

USDA APHIS AZA

**Management Guidelines for Avian
Influenza:**

Zoological Parks & Exhibitors

Outbreak Management Plan

Preface

This document represents the views of an ad hoc group of members from the Association of Zoos and Aquariums (AZA) Animal Health Committee and American Association of Zoo Veterinarians (AAZV) Infectious Disease Committee working in collaboration with USDA-APHIS staff. The purpose of this "Outbreak Management Plan" is to provide information to the range of people who would be involved in containing and managing the detection of avian influenza (AI) in or near a zoological institution. This document will outline procedures and control measures to be used for both low pathogenic avian influenza (LPAI) and highly pathogenic avian influenza (HPAI).

LPAI and HPAI are defined by this document in accordance with OIE (World Organization for Animal Health) guidelines in the Terrestrial Animal Health Code (2008) Chapter 10.4.1¹:

For the purposes of *international trade*, avian influenza **in its notifiable form** (NAI) is defined as an *infection of poultry* caused by any influenza A virus of the H5 or H7 subtypes or by any AI virus with an intravenous pathogenicity index (IVPI) greater than 1.2 (or as an alternative at least 75% mortality) as described below. NAI viruses can be divided into highly pathogenic notifiable avian influenza (HPNAI) and low pathogenicity notifiable avian influenza (LPNAI):

- a. HPNAI viruses have an IVPI in 6-week-old chickens greater than 1.2 or, as an alternative, cause at least 75% mortality in 4-to 8-week-old chickens infected intravenously. H5 and H7 viruses which do not have an IVPI of greater than 1.2 or cause less than 75% mortality in an intravenous lethality test should be sequenced to determine whether multiple basic amino acids are present at the cleavage site of the hemagglutinin molecule (HA0); if the amino acid motif is similar to that observed for other HPNAI isolates, the isolate being tested should be considered as HPNAI;
- b. LPNAI are all influenza A viruses of H5 and H7 subtype that are not HPNAI viruses

The OIE uses specific language to describe 'poultry' as "all domesticated birds, including backyard poultry, used for the production of meat or eggs for consumption, for the production of other commercial products, for restocking supplies of game, or for breeding these categories of birds, as well as fighting cocks used for any purpose."

The OIE goes further, and states that "birds kept in captivity for any reason other than those reasons referred to in the preceding paragraph, including those that are kept for shows, races, exhibitions, competitions or for breeding these categories of birds as well as pet birds, are not considered to be poultry." **This distinction between zoological collections and poultry is extremely important in terms of potential response to the outbreak of any HPAI in zoological specimens.**

All other subtypes of LPAI are not considered to be notifiable avian influenza, but may include subtypes H1-H16 (excluding H5 and H7 NAI). LPAI has shown minimal risk to human and animal health, and may not require the same control measures as HPAI. This document seeks to provide measured proportionate responses in zoological parks to detection of: LPAI non-H5/non-H7/non-H9 subtypes;

¹ The OIE Terrestrial Animal Health Code (2008) Chapter 10.4.1:
http://www.oie.int/fileadmin/Home/eng/Health_standards/tahc/2009/en_chapitre_1.10.4.pdf

LPAI H5, H7, or H9 subtypes; and HPAI based on their threat to both agriculture and human health.

This document provides the USDA-APHIS Emergency Management and regional and local emergency management staff with the framework for decision-making in a situation in which a disease emergency were to impact a zoo. In addition, these guidelines should serve as a set of operational procedures for AZA-accredited institutions in the event of a disease emergency. Individual zoological institutions should incorporate the proposed strategies into routine procedures as well as develop additional specific plans for their facility. **Zoo and aquarium staff should work closely with local, regional and federal agency representatives in human, livestock and wildlife health in advance to get pre-approval of mitigation and prevention plans.**

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1 NATURE OF THE ENTERPRISE

1.1 Relevant Federal Legislation and Regulations

1.1.1 Animal Welfare Act (AWA)

The Animal Welfare Act (7 USC 2131-2156) was passed in 1966 and later amended in 1970, 1976, 1985 and 1990, to protect certain animals from inhumane treatment and neglect. The AWA requires that minimum standards of care and treatment be provided for most warm-blooded animals bred for commercial sale, used in research, transported commercially, or exhibited to the public. Individuals who operate facilities in these venues must provide their animals with adequate care and treatment in the areas of housing, handling, sanitation, nutrition, water, veterinary care and protection from extreme weather and temperatures.

The USDA/APHIS administers the AWA, its standards and its regulations. The USDA/APHIS Animal Care program is responsible for ensuring zoo and aquarium compliance with the AWA through licensing requirements and periodic, unannounced inspections.

1.1.2 Animal Welfare Act Regulations

In implementing the AWA, USDA/APHIS has promulgated numerous regulations and policies that guide the daily operation of AZA accredited zoos and aquariums. These regulations are found in the *Code of Federal Regulations—Title 9: Animal and Animal Products; Chapter 1: Animal and Plant Health Inspection Service; Subchapter A—Animal Welfare; Parts 1 (Definitions), 2 (Regulations) and 3 (Standards)*.

1.1.3 Animal and Plant Health Inspection Service (APHIS) Authorization Act

The APHIS Authorization Act (21 USC 101-136) regulates the importation and exportation of ruminants, swine, poultry, birds, pigeons, horses, animal semen, blood and serum. The Act gives the USDA authority to protect the United States against infectious and contagious diseases.

1.2 Definition of Exhibitor

Individuals or institutions that possess warm-blooded animals for public exhibition and affect interstate commerce must be licensed as exhibitors with the U.S. Department of Agriculture/Animal and Plant Health Inspection Service (USDA/APHIS). Examples of licensed exhibitors include:

Zoological Parks/Exhibits--Animal exhibits (even if only a single regulated animal is on exhibit) open to the public must be licensed whether they are owned by states, counties, or other local governments; corporations; foundations; or private individuals. Zoos run by agencies of the federal government are not licensed or registered, but the animals in these zoos are inspected and are subject to these same USDA standards of animal care. Petting zoos with regulated animals, including rabbits, must be licensed and are subject to special regulations protecting animals and the public.

Marine Mammal Shows--Exhibits, shows, and acts with marine mammals must be licensed. This includes public aquariums, amusement parks, and zoos. However, exhibits in which free-living marine mammals are viewed in their natural state are exempt; examples are coastal seal rookeries or commercial whale sightseeing tours. Marine mammals include polar bears, sea otters, whales, porpoises, dolphins, manatees, dugongs, seals, sea lions, walruses, and other mammals that have fins or flippers. Marine mammals are protected by a separate set of standards for care and handling.

Animal Performances--Any owner exhibiting animals engaged in performances or shows must be licensed. This includes each person owning animals performing in circuses, marine mammal shows, amusement parks, carnivals, independent animal acts, television shows, movies, or educational exhibits.

Carnivals--Concessionaires who exhibit regulated animals must be licensed as exhibitors. Carnivals cannot be included in the exemption of an agricultural show, such as a fair with a midway.

Promotional Exhibits--Anyone who uses regulated animals to promote or advertise goods and services must be licensed.

Examples of exempted exhibitors include:

Private Collections--Anyone who collects animals but does not exhibit them to the public is exempt.

Farm Animal Exhibition--Anyone who arranges and takes part in showing farm animals at agricultural shows, fairs, and exhibits is exempt. However, anyone exhibiting farm animals for nonagricultural purposes (such as petting zoos) must be licensed. Exhibitors of foreign farm animals not commonly kept on American farms, including camels, must be licensed.

Animal Preserves--Game preserves, hunting preserves, and similar enterprises that keep animals in the wild state are exempt. "Wild state" means non-domesticated animals living in their original, natural condition.

Shows of Nonregulated Animals--Anyone with exhibits limited to species of animals not covered by law or regulated is exempt. Typical examples would be aviaries, reptile houses, and aquariums not showing marine mammals.

1.2.1 Zoological Parks and Aquariums: The Association of Zoos and Aquariums

"Zoological Parks/Exhibitors" includes members of the Association of Zoos and Aquariums. The AZA is a professional organization representing zoos and aquariums, predominantly in the United States. AZA is the leader in establishing and maintaining high professional standards for zoos and aquariums through its accreditation process. Accreditation is a detailed review and inspection process covering all aspects of an institution's operation including animal collection, veterinary care, physical facilities, safety, biosecurity measures, security, finance, staff, governing authority and support organizations. Accreditation also accords special attention to the use of the living collections and the nature of their management for conservation, education, scientific research and recreational purposes.

This document was prepared for use by Association of Zoos and Aquariums (AZA) member institutions, with cooperation and support from USDA APHIS Animal Care, and approved by AZA Animal Health Committee. HPAI is a reportable foreign animal disease, and ultimately, outbreak management will be dictated by designated State and Federal animal authorities. This Outbreak Management Plan will serve as a guide for zoos and regulatory authorities, and can be adapted and used by other exhibitors where appropriate.

