential: Salmonella is a zoonotic disease that is spread through the faecal-oral route. It spreads to humans through contact with infected animals, especially poultry, swine, cattle, rodents, and pets such as reptiles, dogs and cats (Merck, 2005). Salmonella can also be spread by contaminated food, water, or milk. It is a notifiable human disease in both Australia's and New Zealand's Annual Public Health Surveillance Summary (Australian Government, 2004; MoH, 2005) and in the OIE Handistatus database (OIE, 2004b).

13.2 Risk estimation

The risk of introduction or spread of salmonella is negligible if cavies are brought from safe sources and quarantined appropriately.

13.3 Risk management recommendations

Source of animals: Animals should be sourced from breeders whose stud or caviary have been salmonella disease free for three months.

Treatment: Affected animals should be destroyed along with their bedding preferably by burning (Richardson, 2000).

Quarantine: Quarantine measures would be effective in preventing the introduction or spread of the etiological agent to other cavies or humans. Cavies destined for exportation to New Zealand should be quarantined on the breeder's premises in Australia for 30 days prior to exportation. Cavies imported to New Zealand should be quarantined on the importer's premises for 30 days after importation.

14.0 Handistatus II OIE C620 Cocccidiosis

The database reports that C620 cocccidiosis is reported in birds in New Zealand and Australia.

14.1 Cocccidiosis in Cavies: Risk Assessment

Etiological agents: *Emeria cavia* is the coccidal species recognized in guinea pigs (Harkness and Wagner, 1995).

Susceptible species: *Cavia procellus* (Bowman, 2003).

Transmission: Cocccidiosis is contracted by the ingestion of contaminated food.

Clinical signs: The droppings are slimy in appearance and contain blood. Affected individuals look unthrifty and young cavies fail to gain weight (Richardson, 2000).

Epidemiology: Cocccidiosis is a very rare problem in the domestic guinea pig.

Zoonotic potential: Negligible

14.2 Risk estimation

The risk of introduction of *Emeria cavia* is negligible if cavies are brought from safe sources and quarantined appropriately.

14.3 Risk management recommendations

Source of animals: Animals should be sourced from breeders whose stud or caviary have been *Emeria cavia* disease free for three months.

Treatment: Sulfphadimidine. It is given in the drinking water at a concentration of 0.2% for 5 days (Richardson, 2000).

Quarantine: Quarantine measures would be effective in preventing the introduction or spread of the etiological agent. Cavies destined for exportation to New Zealand should be quarantined on the breeder's premises in Australia for 30 days prior to exportation. Cavies imported to New Zealand should be quarantined on the importer's premises for 30 days after importation.

15.0 Specific Diseases and Parasites

Bordetella pneumonia, *Streptococcus pneumoniae*, ectoparasites and dermatophytes are the most common disease agents in cavies (Harkness and Wagner, 1995). Denise Noonan (1994) of the Australian and New Zealand Council for the Care of Animals in Research and Teaching, ANZCCART, states in her comprehensive report on cavies, "with good husbandry practices, infectious diseases are relatively uncommon in guinea pig colonies". Noonan's statement is confirmed by (Quesenberry et al, 2004) who state from experience in their veterinary practice "that pet guinea pigs are hardy animals with few disease problems".

Diarrhoea is not a common condition in guinea pigs and is rarely seen in clinical practice. Individuals with severe enteritis often die acutely before the development of diarrhea. *Yersinia pseudotuberculosis*, *Listeria monocytogenes*, and *Pseudomonas aeruginosa* have been known to occasionally cause enteritis (Hoefer, 2001). Good husbandry practices are the key to prevention of enteritis.

15.1 Pneumonia: *Bordetella bronchiseptica*

Bordetella bronchiseptica is the most common cause of pneumonia in cavies (Harkness and Wagner, 1995; Richardson, 2000). To a lesser extent, *Streptococcus pneumoniae* can cause respiratory infection in cavies (O'Rourke, 2004)

Streptococcus zooepidemicus, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Streptobacillus moniliformis*, and *Pasturella multocida*, rarely cause pneumonia in

cavies (Noonan, 1994). The MAF Surveillance Magazine has multiple references to these disease organisms being present in New Zealand livestock, wild animals, cats and dogs. However, *Bordetella bronchiseptica and Streptococcus pneumoniae* will be reviewed because interspecies transmission is likely and both diseases are potentially zoonotic (Harkness and Wagner, 1995).

Etiological agent: *Bordetella bronchiseptica* is a gram-negative bacillus (Merck, 2005).

Susceptible species: *Bordetella bronchiseptica* can be transmitted by asymptomatic carriers of many species including humans (Harkness and Wagner, 1995). This disease organism can be carried by rats, rabbits, dogs, cats, swine, primates, horses, and humans (Musser et al., 1987; Besselsen, 2004). *Bordetella bronchiseptica* prevalence in cats in the Manawatu region of New Zealand has been documented by Molyneux et al., (2000). A carrier state can also occur in the guinea pig although most animals that survive the disease develop immunity and eliminate the infection (Harkness and Wagner, 1995).

Transmission: Transmission between animal to animal and animal to humans is by direct contact, aerosolization, and contaminated fomites.

Clinical signs: Acutely infected guinea pigs may exhibit sneezing, nasal discharge, anorexia, weight loss, conjunctivitis, dyspnea, and death. Stillbirth and abortion may occur in pregnant females. Young, stressed and old animals are more severely affected, especially in the winter and mortality can reach 100% in immunologically naive juveniles. In some cases the infection progresses to the middle and inner ear causing torticollis (Besselsen, 2004) Cavies should not be housed with rabbits or unvaccinated dogs because they are mutual sources of *Bordetella bronchiseptica* infection (Harkness and Wagner, 1995).

Zoonotic potential: Human respiratory infections associated with *Bordetella bronchiseptica* have been reported (Woolfrey and Moody, 1991). The symptoms are similar to pertussis or whooping cough.

15.2 Risk estimation

The risk of introduction of *Bordetella bronchiseptica* or its spread throughout a caviary is negligible if cavies are brought from safe sources and quarantined appropriately.

15.3 Risk management recommendations

Source of animals: Animals should be sourced from breeders whose stud or caviary have been *Bordetella bronchiseptica* disease free for three months.

Treatment: Suggested antibiotic regimens include chloramphenicol (10 to 30 mg/kg b.i.d. IM or PO for 7 to 10 days), enrofloxacin (2.5 mg/kg twice daily for 7 to10 days), and sulfamethazine (4 ml of a 12.5% solution/500 ml water for 1 to 2 weeks). Fluid and respiratory therapy, as in conventional small animal species, may also be appropriate (Harkness and Wagner, 1995).

Quarantine: Quarantine measures would be effective in preventing the introduction or spread of the etiological agent. Cavies destined for exportation to New Zealand should be quarantined on the breeder's premises in Australia for 30 days prior to exportation. Cavies imported to New Zealand should be quarantined on the importer's premises for 30 days after importation.

15.4 Pneumonia: *Streptococcus pneumoniae*

Etiological agent: *Streptococcus pneumoniae* infections in guinea pigs are caused by serotypes III, IV, and XIX. *Streptococcus pneumoniae* are gram-positive coccus that often occurs in distinct pairs or short chains (Harkness and Wagner, 1995).

Susceptible species: *Streptococci* are ubiquitous in the environment and are considered opportunistic organisms (Merck, 2005). *Streptococcus pneumoniae* is carried by many species of animals including man (Harkness and Wagner, 1995).

Transmission: Transmission is by respiratory aerosol or direct contact. Clinically normal cavies many carry the organism in the upper respiratory passages. Depending on the season of the year, 40 to 70% of human populations carry *S. pneumoniae* in the respiratory passages (Harkness and Wagner, 1995).

Clinical signs: Clinical signs include sneezing, nasal and ocular discharges, anorexia, weight loss, coughing, dyspnea, depression, death, and torticollis if the inner ear or brain is affected. Abortions are associated with both general and uterine infections (Harkness and Wagner, 1995).