For the purposes of AZA's accreditation program, a zoological park or aquarium is defined as a permanent institution which owns and maintains wildlife, under the direction of a professional staff, provides its collection with appropriate care and exhibits them in an aesthetic manner to the public on a regularly scheduled, predictable basis. The institution, division, or section shall further be defined as having as their primary mission the exhibition, conservation, and preservation of the earth's fauna in an educational and scientific manner. Accreditation takes place every five years and is required for zoos and aquariums to be members of AZA (For more details on AZA Accreditation, consult <http://www.aza.org/Accreditation/>).

In addition to accreditation, AZA also conducts a similar evaluation to certify membership for those facilities maintaining wildlife, which are not regularly open to the public.

As of September 2009, there are 221 AZA accredited zoos and aquariums.

2 RISK REDUCTION TECHNIQUES

Introduction

This section addresses Best Practices for zoos to avoid disease introduction and spread of a foreign animal disease. In the case of HPAI, these recommendations are appropriate for a **zoo that does not have any clinical or suspected cases of HPAI, and is not situated in a declared quarantine zone for HPAI**. The techniques described should be incorporated into the daily management of a zoological collection to minimize the risk of introduction of a foreign animal disease or **any** other disease emergency.

2.1 Animal Management

2.1.1 Management of Animal Acquisitions and Dispositions

In addition to the sound management of animal collections in zoos (in accordance with Association of Zoos and Aquariums accreditation standards), the implementation of the following management strategies will significantly reduce the risk of an emergency disease outbreak, maximize early detection, and assist in control measures.

- All animals must be permanently identified at all times and detailed records kept (ISIS ZIMS is recommended for record keeping as soon as available).
- The senior veterinarian and general curator should have available a current inventory along with origination/source of all imported animals held by the institution which is updated on an annual basis.
- The senior veterinarian and general curator should be advised of the relocation within or between institutions of any imported animal.
- Do not accept shipments of animals from facilities known to be in close proximity to or experiencing an outbreak of and FAD such as HPAI. Preshipment examination and certification surrounding animal movements between institutions provides an additional opportunity for disease detection.
- The senior veterinarian should be advised of the cause of death of any quarantined or imported animal as soon as possible after the postmortem examination. Disposal of the carcass should be performed to minimize potential transmission of pathogens to humans, other collection animals, or wildlife (see Section 2.7- Disposal Systems Review).
- During initial quarantine of an incoming animal, access to animals should be limited to essential staff (veterinary and designated animal care staff only). Biosecurity standards for quarantine should follow those outlined in the AZA accreditation standards.
- Waste material from animals in quarantine should be treated in a manner that limits access by all other fauna (including free-ranging animals/birds).
- Biological specimens from animals in quarantine should be handled, transported, and stored under conditions that will minimize the potential transmission of pathogens while preserving the integrity of the sample for diagnostic testing.
- There may be a need to consider the spatial requirements (distance) between animals in quarantine and those that have been cleared. For example, zoo quarantine areas for some species may include outdoor holding areas. Potential for aerosol or fomite transmission should be minimized using facility design, animal management procedures, and spatial arrangements.

- When animals are in quarantine, an all-in-all-out policy should be adopted (based on taxonomic and disease transmission considerations) per AZA quarantine guidelines.
- All animals that are relocated from a zoo collection should have a current health assessment prior to movement. Detailed records of movement of the animals should be kept according to AZA accreditation standards. This will facilitate “trace-forward” and “trace-back” investigations.

2.1.2 Management of Resident Animal Collection

The level of biosecurity and record-keeping required for each institution to comply with AZA accreditation standards will significantly reduce the risk of acquiring an exotic animal disease.

- All animals are individually identified.
- **Daily observation by animal care staff** of each animal for clinical signs of disease and method of reporting abnormalities facilitates early veterinary investigation.
- Record-keeping method should include current enclosure or location of each individual.
- Historical movements of individual animals between locations within an institution should be readily available in a manner which allows identification of potential contacts in an epidemiological investigation.
- Where possible, prohibit access by wild birds and other animals and vermin to enclosures or water features housing collection specimens.

2.2 Veterinary Services

- Veterinary services provided to the AZA-accredited institutions should include emergency disease preparedness plans.
- The attending veterinarian should be familiar with all relevant aspects of the institution’s animal handling and management practices so as to enable more informed decisions if an exotic animal disease is suspected.
- The veterinarian should be aware of reportable diseases and procedures for reporting suspected cases.
- The veterinary health program should be designed so that there is a reasonable chance of detecting disease should it be present.
- The veterinarian should be involved in basic training of staff in procedures to minimize the spread of disease.

2.3 Training of Staff

- The main objective of training (as it applies to these guidelines) is to prepare zoo staff for an emergency disease, including training for specific individual roles and information about means of transmission and recognition of clinical signs of highly pathogenic avian influenza.
- Emphasis should be placed on the need for staff to report promptly any abnormalities in animals under their care.

2.4 High Risk Species for Avian Influenza

Certain avian taxa have been identified as reservoirs for avian influenza. The Anseriformes, Charadriiformes and Ciconiiformes are the most common wild bird reservoirs for LPAI. Other species of concern based on present knowledge include suids, felids, non-human primates, and carnivores with

access to wild birds. Of lower concern are other naive species that might also come into contact with wild bird fluids or feces. It is important for zoo employees to continue to be aware of additional taxa that may be identified as reservoirs of LPAI or found to be susceptible to HPAI.

2.5 Regular Sampling

Regular sampling of collection animals for a range of diseases by fecal, urine, or blood analyses is part of each institution's routine preventive health program (see AZA Accreditation Standards). These opportunities to collect samples may include serological and other testing for diseases of concern and banking of samples. Banked samples would permit a more thorough epidemiological assessment of disease in the collection, and is therefore encouraged.

In conjunction with AZA, the USDA is funding a voluntary avian influenza surveillance system for zoological institutions. For details on the sampling and submission procedures, or for information on participating, please see the following website: <http://zooanimalhealthnetwork.org>

2.5.1 Laboratory Submissions

- Zoo veterinarians should be encouraged to include emergency diseases in their differential diagnoses and submit appropriate samples to a state laboratory within the National Animal Health Laboratory Network (NAHLN), and if confirmation is required (as with all reportable diseases) the sample will be forwarded to the National Veterinary Services Laboratory (NVSL) or the Plum Island Animal Disease Center (PIADC).
- Suspect cases should be reported to the state animal health official/state veterinarian and USDA area-veterinarian-in-charge. Additional diagnostic testing may be directed by a trained Foreign Animal Disease (FAD) diagnostician during a field investigation.

2.5.2 Routine Screening of Deaths

In accordance with AZA-accreditation standards, all collection animals that die in a zoo should receive a complete necropsy. This provides a check on the disease status of the zoo's animal collection. If lesions consistent with HPAI are present, appropriate samples for additional diagnostic testing should be collected (i.e. affected tissue, tissue fluid, serum if possible). The state animal health official/state veterinarian and USDA area-veterinarian-in-charge should be notified of suspect cases.

2.6 Work Practices and Staff Hygiene

It is recommended that the following routine practices be followed:

- Work clothes, including footwear, should be worn only at work.
- Contact between animals kept at home and zoo animals should not occur. This includes indirect contact via footwear, equipment and clothes as stated above. Hand-washing before and after work is an additional risk mitigation technique that should be mandatory.
- Close preventive health monitoring of personally owned animals; it is very important to report and follow-up on any suspect signs of clinical illness.

All para-professional and professional staff who are directly involved in animal care positions should be encouraged to have seasonal influenza vaccines, which may provide some protection against possible zoonotic influenza strains.

More stringent personal protective equipment (PPE) guidelines are recommended as the risk of exposure to HPAI H5N1 increases. Appendix 6.1 lists the appropriate PPE guidelines by proximity to suspected HPAI.

2.7 Disposals Systems Review

AZA accredited zoos have developed disposal protocols for their individual institutions that meet with AZA standards and their own local and state requirements. Disposal of potentially infectious materials in emergency situations should be discussed and solutions identified before an emergency occurs. They may include:

- Identification of strategic locations for disposal facilities well in advance of an emergency disease event.
- Any disposal procedure that necessitates the transport of carcasses from inside an infected premise to a distant location increases the risk of spread and may require special measures. (This includes the occasional use of carcasses or portions of carcasses of animals from zoos for teaching purposes or as museum exhibits.) It also applies to the transport of carcasses of animals too large to undergo necropsy examination or disposal at the zoo and which have to be transported to an outside facility. If on-site facilities for carcass disposal are unavailable, commercial facilities licensed for disposal of infectious medical waste can be utilized. All procedures for carcass disposal should comply with AZA accreditation standards and state and local regulations. These procedures should provide adequate biosecurity measures and traceable disposition of carcasses to prevent transmission of pathogens, including HPAI virus.
- In a disease emergency, feces, bedding, and used hay should be incinerated or buried on-site. Non-infective fecal material, i.e. from animals not involved in an outbreak may be composted under instructions from, and with the permission of the state veterinarian and/or USDA area-Veterinarian-in-charge. Fecal waste from recently imported susceptible animals still in quarantine should be kept separate or sterilized before disposal.
- Consult your state and federal agencies for guidance on approved disinfectants. There are many options since the virus is susceptible to most disinfectants. A list of all EPA approved disinfectants can be found in Appendix 6.2.