Zoonotic potential: *S. pneumoniae* can cause respiratory and meningeal disease in humans, especially in elderly people and people who lack spleens. In some cases the serotypes that affect animals may also affect humans (Harkness and Wagner, 1995). The Australian Government considers human invasive pneumococcal disease as a notifiable disease (Australian Government, 2004).

15.5 Risk estimation

The risk of introduction of *S. pneumoniae* or its spread throughout a caviary is negligible if cavies are brought from safe sources and quarantined appropriately. Good husbandry, avoidance of stress and separation of cavies from dogs and rabbits will help control pneumonia (Harkness and Wagner, 1995).

15.6 Risk management recommendations

Source of animals: Animals should be sourced from breeders whose stud or caviary have been *S. pneumoniae* disease free for three months.

Treatment: A combination therapy using enrofloxacin and doxycycline (2.5mg/kg PO q12) for 7-21 days has been shown to be effective (O'Rourke, 2004).

Quarantine: Quarantine measures would be effective in preventing the introduction or spread of the etiological agent. Cavies destined for exportation to New Zealand should be quarantined on the breeder's premises in Australia for 30 days prior to exportation. Cavies imported to New Zealand should be quarantined on the importer's premises for 30 days after importation.

16.0 Parasites

16.1 Ectoparasites

It has been reported that guinea pigs rarely become infested with the cat flea, *Ctenocephalides felis*, the northern rat flea, *Nosopsyllus fasciatus,* and ticks of the genus *Dermacentor* (Fox et al, 2002).

The ectoparasites of guinea pigs are all host specific.

The Ivermectin treatments for ectoparasites are the personal recommendations of the UK Cambridge Cavy Trust and New Zealand All Breeds Judge Christa Krey and Fox et al, 2002.

Lice: *Gliricola porcell* and *Gyropus ovalis* are also known as chewing lice. They can be observed at the base of hair shafts and on the skin surface (Fox et al, 2002).

Clinical Signs: Lice may occasionally cause partial alopecia and pruritus in select animals.

Treatment: Quarantine treatment prior to exportation: Ivermectin 200 µg/kg given orally twice, 10 days apart. The last treatment should be given one week prior to departure. This is also a good prophylactic treatment given every three months.

Routine treatment: Treatment should also include use of a synthetic pyrethroid flea powder or spray one time per week if lice are observed (Harkness and Wagner, 1995).

Mites: *Chirodiscoides caviae* known as the fur mite (Fox et al, 2002).

Clinical Signs: Infestation with *C. caviae* is usually asymptomatic, however, fur mites may occasionally cause partial alopecia and pruritus in select animals. *Chirodiscoides caviae* are hair-clasping mites, these mites commonly infest the hindquarters including the perineal and hip areas. They can be seen by visual examination of the hair coat.

Treatment: Quarantine treatment prior to exportation: Ivermectin 200 µg/kg given orally twice, 10 days apart. The last treatment should be given one week prior to departure. This is also a good prophylactic treatment given every three months.

Routine treatment: Treatment should also include use of a synthetic pyrethroid flea powder or spray one time per week if mites are observed (Harkness and Wagner, 1995).

Mites: *Trixacarus caviae* is a sarcoptic mange mite (Fox et al, 2002). *T. caviae* was first reported in New Zealand by Heath and Bishop (1984).

Clinical signs: This parasite occasionally can cause an intense pruritus leading to self-mutilation, abnormal behavior, debility, and death. Commonly infected areas of the guinea pig infested with *T. caviae* include the trunk, inner thighs, neck, and shoulders. *T. caviae* infestation can be identified using skin scrapings.

Treatment: Quarantine treatment prior to exportation: Ivermectin 200 µg/kg given orally twice, 10 days apart. The last treatment should be given one week prior to exportation. Treatment should also include use of a synthetic pyrethroid flea powder or 0.15% pyrethrin spray one time per week for 2 weeks during the initial quarantine period. The journal, Lab Animal recommends that the affected animals be treated with ivermectin and sprayed with Frontline® spray by Merial Inc. (Donnelly, 2004). The use of ivermectin and flea spray are also a good prophylactic treatment given every three months.

Zoonotic potential: *Trixacarus* may cause scabies in humans (Harkness and Wagner, 1995).

16.2 Endoparasites

Etiology: The major protozoan parasite in the guinea pig is *Cryptosporidium wrairi*.

Susceptible species: *Cavia porcellus* (Lihua et al., 1999).

Clinical signs: Intestinal colonisation by this organism may cause weight loss in adults and diarrhoea and/or poor growth rates in weanlings and juveniles.

Treatment: Outbreaks of clinical disease can be partially controlled by the addition of 0.2% sulfamethazine to the water supply.

Zoonotic potential: *Cryptosporidium wrairi* appears to be species specific (Gibson and Wagner, 1986).

16.3 Metazoan Endoparasite

Etiology: The metazoan parasite commonly associated with guinea pigs is *Paraspidodera uncinata*, a roundworm that resides in the caecum (Harkness and Wagner, 1995).

Clinical signs: It rarely causes disease. A heavy infestation may cause enteritis.

Treatment: Fenbendazole 100mg/kg given orally once (Richardson, 2000).

16.4 Risk estimation

The risk of introduction of ecto and endoparasites or their spread throughout a caviary is negligible if cavies are brought from safe sources and quarantined appropriately. Also if preventative measures are taken such as the use of prophylactic treatment protocols applied to all cavies prior to export. Also, good husbandry practices that include routine prophylactic treatment for ecto and endoparasites and bathing with pyrethrin shampoo or spraying/dusting to control parasites should prevent transmitting these agents to other cavies.

16.5 Risk management recommendations

Source of animals: Animals should be sourced from cavy breeders who provide prophylactic treatment for endo and ectoparasites.

Treatment: Prophylactic pre-export treatments as specified above should be used to treat potential parasitic infections. Treatment should begin at least 3 weeks prior to exportation.

Quarantine: Quarantine measures would be effective in preventing the introduction or spread of parasites. Cavies destined for exportation to New Zealand should be quarantined on the breeder's premises in Australia for 30 days prior to exportation. Cavies imported to New Zealand should be quarantined on the importer's premises for 30 days after importation.

17.0 Dermatophytosis

Etiology: *Trichophyton mentagrophytes* and *Microsporum gypseum* are the most common dermatophytes isolated from guinea pigs. Carman et al, (1979) were the first to report ringworm in guinea pigs in New Zealand.

Susceptible species: These pathogenic fungi are found worldwide, and all domestic animals and humans are susceptible (Merck, 2005).

Transmission: Transmission of ringworm is by direct contact with the spores. Young, aged, pregnant, and otherwise stressed animals are most susceptible to the disease.

Clinical signs: Lesions consist of irregular alopecia with occasional crusts and broken hair shafts. Progression of lesions occurs from the nose to limbs and back. Severe lesions may become secondarily infected with bacteria.

Zoonotic potential: *T. mentagrophytes* has been reported to spread by contact and fomites from animal to animal and from animal to man (Harkness and Wagner, 1995).

Treatment: Treatment includes clipping the area and griseofulvin (15 mg/kg s.i.d. PO, 2 to 4 weeks) or a topical antifungal cream applied b.i.d. for at least 4 weeks are probably equally effective. Many New Zealand cavy breeders have told the author that they use Vetadine Wash. Vetadine Wash contains iodophor, which has an antiseptic action. This formulation is effective against a wide range of organisms including those associated with bacterial and fungal skin conditions. It is used to treat non-specific dermatoses and ringworm in horses, cattle, dogs and cats, and 'Queensland Itch' in horses. It is also very effective in treating dermatoses in cavies.

18.0 Cavies and Livestock

An electronic search of the peer-reviewed scientific veterinary and agricultural journals from 1975 to July 2005 yielded no reference to domestic guinea pigs transmitting disease to livestock. On the contrary, there were several references to rabbits raised as livestock infecting cavies with rabbit ear mites, *Psoroptes cuniculi*.