3 RISK REDUCTION TECHNIQUES: HPAI DETECTED IN US

Introduction

The detection of HPAI in the US or geographic region may necessitate a higher level of biosecurity for the protection of zoological specimens and employees. All of the AZA accreditation standards and the Best Practices for biosecurity as outlined above should be implemented. Zoo veterinary staff and state/federal experts should discuss the situation, and additional preparations should be considered if necessary. To prepare for possible incursion of the disease, in this case HPAI, the following recommendations should be considered for implementation:

3.1 Identification and Preparation of Isolation Facilities

Isolation areas should meet requirements for quarantine facilities as outlined in the AZA accreditation standards. Staff designated to work in these areas should use the appropriate PPE as outlined by the National Association of State Public Health Veterinarians (NASPHV) Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel (see Appendix 6.1 for further information).

3.1.1 Isolation Premises for Small Birds and Susceptible Mammals

- Isolation premises for small species must be indoors and bird, vermin, and insect-proof.
- Facility should also have no wind currents (i.e. have static air);
- change room facilities preferably with showering and washing facilities; footbaths;
- efficient waste collection and disposal
- Use dedicated utensils, instruments, and clothing.

3.1.2 Isolation Premises for Large Birds and Susceptible Mammals

- Large animal isolation premises must be in a part of the property that permits as wide a buffer zone as possible from other stock or have solid walls that prevent aerosol transmission.
- Must also have change and washroom facilities; footbaths; dedicated utensils, instruments and clothing;
- Must be tended by staff that will not have further contact with any other collection animals that day. Staff in these areas should use the appropriate PPE as recommended by the NASPHV (see Appendix 6.1 for further information).

3.2 Vaccination

Vaccination of captive zoo birds could be an appropriate additional preventive measure, under certain circumstances, if it is part of a comprehensive prevention and control plan. Current guidelines for vaccination are outlined in **USDA APHIS Vaccination Plan for AZA Accredited and AZA Equivalent Zoos**. The decision to allow vaccination for H5 and H7 AI subtypes will be made by USDA-APHIS personnel along with the state veterinarian. Due to the individual value of rare or endangered species, authorization to vaccinate should be obtained early if the threat of an outbreak occurs. In the face of an emergency, experimental vaccine may need to be used in susceptible mammal populations to prevent infection. The continued development and testing of 'universal' vaccines should

be encouraged by the AZA community to protect a broader range of the species that are exhibited in our institutions.

Other points to consider in making the decision to vaccinate include:

- The Commission of the European Communities published a Commission Decision of 21 October 2005 establishing the requirements for prevention of HPAI-H5N1 in zoo birds using vaccination.
- There are studies showing response to vaccination of some species of zoo birds.
- The AZA member institutions' collections contain many species with irreplaceable conservation value (e.g. California condor, Micronesian kingfisher, and many more).
- If HPAI were present in migratory birds in the regional flyways, there would be a high risk of exposure to the many specimens housed at the AZA member institutions. Wild birds cannot be kept out of our facilities, and there is not enough suitable housing to keep all at-risk birds and susceptible mammals indoors.
- Public health risk to employees working with collection birds and susceptible mammals during an outbreak would be decreased if those birds were vaccinated.
- Vaccination of employees for seasonal influenza is highly encouraged wherever possible as some measure of protection.
- AZA accredited facilities can responsibly manage vaccination of animals in zoo collections as a) all collection animals are individually identified, b) pre- and post-vaccination samples can be collected, and c) movement of vaccinated animals can be controlled.
- Public confidence in our facilities can be increased by having avian vaccination as part of our preparedness plan.

Vaccination of all or part of an AZA institution's avian collection would be triggered when the institution is affected by one or more of the following conditions:

- Presence of HPAI-H5N1 (or other HPAI strain shown to have similar risk) documented or highly suspected in migratory birds of the regional flyway.
- Presence of HPAI-H5N1 (or other HPAI strain shown to have similar risk) documented or highly suspected in poultry in the United States, Canada, or Mexico, and determined by state or federal regulatory agencies to be threatening the collections of one or more AZA institutions.
- Additional vaccine studies for research purposes could be approved by USDA and state regulatory agencies in advance of the above triggers.

Prerequisites for vaccination of birds in AZA institutions using collections would include:

- A list of priority species to be vaccinated would be developed and based on the following criteria: 1) degree of exposure, 2) conservation value, 3) susceptibility to infection, and 4) ability to safely capture and handle.
- Each AZA institution will take appropriate and practical measures to reduce the risk of transmission of avian influenza from birds living in the wild to susceptible species kept in its facilities.
- Vaccinated animals would not be eligible for interstate or international movement unless specific conditions are met and agreed to by receiving states or countries.
- Vaccinated animals would not be intended for the production of animal products.
- Previous approval from the USDA and state regulatory agencies for vaccination using H5 and/or H7 AI subtype vaccine, final verbal approval from the USDA area-veterinarian-in-charge, and availability of approved vaccine.

Proposed vaccination protocols:

- Each AZA institution will submit a prioritized list of species and individuals it plans to vaccinate to the USDA and state agricultural authorities for H5 and H7 AI subtype vaccine.
- Each individual to be vaccinated will possess a permanent physical identification (e.g. leg band and/or transponder) that corresponds to an individual inventory number, move history, and medical history (again, ISIS ZIMS is recommended for record keeping when available).
- The type of vaccine and vaccination schedule will be based on recommendations by regulatory agencies, manufacturer, and any vaccination studies done on similar species.
- Each animal selected for vaccination will be weighed and identified.
- Blood samples will be taken prior to vaccination from all animals dependent on size and venous access. Plasma or serum samples will be frozen and stored.
- Animals will be vaccinated using manufacturers recommendations for poultry, with dose adjustments as needed for larger animals.
- Animals will receive a booster at 2-4 weeks. Additional blood samples will be collected and submitted with the pre-vaccination samples for serology.
- A third blood sample will be collected in selected animals at 6-8 weeks following the initial vaccination. The animals will be selected based on conservation value and feasibility of collecting additional samples. Additional vaccinations will be given based on these results.
- Additional booster vaccines will be considered based on disease status in region.
- A report on vaccinations given, adverse effects, and serological results will be made available to officials at USDA when requested.

The local Incident Command Center (ICC) and USDA-APHIS Emergency response team will determine the appropriate minimum distance from the zoo to the outbreak focus in which to vaccinate susceptible animals. This will depend on the individual circumstances including the density of susceptible animals in the area, climatic and traffic conditions. Vaccination of zoo animals should not change the HPAI status of the country in which these animals reside; therefore, domestic farm/agricultural animals will not be vaccinated at AZA accredited institutions.

3.3 Public Relations and Education

In the event of an emergency disease, a zoological institution could be the target of intense media interest, regardless of how close it is situated to a zone of infection. In preparation for the event of an emergency disease outbreak, every institution should formulate a plan for handling public relations. Someone should be designated as the zoo media officer (ZMO); this will usually be someone from the public relations or marketing office but must be a senior staff member. In the event of an outbreak, the ZMO should be advised immediately and kept up-to-date periodically.

Media and public relations activities relating to a zoological institution should ensure:

- Rapid and effective information flow and media operations in the event of an emergency disease affecting or threatening to affect a zoo;
- An up-to-date, constant flow of accurate information to:
 - Staff within the affected premises,
 - Staff at other zoos,
 - Media outlets and, via them, the general public.

Part of the ZMO's responsibility is ensuring the cooperation of zoo staff by keeping them fully informed about animal management decisions and animal health status. Technical information regarding the situation should be explained in layman's terms and should be prepared in advance. Information available from the USDA-APHIS website can be a resource for public educational materials. Signs, graphics and brochures should be used to communicate actions being taken to minimize the impact of HPAI on the public and zoo personnel. Film footage and photographs of pertinent animals should be available in the event of a disease emergency.

4 RESPONSE PLANS IN A SURVEILLANCE ZONE

Introduction

This section addresses the situation where a zoo **does not have any confirmed or suspected cases of HPAI itself, but is within a surveillance zone** due to an outbreak on another property. Member institutions will work closely with local, regional and federal agency representatives in human, livestock and wildlife health in advance to get pre-approval of response plans.

4.1 Surveillance/Quarantine Zone

The surveillance zone surrounds the infected zone; its area is defined by emergency managers of the state(s) in which the outbreak occurs, in conjunction with the USDA. The exact boundary of the zone is variable and will be established with the goal of containing the outbreak. International guidelines for establishing surveillance areas are provided in the OIE animal health code.

A surveillance/quarantine zone creates a buffer between the infected zone and areas free of disease; restrictions within this area will reduce the chance of the disease spreading further. The surveillance area should reduce in size as confidence about the extent of the outbreak becomes clearer. USDA VS and Emergency Management works with the State authorities to define the appropriate Surveillance Zone. . In principle, animals and specified product will only be able to be moved out of the surveillance/quarantine area into the free area by permit.