It is interesting to note that domestic guinea pigs have not been ignored in the New Zealand scientific literature. The magazine Surveillance is published on behalf of the Director of Animal Biosecurity and is an authoritative source of information on New Zealand's animal health status. It routinely publishes articles on the disease status of domestic guinea pigs. One example is the article on dermatophytes by Carman and Gardner (1997). When diseases of cavies occur they are also reported in the Biosecurity Authority animal health surveillance report. One such report was published by Anonymous in 1999.

Furthermore, it is interesting to note that there are no references in the international literature or in the New Zealand literature of domestic guinea pigs becoming feral animals and causing environmental and economic damage like what has occurred with feral rabbits and cats in New Zealand and Australia. Several New Zealand cavy fanciers have told the author that it is generally believed that domestic guinea pigs arrived with the first European settlers to New Zealand in the early 1800's. Therefore, conservatively guinea pigs have had several hundred years to establish themselves as feral animals or become known as a threat to livestock. This has not occurred in New Zealand.

19.0 SPS Pest Risk Assessment

Cavia porcellus do not exist in the wild, but in Peru, the rodent's birthplace, it remains a vital source of protein in rural communities, a mainstay of Andean folk medicine and a common religious sacrifice to the gods. Archaeological evidence shows guinea pigs were domesticated in Peru as far back as 5000 B.C. (Morales, 1995).

The closest relatives to guinea pigs in South America, *Cavia aperea*, are found on montane grassy plains, marshes and along rocky outcrops (Sutherland and Festing, 1987). They move together in small groups eating grass and fruits They tend to be most active during dawn and dusk, when it is harder for predators to spot them (Smallwood, 1992). *Cavia aperea* are a prey species, if startled they either become motionless or can run for cover with surprising speed. They are semi-domesticated but in the wild, they live in hollowed out logs, between rocky outcrops or in abandoned burrows. They do not build nests (Wagner and Manning, 1976). Domestic guinea pigs, *Cavia porcellus*, do not dig burrows, climb or jump (Harkness and Wagner, 1995).
Domestic guinea pigs released into the environment have remote chances of survival since they are prey to ferrets, *Mustela furo*, stoats, *Mustela erminea,* cats, dogs, rats, *Rattus norvegicus*, owls, *Ninox novaeseelandiae*) and falcons, *Falco novaeseelandiae*. In addition, the climate of New Zealand would be too extreme for their survival. The recommended temperature range for guinea pigs is 18° to 26°C (Harkness and Wagner, 1995).

Young pet guinea pigs readily adapt to husbandry systems and workday routine. However, as they mature, guinea pigs are less able to adapt to change; this gives rise to their reputation for being fussy eaters that will often refuse to eat or drink if changes in the feed, water or housing conditions occur (Harkness and Wagner, 1995). Domestic guinea pigs rely on humans to provide them food and protection.

20.0 Conclusion

Guinea pigs imported from Australia present a negligible biosecurity risk to New Zealand livestock, humans or the environment. Cavies do not carry any diseases or parasites that are not already present in New Zealand. Sanitary measures have been proposed to facilitate the development of Import Health Standards.

21.0 Appendix I

21.1 Further Reading

AGREEMENT ON THE APPLICATION OF SANITARY AND PHYTOSANITARY MEASURES
http://www.biosecurity.govt.nz/sps/agreement/sps-agreement.pdf

Biosecurity Act 1993
http://www.biosecurity.govt.nz/legislation/index.htm

Biosecurity New Zealand. Animal Pests and Diseases, OIE Handistatus Database, Ministry of Agriculture and Forestry. 2005
http://www.biosecurity.govt.nz/pests-diseases/animals/index.htm

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http://www.biosecurity.govt.nz/sps/agreement/sps-agreement.pdf

23.0 Attachments

1.0 **Harmon, L**. Letter to Barry O'Neill, Director, Bio Security NZ, MAF. 4th of July 2005

85 Durham St,
ASHHURST

4 July 2005

Barry O'Neill,
Director,
Bio Security NZ,
MAF,
P.O.Box 2526,
WELLINGTON

Dear Barry,

I am writing to you on behalf of many hundreds of Cavy (Guinea Pig) fanciers and their Clubs throughout NZ in regards to the importation of the humble Cavy into our country.