While in a surveillance zone, it is recommended that all animal movement be halted. Any exceptions to this would need to be negotiated with local, state, and USDA representatives on a case-by-case basis.

4.1 Local Disease Control Center

In the event of an outbreak of HPAI, which is a reportable foreign animal disease (FAD) the affected state and USDA APHIS will be responsible for disease control activities. An Incident Command Post (ICP) comprised of state, federal, and local authorities will be established and will be responsible for all activities within the surveillance zone, including disease investigation, collection of specimens, quarantine of properties, valuation, slaughtering and disposal of livestock, and decontamination of properties.

Senior zoo officials should be in contact with the Incident Commander (IC) and all support staff must be made fully aware of Incident Command System requirements and of all arrangements made to control and eradicate the disease.

4.2 Can the Enterprise Continue to Operate in a Declared Surveillance Zone?

Zoos generally have a higher level of security than most agricultural enterprises with the exception of some intensively managed species.

The following physical and procedural components may allow zoos to continue to remain open if they are located in an established surveillance zone:

- They are characterized by fencing constructed to exclude both livestock and feral animals.

- Gate entry is usually under close supervision by staff during opening hours and key operated after hours. Zoos in surveillance areas can be quickly quarantined since the physical and management barriers required are already in place
- Automatic or mechanically operated gates are used in some zoos.
- Service entrances are usually similarly secure. Regular fence inspections are routine in accredited zoos. Emergency procedures are readily available since many of these are applicable to animal escapes and can be quickly applied to, or modified for, disease control purposes. There are also established 'chains of command' and communication procedures ensuring adherence to emergency procedures.
- Animal keepers generally have training in the principles of disinfection and sanitation. Daily records are available to supervising veterinarians and are regularly reviewed thus allowing for early recognition of any suspected emergency disease.

4.2.1 Staff Entry

Staff entry onto zoo grounds that is under surveillance will be necessary in order to maintain care of animals in the collection. They will perform routine disinfection, plus any other procedures required by the ICP, upon entering and leaving the surveillance area; dedicated work clothes and areas for changing must also be ensured for all personnel as stated above, and additional appropriate PPE will be worn as determined by ICP.

4.2.2 Public Access

Each institution should work with their local, state, and federal (USDA) animal and public health officials to discuss potential risks to the public and to the collection specimens should the zoo find itself in a surveillance zone. In the case of a zoonotic HPAI, it is possible that pre-clinical humans may potentially infect collection specimens that they come in close contact with. Depending on the disease dynamics, the closing of exhibits that allow close contact with susceptible animals may be an appropriate response to protect the collection specimens. For highly virulent diseases such as HPAI, visitors should be denied access to direct animal contact or into animal areas. The period of this level of control should be decided by consultation between senior zoo managers, veterinary staff, and the ICP. Automatic gates should be converted to manual operation, and unattended gates should be attended, while the zoo is in a restricted area.

4.3 Minimization of Risks Associated with Maintaining Operations

Each institution should designate a person (HPAI Liaison) to communicate directly with the ICP/IC. The liaison would preferably be a veterinarian, but may be a high-level person from the animal management staff in close communication with a veterinarian. Each area of the zoo should have a coordinator that works with the HPAI liaison to ensure that biosecurity measures are in place and adhered to. Senior or supervising curators, or designated keepers, should be placed in charge of controlling staff and visitors coming into their area of the zoo and be in close communication with the HPAI liaison.

Important areas of biosecurity include, but are not limited to:

- Preventing movement of high risk animals into the zoo except with ICP permission; lower risk animal traffic should be minimized as well due to the possibility of mechanical transmission;

- Enforcing decontamination procedures of staff and vehicles moving into and out of the zoo;
- Organizing and prioritizing staff duties and movements, with high-risk animals being dealt with last;
- Ensuring decontamination/disinfection of zoo vehicles and other equipment;
- Providing proper training and refresher training for the recognition of clinical signs and prompt reporting of any unusual signs in collection animals.

4.3.1 Animals

- In addition to Section 2.1- Animal Management, additional risk reduction techniques should be considered:
- The curator and zoo veterinarian should prepare a list of all the potentially susceptible animals within the zoo divided into high- and low-risk groups. The high-risk group should consist of animals that have proven to be highly susceptible to HPAI. The low-risk group should consist of animals that are known to be resistant to infection or are housed in such a way (e.g. protected suspended caging) that helps to prevent infection.
- Housing conditions (indoors vs. outdoors) may be an important factor in determining risk depending on source of disease introduction.
- When possible, outdoor ponds should be drained to prevent wild waterfowl from congregating. Proper disposal of pond water will be determined by ICP. It may be desirable to withdraw any high-risk or high value susceptible species from public display while restrictions are in place.
- A schedule of regular surveillance for the presence of HPAI should be developed for both low and high-risk groups. The methods and frequency should be appropriate for the species involved. Instructions should then be given to relevant staff, such as keepers, to carry out these surveillance procedures and report the results to the veterinary section.

4.3.2 Animal Movement Controls

- All movements of susceptible species within and into or out of the zoo should cease; exceptions may be made only by permission of the senior veterinarian and the ICP (state and federal authorities would decide to issue movement permits).
- Any endangered or valuable susceptible species should be immediately moved to the most biosecure facilities available within the zoo and kept there in isolation from all other susceptible species. Where possible, bring high-risk birds housed in outdoor enclosures indoors, or into temporary quarters (e.g. tents), until the wave of infection has safely passed by the facility, quarantine has been lifted or vaccination becomes available or effective
- Zoo staff should not have contact with other susceptible species within the surveillance zone or any other high-risk area as determined by the ICP during an HPAI outbreak. If animals are already in transit and have to be admitted to the zoo for lack of other suitable holding facilities, they should be held in isolation from other susceptible species until it is clear that there is no risk of disease transmission involved.
- Where possible, all free-ranging exhibition **fowl** (e.g. peafowl, pheasants, etc.) should be captured and placed into enclosures or removed from the grounds because of the security risk they pose to the facility.

4.3.3 Animal Feeds

- Use of raw poultry products as animal feed should be discontinued. Recent raw poultry product introductions should be traced immediately.
- If the source of food is within the surveillance or infected zone, it should not be fed to susceptible species.
- If the risk of previous cross contamination is considered significant, the food should be destroyed following the procedures in the Disposal Procedures Manual.
- Further food brought in to the zoo should only be sourced from outside the surveillance and infected areas; if not feasible, special arrangements should be made with the ICP.

4.3.4 By-Products

- As a matter of priority the ICP should determine the conditions of disposal of zoo organic by-products.
- If they cannot be disposed of normally then they must either be stockpiled in the zoo or removed and transported (in a manner approved by the ICP) to a suitable disposal site.
- For non-organic product or materials leaving the zoo, advice should also be sought from the ICP as to the need for any disinfection or restriction on movement of such products.
- All movements of products out of the zoo should be minimized.

4.3.5 Vehicles

- All service entrances should be treated as critical control points.
- Any recent vehicle movements into the zoo proper (excluding visitor parking areas) should be traced.
- Where such vehicles are still within the zoo and there is any risk of contamination, they should be withdrawn from use until decontaminated.
- Decontamination should include disinfection of tires, wheel wells, and undercarriage with an appropriate disinfectant.
- A checkpoint and vehicle disinfection station should be set up for all future vehicle entries into the zoo proper. Only essential vehicles that have not originated from, or passed through, the infected zone and have appropriate permits from the ICP should be allowed entry.
- Drivers should be queried regarding recent bird contacts and delivery routes prior to admission. and the use of footbaths by drivers should be enforced.

4.3.6 Equipment and Materials

- Tracing of all recently introduced equipment and materials should be carried out. Where there is any uncertainty as to whether it may have been in contact with the infectious agent then it must be immediately decontaminated, along with sites where it has been held and people who have handled it (see Section 5.4- Decontamination).
- If decontamination cannot be effectively performed then such material should be destroyed (with likely compensation) following the appropriate procedures in the above manual. All routine entry of equipment and materials from other parts of the declared area should cease, except where the ICP has approved movement on a case-by-case basis.

4.3.7 Personnel

An initial joint briefing by a senior zoo officer (HPAI liaison) and a representative of the ICP (state and federal authorities) should be given to the staff. This should concentrate on eliminating contact between people and susceptible species outside the zoo. **Staff who must have contact with susceptible species in the surveillance zone outside the zoo should not have direct contact with susceptible species within the zoo.** Staff should be advised to keep direct contact between susceptible species and people to a minimum. They should also pay particular attention to hygiene in food preparation; it may be desirable for a separate area to be set up for food preparation during the outbreak. Dedicated personnel for susceptible animals helps minimize the risk of disease spread should it occur. Staff working with susceptible animals should shower, change clothes or undergo personal disinfection before and after handling these animals. The following precautions would also be helpful:

- All personnel entering animal areas should shower and change clothing when entering and leaving the premises;
- No contact between keepers and non-zoo susceptible animals, either directly or indirectly (including clothing);
- Laundering of dedicated work clothes on site;
- Car parking relocated elsewhere than within the zoo grounds.

4.3.8 Vermin and Feral Animals

Immediate, heightened action should be taken to control any vermin or feral animals that could spread the disease agents. This may include rodents, wild birds, and a variety of wild mammals. As permits may be required, USFWS, State and other regulatory agencies should be consulted. For control of insects, an entomologist with the Department of Agriculture or Public Health should be consulted. In addition, attention should be paid to the security of boundary fencing and enclosures to prevent the entry of animal vectors. Particular attention should be paid to enclosures holding any susceptible species.

4.3.9 Buildings and Structures

A general clean-up of all building and enclosures should occur with any accumulated garbage/unused equipment removed. Particular attention should be paid to removal of any accumulated organic material that may either harbor microorganisms or act as insect or vector breeding grounds.

4.4 Media and Public Relations

In the event that a zoo or similar facility is within an AI surveillance zone, some media attention would be inevitable. The designated HPAI liaison would be responsible and must work with the ICP (local disease control center) to provide media releases as necessary (see Section 3.3- Public Relations and Education).

5 RESPONSE PLANS IN INFECTED OR SUSPECT PREMISES

Introduction

This section covers the situation where a zoological park lies **within a declared infected zone (area determined by ICP), has animals known to have been in direct contact with infected animals, or has infected animals on the premises.** Declared premises are defined below. Zoo and aquarium personnel should work closely with local, regional and federal agency representatives in human, livestock and wildlife health in advance to get pre-approval of all response plans.

Infected premises (IP): an area (which may be all or part of a property) in which an emergency disease exists, or in which the infective agent of that emergency disease exists or is believed to exist. There may be cases where no diagnostic tests have yet been completed and the state veterinarian may decide to quarantine a zoo premises.

Suspect premises (SP): an area containing animals that might have been exposed to a reportable disease through possible contact with infected animals or facilities, people, equipment, semen or embryos, and currently show no clinical signs; OR where clinical signs of the disease are evident, but the diagnosis is yet to be confirmed.

5.1 Low Pathogenic Avian Influenza

The response plans provided by the document are divided into two groups based on the level of pathogenicity of the avian influenza virus that is detected. Both LPAI and HPAI are defined by this document in accordance with OIE (World Organization for Animal Health) guidelines in the Terrestrial Animal Health Code (2008) Chapter 10.4.1²:

For the purposes of *international trade*, avian influenza in its notifiable form (NAI) is defined as an *infection* of **poultry** caused by any influenza A virus of the H5 or H7 subtypes or by any AI virus with an intravenous pathogenicity index (IVPI) greater than 1.2 (or as an alternative at least 75% mortality) as described below. NAI viruses can be divided into highly pathogenic notifiable avian influenza (HPNAI) and low pathogenicity notifiable avian influenza (LPNAI):

- a. HPNAI viruses have an IVPI in 6-week-old chickens greater than 1.2 or, as an alternative, cause at least 75% mortality in 4-to 8-week-old chickens infected intravenously. H5 and H7 viruses which do not have an IVPI of greater than 1.2 or cause less than 75% mortality in an intravenous lethality test should be sequenced to determine whether multiple basic amino acids are present at the cleavage site of the hemagglutinin molecule (HA0); if the amino acid motif is similar to that observed for other HPNAI isolates, the isolate being tested should be considered as HPNAI;
- b. LPNAI are all influenza A viruses of H5 and H7 subtype that are not HPNAI viruses

All other subtypes of LPAI are not considered to be notifiable avian influenza, but may include subtypes H1-H16 (excluding H5 and H7 NAI).

² The OIE Terrestrial Animal Health Code (2008) Chapter 10.4.1:
http://www.oie.int/fileadmin/Home/eng/Health_standards/tahc/2009/en_chapitre_1.10.4.pdf

This distinction is important as LPAI occurs naturally in wild birds and is common worldwide (across the United States). As surveillance activities for avian influenza increase, more LPAI will be found. H5 and H7 LPAI subtypes and all HPAI were made reportable to the OIE in 2006, and it is likely that LPAI will be detected in zoological surveillance.

LPAI infecting zoo specimens is likely to have originated in the wild bird compartment and there are two possible scenarios for consideration of detection of LPAI, specifically subtypes which are non-H5/non-H7/non-H9 and subtypes that are H5, H7, or H9.

5.1.1 LPAI- non-H5/non-H7/non-H9

Detection of a non-H5/non-H7/non-H9 LPAI should elicit no action since these subtypes are not reportable. The zoo would remain open and the standard biosecurity measures would continue to be kept in place.

5.1.2 LPAI- H5, H7, or H9 zoonotic

In the event an LPAI H5, H7, or H9 (although H9 is not considered as an HPAI, it does have significant zoonotic potential and therefore should be carefully handled) is detected, the following response plan should be implemented:

- The positive bird would be held under quarantine for a minimum of 21 days (AI incubation period defined by OIE) in their enclosure unless movement is necessary for medical management or welfare issues.
- If the positive bird or any of its enclosure-mates are to be moved, they must test negative for AI by rRT-PCR prior to 7 days of removal from the enclosure. Otherwise, the birds in the affected exhibit will remain under quarantine in the enclosure until routine surveillance produces a negative test result by rRT-PCR, or after 8 weeks since the last positive result. This is twice the typical viral shedding time for ducks infected with AI³ and should, therefore, ensure no viral particles are being shed.
- Any bird testing positive for LPAI H5, H7, or H9 will not be allowed to leave the zoological institution until virus is no longer detectable by rRT-PCR. Any free-ranging fowl with access to the exhibit would be removed and restricted from re-entry.

The facility should be allowed to operate normally during an LPAI outbreak, except the enclosure(s) where virus has been detected by rRT-PCR must have no public access to the exhibit (meaning there is a reasonable barrier or distance) and birds in such an enclosure must not be allowed egress from the exhibit. Staff will use appropriate standard veterinary precautions when handling birds in an enclosure under quarantine (see Appendix 6.1 for more information).

³ Hulse-Post, D.J., Sturm-Ramirez, K. M., Humberd, J, et al. 2005. Role of domestic ducks in the propagation and biological evolution of highly pathogenic H5N1 influenza viruses in Asia. *PNAS* **102(30)**:10682-10687

5.2 Highly Pathogenic Avian Influenza

5.2.1 Can the Enterprise Continue to Operate if Declared an Infected or Suspect Premises?

In general, AZA accredited institutions have high levels of biosecurity, including perimeter fences, exclusion or control of feral animals and wildlife, limited access to animal areas, quarantine of all incoming animals, high quality on-site health care, individual identification of animals, and records of all animal movements. In addition, many AZA institutions occur in urban areas remote from agricultural activities. It is therefore more likely that a zoo declared an infected or suspect premises will be able to successfully contain the spread of infection within the institution.

It is also important to recognize that the ability of a zoo to feed and maintain its animal collection often depends heavily on cash flow generated by daily visitation. It is therefore essential that, whenever possible, control measures allow operations to continue. The ability of a zoo to continue operations when there is an infection on the premises depends on

- The physical features of the zoo.
- The unique biosecurity conditions of that institution.
- The ability to completely isolate affected animals from zoo visitors.
- The location of public access routes in relation to movement control zones.

It is possible the institution may have to close for one or two days while implementing its outbreak response plan. The feasibility of public access must be determined in consultation with the ICP and the USDA-APHIS Emergency response team. The following general conditions may apply.

5.2.1.1 Staff Entry

Staff entry is necessary for maintenance of other animals in the collection. Staff will be required to perform routine disinfection on entering and leaving the infected zone. For staff associated with animals in the infected premises, special disinfection practices need to be followed (see Section 5.4- Decontamination).

5.2.1.2 Public Entry

There is potential for large amounts of virus to be produced if a large number of animals are infected. Public entry into the infected zone may be prevented until a time has elapsed exceeding the survival time for the virus under the prevailing conditions, or the area has been disinfected to the satisfaction of the ICP. This may mean closing the entire facility for a brief period so that proper quarantine measures can be implemented in affected areas and disinfection of public areas occurs.

5.2.1.3 Animal Movements

All movements of susceptible animals in an infected or suspect premise should cease, following protocols outlined in Section 4.4- Minimization of Risks Associated with Maintaining Operations.

5.2.1.4 Animal Movement within the Zoo or Aquarium – Compartmentalization.

Birds may be designated at different levels of risk depending on the species, their origin, and their living situation (indoor or outdoor). Movement of these animals within the facility should be restricted

accordingly to prevent spread to other compartments should there be an introduction. Most importantly, unvaccinated indoor and outdoor birds should not be mixed.

If the disease is diagnosed in one area of the zoo, movement of workers and animals should be limited within that part based on not spreading the disease to other areas on grounds. Separate staff and equipment should be used in each zone to limit the possibility of spread.

Prior to the arrival of HPAI, each zoological institution should have its own plan for relocating birds at risk within the facility. (see Section 3.1- Identification and Preparation of Isolation Facilities) Species that are known to be susceptible to AI and are housed outside should be brought and kept inside.