Back in 1995 I applied to MAF for a permit to import 12 Cavies into NZ from Sydney, Australia. The permit was granted and I was provided with a list of procedures required to be carried out both before and after the animals were to enter our country. The last procedure being they were required to be Quarantined on my property for a period of 30 days. All these procedures were carried out to the letter with no problems occurring.

On behalf of several fanciers I successfully carried out 2 further imports from Australia both in 1997 and finally the 8th Feb 2000. All the animals that came in were healthy, remained disease free for the remainder of their lives, and greatly improved the gene pool for our Pedigree stock for both breeding and showing.
Now to my question, I would like to know why the importation of Cavies from Australia is no longer possible?
In the past Cavies were also being imported from the UK into NZ and several small shipments were brought into the country in the early 1980's. This was also halted somewhere along the line (we are not sure when) and the only Country it was possible to import from was Australia.
So consequently this has been a blow to us, as this small animal is practically disease free and poses no health risk to our Bio Security. (I have actually bred them for 17 years myself).
I have made some extensive enquiries to various Staff members at MAF and they have no idea why the importing was stopped and suggested I write to you.

On behalf of the Cavy Fancy in NZ we would greatly appreciate your help in this matter in that we may in the very near future be able to import from at least Australia again.
I thank you in anticipation for your reply.

Yours Faithfully,

Linda Harmon
Ph (06 326 8663) e-mail: linda_colin@inspire.net.nz

PS. for the records the last import was carried out in Conjunction with a friend Amanda McKinnell who's name apprears on the Biosecurity Authority Clearance certificate (copy enclosed for your reference)

2.0 **Harkness, JE.** E-mail to Ann Ramus (Evans) Harkness@Research.MsState.Edu

Dear Ann: I spoke with our microbiologist and I found information in books, articles, and on-line relative to your question, but it would help (perhaps you have done this already) if you spoke with epidemiology/microbiology people at some university near you. I can list diseases that may, even rarely, occur spontaneously in guinea pigs, and diseases that man can cause to occur (force) in guinea pigs (infectious models or experimental infections), but I probably would have a hard time convincing government authorities that the possibility of transmission of most spontaneous infections from pet guinea pigs to livestock is zero or negligible and that the possibility of an experimental/model infection going to livestock is nil. Where are you located? Is there a university near you? As for experimental infections, confined to laboratories, guinea pig models are established for prion disease, ebola, genital herpes, lymphocytic choriomeningitis, respiratory syncytial virus, foot and mouth disease (Pakistan J. Biol. Sci. 5(9):1004-1005, 2002), equine morbillivirus, poliovirus, PIV-3, Venezuelan HF-guanarito, adenovirus 5, and pichende viruses. **But to suggest that pet guinea pigs can transmit by natural routes these experimental infections to livestock is irresponsible without really good evidence to the contrary, which I don't think exists.**
If guinea pigs should escape into the wild and establish a breeding population in, e.g, New Zealand, then there could be bad consequences, but habitat destruction rather than disease transmission is the probable outcome. Spontaneous diseases that occur in guinea pigs that also occur in livestock are several, but some of these are very rare in guinea pigs or caused by a variant organism that does not "go" to livestock or would not be transmitted in any case or are so common anyway that another source doesn't matter that a listing of "shared" diseases is silly and misleading. Some of the "common" infections are Salmonella (so common in so many species),

Leptospira (also common), Mycobacterium ("TB"), ringworm (common), and deep fungi. None of these strikes me in "real life" as being a threat from guinea pigs to livestock.

There are on this faculty microbiologists and epidemiologists with whom I could speak further, but try to find an at hand academic person familiar with infectious disease who understands better than I New Zealand's thinking. If I can help, let me know.

Cheers, John Harkness