5.3 Elimination of the Disease — Animals

Because AZA accredited institutions have high levels of biosecurity and often have endangered or otherwise irreplaceable animals in their collections, every effort should be made to contain and eradicate infection without unnecessary euthanasia of valuable animals. Prior to the arrival of HPAI, each zoological institution should determine which species at their facilities should be preserved through isolation and/or vaccination. Successful isolation of non-domestic birds with clinical avian influenza has been described⁴. This decision should be made based on the bird's endangered status, conservation value, genetic significance, or other mission-driven considerations.

Birds that are infected with HPAI and are deemed not to have a high collection or conservation value should be euthanized and disposed of properly (as described in the following section).

All susceptible birds should be isolated to reduce the risk of exposure. Appropriate isolation facilities include indoor enclosures or outdoor enclosures with solid tops and sides consisting of a solid barrier or a double-layer of netting. There should be no public access to these enclosures. Staff or other people handling or feeding animals, cleaning enclosures or otherwise coming into contact with susceptible species will not be permitted to have contact with any other groups of susceptible species until they have showered, changed clothes and disinfected any other material or equipment required. As far as possible, different people will be used in the handling of each separate group of susceptible species. The definition of what constitutes a separate group of susceptible species would have to be determined for each institution in consultation with the ICP commander.

There is a potential zoonotic risk with H5N1 HPAI originally identified in Asia. Therefore certain populations of unvaccinated affected domestic animals might need to be depopulated. It is important to discuss these options *in advance* with the appropriate agency representatives in your area.

5.4 Decontamination — Products and Facilities

5.4.1 Products

- Advice will be sought from the ICP as to whether any biological products within the zoo constitute a disease transmission risk. If they do they will be disposed of in the manner directed

⁴ Hawkins, M.G., Crossley, B.M., Osofsky, A., et al. (2006). Avian influenza A virus subtype H5N2 in a red-lored Amazon parrot. *JAVMA* 225(2):236-241

by the infected premises section of the ICP or in a manner directed by the Disposal Procedures Manual.

- Commodities with a commercial value that are required to be destroyed will be valued in accordance with established procedures.
- When disposal of large numbers of animal carcasses cannot be accomplished within the zoo, they must be transported in sealed leak-proof containers to a suitable location identified by the infected premises operations section of the ICP. Advice will be sought from the ICP controller on whether such transportation requires police escort. Any other products from within the zoo will be decontaminated in accordance with the relevant strategies/manuals.

5.4.2 Disposals Systems Review

- The disposal of all materials and movement of the material outside of zoo grounds will be dictated by ICP in the event of HPAI outbreak in an attempt to halt the spread of the disease outside zoo grounds. By-products will be treated in such a manner as is necessary to destroy the virus or, if this is not feasible, destroyed or disposed of according to the Disposal Procedures Manual.
- Disposal of contaminated material and carcasses will be accomplished by a USDA APHIS approved method

5.4.3 Discharges

- Wherever possible, discharges will be contained within the secure area of the zoo until it is certain that they are not infectious.
- Contaminated discharges (including pond water drained to discourage use by wildlife) should be prevented from entering any local watercourses. Where discharges that constitute a risk cannot be held on the zoo premises they will be transported in secure leak-proof containers to a suitable disposal site or will be decontaminated prior to discharge.
- Draining ponds, if able to be done safely, may be an option to avoid contamination or possible source of infection.

5.4.4 Vehicles

- Vehicle entry should be kept to an absolute minimum within the secure area of the zoo.
- When possible, different vehicles will be used within the infected area and the other parts of the zoo.
- Disinfection of people and equipment or material is to occur between the infected area and clean area vehicles.
- Where it is necessary to remove vehicles from the infected areas of the zoo, they will be thoroughly disinfected at the boundary of the area following the procedures in the Section 5.4-Decontamination.
- Drivers of such vehicles will be advised to avoid contact with susceptible species outside the zoo.
- Staff vehicles should not be parked within the internal zoo premises. As far as possible within the infected premises vehicle usage should be kept to an absolute minimum.

5.4.5 Equipment and Materials

These will be either disposed of or decontaminated as specified in the Decontamination Manual and the Disposal Procedures Manual. In the event of uncertainty regarding the most appropriate method, advice will be sought from the manager of the infected premises operations section at the ICP.

5.4.6 Personnel

- An initial briefing on the situation should be provided to the staff jointly by an ICP representative and senior zoo veterinarian (or other appropriate senior zoo staff).
- This briefing should concentrate on eliminating contact between people and susceptible species outside the zoo.
- Staff who must have contact with susceptible species in the infected area of the zoo should not have direct contact with susceptible species in other parts of the zoo.
- Staff should be advised to keep direct contact between susceptible species and people to a minimum and also to pay particular attention to hygiene in relation to food preparation and handling from animal to animal in order to minimize risk of disease spread.
- If feasible, designate a separate area to be set up for food preparation for highly valuable animals, and for staff handling these animals to shower, change clothes or undergo personal disinfection before handling other animals.
- Staff should follow the latest PPE guidelines from CDC and WHO for working in areas where HPAI H5N1 (Asian strain) is suspected⁵.

5.4.7 Vermin and Feral Animals

Although AZA accreditation standards require control of vermin and feral animals, control activities should be increased in the event of a HPAI outbreak. In addition, boundaries of the zoo and enclosures of susceptible species should be inspected to ensure that there is sufficient security to exclude all other creatures, regardless of whether they are likely to be active disease carriers or not. Methods for controlling feral animals, vermin, and native wildlife should be in accordance with relevant federal, state and local regulations, but emergency exemptions may need to be pursued as part of the emergency response plan.

5.4.8 Buildings and Structures

These should be decontaminated following the techniques outlined in Section 5.4- Decontamination. Highly contaminated structures that cannot be effectively cleaned should be valued for compensation purposes, if applicable, and destroyed according to established procedures.

⁵ <http://www.cdc.gov/flu/avian/professional/protect-guid.htm>
http://www.who.int/csr/disease/avian_influenza/guidelines/Avian%20Influenza.pdf

5.5 Tracing Requirements

5.5.1 Existing Zoo Tracing Capabilities

As discussed in Section 1.1, all susceptible animals imported into the United States must be positively identified at all times using an accepted method (ear tag, brand, microchip implant, tattoo, or leg band) and records relating to that animal be maintained using ISIS ZIMS as soon as available, in the meantime ISIS ARKS or a similar inventory system . All records relating to animals imported into the United States and their offspring must be kept up-to-date and be available to quarantine officers at short notice. All progeny (2 generations) of an animal imported into the United States must be identified using an accepted method and records relating to that animal also be maintained using ISIS ZIMS, ISIS ARKS or a similar inventory system. The system allows individual animals and their offspring to be traced with little difficulty and allows the following data to be retrieved on very short notice:

- An inventory report for each institution that provides status data, with breakdowns for births/hatches, acquisitions, deaths and translocations;
- A taxon report that lists all the specimens of a given species held by that institution, their identification, parentage, date of birth/hatch, location and origin;
- A specimen report that shows the animal's parentage, origin, date of birth/hatch, identification, location, treatment and movements both within the institution as well as from one institution to another;
- Transaction reports that detail all movements for any given period;
- Enclosure reports (with historical option) to show the location of the animals and any animals that have shared that enclosure;
- Management reports that include:
 - Age pyramids for any given taxon;
 - Fecundity and mortality;
 - Local inbreeding.
- Specimen relationship that include:
 - Pedigree charts;
 - Sibling tables, which list both full and half siblings for any given specimen;
 - Reproductive history of any individual, male or female.
- Medical records

A higher degree of surveillance may be applied in cases where the level of tracing does not meet the above standards.

5.5.2 Tracing Actions for Reportable Diseases

Through the institution executive officer, the records officer must be contacted to request the following information:

- Inventory report for the collection, providing a summary of all transactions for any stipulated period (to include births/hatches, deaths, imports, exports and status);
- Taxon report for all specimens of the species in which the outbreak has occurred;
- Enclosure report showing all specimens that have been maintained in the enclosure in which the outbreak occurred over a stipulated period of time. An enclosure report for adjoining enclosures may also be appropriate;
- Specimen reports for those individuals in which the outbreak has been detected.

With the above reports it will be possible to identify any trend that may occur and identify areas in which further information will be required (i.e., siblings, parentage, treatment records, postmortem reports, location of animals removed from the property). Using information from the above request, as appropriate, the following factors should be traced:

- All material (hay/feces/bedding) removed from the enclosures in which the outbreak has occurred (stipulate period);
- The location of any crates or containers that may have been used to transport the animals;
- The identification of staff that may have had direct contact with the animals or area in which the outbreak occurred;
- Any contact between staff that have been exposed to animals/areas and contact with domestic/commercial/pet animals outside the institution in which the outbreak occurred; and
- The location of any biological samples that have been removed from the property during a specified period.

5.6 Exit Strategy

5.6.1 Proof of Freedom

The 2008 OIE Terrestrial Animal Health Code for Avian Influenza (Chapter 10.4.1) sets international guidelines for documentation of NAI or HPAI 'free status'. Ultimately the decision to declare freedom from a particular reportable disease and cessation of disease control activities in the U.S. will be made by the USDA-APHIS Emergency Response Team and the ICP based on information assessed at the time. (The EU has been formulating a compartmentalization plan that places zoos and aquariums in a different category from the producers and thus it doesn't affect trade status).

5.6.2 Release from Quarantine

- The State Veterinarian will decide when to release quarantine in consultation with USDA APHIS.
- Currently, quarantines imposed during HPAI outbreak may be released 42 days following cleaning and disinfection of the last positive premises or until environmental sampling demonstrates HPAI virus negative test results after completion of cleaning and disinfection.
- Release from quarantine will be dictated by applicable standards in the current USDA APHIS HPAI Response Plan.
- Additional surveillance prior to release from quarantine may be required if all susceptible individuals cannot be sampled within that time frame. It is possible to be declared free of disease and be released from quarantine by your state and federal regulatory agencies but still be unable to transport these animals as other states may not accept the shipment.

5.7 Media and Public Relations

In the event that zoo animals are involved in a HPAI outbreak, media interest would be intense. As with other animal disease emergencies, a proactive approach is necessary to manage the media when such an event affects a zoo. It is therefore essential that the zoo's media representatives work closely with the ICP media representative(s). Whenever possible, all press releases, interviews, and press conferences relating to a zoo or aquarium HPAI outbreak should be conducted jointly by zoo and ICP representatives to ensure the accuracy and consistency of the information being disseminated (see Section 3.3- Public

Relations and Education, and Section 4.5- Media and Public Relations See sections for additional detail). It is also recommended that all zoos have a legally designated air space, usually a ceiling of 500 feet, above their establishments. Attention should be drawn to this, particularly in early media releases, so that all concerned are aware of the fact that aircraft movement in this area can be prohibited.

6 APPENDICES

Appendix 6.1: Personal protection guidelines

For standard veterinary precautions for zoonotic disease prevention in veterinary personnel:

- Follow the guidelines presented by the National Association of State Public Health Veterinarians.
 - <http://nasphv.org/Documents/VeterinaryPrecautions.pdf>

For individuals handling apparently healthy birds in areas where HPAI H5N1 is not suspected:

- Personal protective equipment (PPE) should include boots, coveralls, disposable medical gloves, and eye protection.
- If indoors, work in well-ventilated areas.
- If outdoors, place yourself upwind of the animal, to the extent practical, to decrease the risk of inhaling aerosols such as dust, feathers, and dander.
- Wash hands with soap and water often and disinfect work surfaces and equipment with a 70% alcohol solution or a 10% bleach solution.
- Do not eat, drink, or smoke while handling animals.

For individuals handling sick or dead birds in areas where HPAI H5N1 is not suspected:

- Follow the recommendations above plus wear protective clothing (including coveralls, rubber boots, and disposable medical gloves) that can be properly disinfected or disposed of.
- Minimize exposure to mucosal membranes by wearing protective eyewear (goggles) and a particulate surgical mask (NIOSH N95 respirator/mask is preferable).
- Decontaminate and properly dispose of potentially infectious material, including carcasses. For additional information, see the USGS Field Guide to Wildlife Diseases:
 - http://www.nwhc.usgs.gov/publications/field_manual/chapter_4.pdf

For individuals handling birds in an area where HPAI H5N1 (Asian strain) is suspected:

- Follow the latest guidelines from CDC and WHO for prophylactic medications and personal safety precautions:
 - <http://www.cdc.gov/flu/avian/professional/protect-guid.htm>
 - http://www.who.int/entity/csr/disease/avian_influenza/guidelines/Avian%20Influenza.pdf

Appendix 6.2: Disinfectants Registered by EPA for Use Against AI Viruses

Current as of July 13, 2007

For More Information

- National Pesticide Information Center (NPIC) 800-858-7378 (6:30am - 4:30pm PT, M-F)
 - <http://npic.orst.edu/>

These EPA disinfectant products are registered and labeled with a claim to inactivate "**avian influenza A**" viruses on hard, non-porous surfaces. The label specifies the use sites (e.g., poultry houses and farm premises) for application of the product. Although there are no antimicrobial products registered specifically against the H5N1 subtype of **avian influenza A** viruses, EPA believes based on available scientific information that the currently registered **avian influenza A** products, when applied in strict accordance with the label directions, will be effective against the H5N1 strain. These disinfectants are available at retail establishments which sell to those in the poultry industry. Users should look for an EPA registration number on the label (e.g., EPA Reg. No. XXX-XX). Each manufacturer's name and telephone number are provided so that potential product users may contact the manufacturer to find out how to obtain a listed product. For general information about disinfecting for avian flu, go to the following website: <http://www.epa.gov/opp00001/factsheets/avian.htm>.

Users should carefully follow the disinfection directions on the label to handle and safely use the pesticide product and avoid harm to human health and the environment. The approved label of a product can be found in the Pesticide Product Label System (PPLS) database label search site at <http://oaspub.epa.gov/pestlabl/ppls.home>. To obtain a product label, enter the EPA Registration Number of the primary product in the search query boxes (i.e., the company identification number and the product number) of the PPLS database. Information about the Pesticide Product Label System (PPLS) database is posted on the PPLS homepage located here: <http://www.epa.gov/pesticides/pestlabels/index.htm>.

Registration Number	Product Name	*Active Ingredient	Formulation Type	**<u>Manufacturer Contact Information</u>
106-72	Maxima 128	5, 9, 10, 19	soluble concentrate	Bruln & Company, Inc.>
106-73	Maxima 256	5, 9, 10, 19	soluble concentrate	Bruln & Company, Inc.
106-79	Broadspec 256	5, 9, 10, 19	soluble concentrate	Bruln & Company, Inc.
106-81	Maxima RTU	5, 9, 10, 19	solution-ready to use	Bruln & Company, Inc.
134-65	DC&R Disinfectant	2, 7, 12	soluble concentrate	Hess & Clark, Inc.
211-25	Pheno Cen Germicidal Detergent	17, 20, 24	soluble concentrate	Central Solutions, Inc.
211-32	Pheno Cen Spray Disinfectant	11, 16	pressurized liquid	Central Solutions, Inc.
211-50	Q5.5-5 NPB 2.5 HW	5, 9, 10, 19	soluble concentrate	Central Solutions, Inc.

Registration Number	Product Name	*Active Ingredient	Formulation Type	**Manufacturer Contact Information
211-62	Low pH Phenolic>	1, 16	soluble concentrate	Central Solutions, Inc.
303-91	Hi-Tor Plus Germicidal	5, 9	soluble concentrate	Huntington Professional
464-689	Ucarsan Sanitizer 420	13	soluble concentrate	The Dow Chemical Company
464-696	Ucarsan Sanitizer 4128	13	soluble concentrate	The Dow Chemical Company
464-700	Ucarcide 14 Antimicrobial	5, 13	solution-ready to use	The Dow Chemical Company
464-702	Ucarcide 42 Antimicrobial	5, 13	solution-ready to use	The Dow Chemical Company
464-715>	Ucarsan 442 Sanitizer	5, 13	soluble concentrate	The Dow Chemical Company
464-716	Ucarsan 414 Sanitizer	5, 13	soluble concentrate	The Dow Chemical Company
777-72	Biosol	5, 11	Ready to Use Liquid	Reckitt Benckiser
1043-91	LpH Master Product	3, 16	soluble concentrate	Steris Corporation
1677-129	Oxonia Active	15, 21	soluble concentrate	Ecolab, Inc.
1677-158	Vortexx	14, 18, 21	soluble concentrate	Ecolab, Inc.
1677-203	OxySept LDI	14, 21	soluble concentrate	Ecolab, Inc.
1839-86	BTC 2125 M 10% Solution	4, 6	soluble concentrate	Stepan Company
1839-95	NP 4.5 (D &F) Detergent/Disinfectant	4, 6	Soluble concentrate	Stepan Company
1839-154	Scented 10% BTC 2125M Disinfectant	4, 6	soluble concentrate	Stepan Company
1839-155	BTC 2125M 20% Solution	4, 6	soluble concentrate	Stepan Company
1839-173	7.5% BTC 885 Disinfectant	5, 9, 10, 19	soluble concentrate	Stepan Company
3838-36	Quat 44	4, 6	soluble concentrate	Essential Industries, Inc.
3838-37	Quat Rinse	4, 6	soluble concentrate	Essential Industries, Inc.
3862-177	Tek-Trol Disinfectant	1, 3, 16	soluble	ABC Compounding

Registration Number	Product Name	*Active Ingredient	Formulation Type	**<u>Manufacturer Contact Information</u>
5813-1	Clorox	30	concentrate Soluble concentrate	Co. Clorox Company
6659-3	Spray Nine	4, 6	Ready to Use Liquid	Spray Nine Corporation
6836-70	Bardac 205M-7.5B	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-71	Lonza Formulation Y-59	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-75	Lonza Formulation S-21	5, 10, 11, 21	soluble concentrate	Lonza, Inc.
6836-77	Lonza Formulation S-18	5, 10, 11, 21	soluble concentrate	Lonza, Inc.
6836-78	Lonza Formulation R-82 >	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-136	Lonza Formulation S-18F	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-139	Lonza Formulation R-82F	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-140	Lonza Formulation S-21F	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-152	Lonza Formulation DC-130	5, 9, 10, 19	solution-ready to use	Lonza, Inc.
6836-233	Bardac 205M-50	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-252	Phencide 256	1, 16	soluble concentrate	Lonza, Inc.
6836-253	Phenocide 128	1, 16	soluble concentrate	Lonza, Inc.
6836-266	Bardac 205M-10	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-277	Bardac 205M 1.30	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-278	Bardac 205M 14.08	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-302	Bardac 205M 5.2	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
6836-303	Bardac 205M 7.5B	5, 9, 10, 19	soluble concentrate	Lonza, Inc.
8155-23	Husky 806 H/D/N	9	Soluble concentrate	Canberra Corporation

Registration Number	Product Name	*Active Ingredient	Formulation Type	**Manufacturer Contact Information
8383-3	Sporicidin Brand Disinfectant solution	22, 31	Ready to use Liquid	Sporicidin International
70060-19	Aseptrol S10-Tabs	27, 28	Pellet/tablet	Engelhard Corporation
70144-1>	Opticide-3	4, 6	Ready to Use	Micro-Scientific Industries
71654-7	Virkon	21, 22	Pellet/tablet	DuPont Chemical Solutions
74331-2	DisinFx	8, 23, 14	Ready to use Liquid	SteriFx Inc.
74559-1	Accel TB	13	Ready-to-Use Liquid	Virox Technologies
10324-56	Maquat 256	4, 6	soluble concentrate	Mason Chemical Company
10324-58	Maquat 128	4, 6	soluble concentrate	Mason Chemical Company
10324-59	Maquat 64	4, 6	soluble concentrate	Mason Chemical Company
10324-63	Maquat 10	4, 6	soluble concentrate	Mason Chemical Company
10324-67	Maquat MQ615-AS	5, 8, 9, 17	soluble concentrate	Mason Chemical Company
10324-72	Maquat 615 HD	5, 9, 10, 19	soluble concentrate	Mason Chemical Company
10324-80	Maquat 5.5M	5, 9, 10, 19	soluble concentrate	Mason Chemical Company
10324-81	Maquat 705M	5, 9, 10, 19	soluble concentrate	Mason Chemical Company
10324-85	Maquat 86 M	5, 9, 10, 19	solution-ready to use	Mason Chemical Company
10324-94	Maquat 20M	4, 6	soluble concentrate	Mason Chemical Company
10324-96	Maquat 50DS	4, 6	soluble concentrate	Mason Chemical Company
10324-99	Maquat 10	4, 6	soluble concentrate	Mason Chemical Company
10324-115	Maquat 750 M	5, 9, 10, 19	soluble concentrate	Mason Chemical Company
10324-117	Maquat 710 M	5, 9, 10, 19	soluble concentrate	Mason Chemical Company
10324-118	Maquat 256 EBC	4, 6	soluble	Mason Chemical

Registration Number	Product Name	*Active Ingredient	Formulation Type	**<u>Manufacturer Contact Information</u>
10324-119	Maquat 128 EBC	4, 6	concentrate soluble concentrate	Company Mason Chemical Company
10324-120	Maquat 64 EBC	4, 6	soluble concentrate	Mason Chemical Company
10324-131	Maquat A	5, 9, 10, 19	soluble concentrate	Mason Chemical Company
10324-141	Maquat 256-NHQ	5, 9	Soluble concentrate	Mason Chemical Company
10324-142	Maquat MQ2425 M 14	4, 6	soluble concentrate	Mason Chemical Company
10324-143	Maquat 10B	4, 6	soluble concentrate	Mason Chemical Company
10324-145	Maquat FP	4, 6	soluble concentrate	Mason Chemical Company
10324-162	Maquat 2420 Citrus	5, 9	soluble concentrate	Mason Chemical Company
10324-164	Maquat 256 PD	4, 6	soluble concentrate	Mason Chemical Company
11600-4	Sanox II	5, 9, 10, 19	soluble concentrate	Conklin Co., Inc.
47371-6	Formulation HS 652Q	5, 9	soluble concentrate	H&S Chemicals Division
47371-7	Formulation HS 821Q	5, 9	soluble concentrate	H&S Chemicals Division
47371-36	HS-867Q	5, 9	soluble concentrate	H&S Chemicals Division
47371-37	HS-267Q germicidal Cleaner	5, 9	soluble concentrate	H&S Chemicals Division
47371-141	Formulation HH 652Q	5, 9	soluble concentrate	H&S Chemicals Division
56392-7	Dispatch Hospital Cleaner with Bleach	30	Ready to use Liquid	Caltech Industries
56392-8	Dispatch Hospital Cleaner Disinfectant Towels with Bleach	30	Ready to use Towelette	Caltech Industries
61178-1	D-125	4, 6	soluble concentrate	Microgen Inc.
61178-2	Public Places	4, 6	solution-ready to use	Microgen Inc.
61178-4	Public Places	4, 6	impregnated	Microgen Inc.

Registration Number	Product Name	*Active Ingredient	Formulation Type	**<u>Manufacturer Contact Information</u>
	Towelette		materials	
61178-5	CCX-151	4, 6	soluble concentrate	Microgen Inc.
61178-6	D-128	4, 6	soluble concentrate	Microgen Inc.
63761-8	Sterilex Ultra Disinfectant Cleaner	4, 6, 15	Soluble concentrate	Sterilex Corporation
66171-1	Advantage 256	1, 3, 16	soluble concentrate	Preserve International
66171-6	Dyne-O-Might	32	soluble concentrate	Preserve International
66171-7	Synergize	7, 13	soluble concentrate	Preserve International
66243-1	Odo-Ban Ready to Use	5	solution-ready to use	Clean Control Corporation
66243-2	Odo-Ban	5	soluble concentrate	Clean Control Corporation
66243-3	Quik Control	5, 9, 10, 19	soluble concentrate	Clean Control Corporation
67619-8	CPPC Ultra Bleach 2	30	Soluble concentrate	Clorox Professional Services Company
67619-9	PJW-622	4, 6	impregnated materials	Clorox Professional Products Co.
67619-13	CPPC Storm	30	Ready to use Liquid	Clorox –professional Services Company
70144-2	Opticide-3 wipes	4, 6 >	Ready to Use Towelette	Micro-scientific Industries
70263-6	Microban QGC	5, 9, 10, 19	soluble concentrate	Microban Systems, Inc.
70263-8	Microban Professional	5, 9, 10, 19	solution-ready to use	Microban Systems, Inc.
70627-2	Disinfectant DC 100	4, 6	solution-ready to use	Johnson Diversey, Inc.
70627-6>	Phenolic Disinfectant HG	1, 16	soluble concentrate	Johnson Diversey, Inc.
70627-10	Johnson's Forward Cleaner	5	soluble concentrate	Johnson Diversey, Inc.
70627-15	Johnson's Blue Chip Germicidal	5	soluble concentrate	Johnson Diversey, Inc.
70627-21	Virex II 128	5, 9	soluble concentrate	Johnson Diversey, Inc.

Registration Number	Product Name	*Active Ingredient	Formulation Type	**Manufacturer Contact Information
70627-22	Virex RTU	5, 9	solution-ready to use	Johnson Diversey, Inc.
70627-23	Virex II 64	5, 9	soluble concentrate	Johnson Diversey, Inc.
70627-24	Virex II 256	5, 9	soluble concentrate	Johnson Diversey, Inc.
71355-1	Virocid	5, 10, 15	soluble concentrate	CID Lines, NV/SA
71654-6	Virkon S	25, 26	soluble concentrate	DuPont Chemical Solutions
71847-2	Klor-Kleen	29	pelletted/tablettened	Medentech, Ltd.
81073-1	Peridox	15, 21	soluble concentrate	Clean Earth Technologies,

*** Active Ingredient Active Ingredient Key**

- 1 2-Benzyl-4-chlorophenol (62201)
- 2 2-(Hydroxymethyl)-2-nitro-1,3-propanediol (83902)
- 3 4-tert-Amylphenol (64101)
- 4 Alkyl dimethyl benzyl ammonium chloride (60%C14, 30%C16, 5%C18, 5%C12) (69104)
- 5 Alkyl dimethyl benzyl ammonium chloride (50%C14, 40%C12, 10%C16) (69105)
- 6 Alkyl dimethyl ethylbenzyl ammonium chloride (68%C12, 32%C14) (69154)
- 7 Alkyl dimethyl benzyl ammonium chloride (67%C12, 25%C14, 7%C16, 1%C18) (69175)
- 8 Citric Acid
- 9 Didecyl dimethyl ammonium chloride (69149)
- 10 Dioctyl dimethyl ammonium chloride (69166)
- 11 Ethyl alcohol (1501)
- 12 Formaldehyde (43001)
- 13 Glutaraldehyde (43901)
- 14 Hydrochloric Acid
- 15 Hydrogen peroxide (595)
- 16 o-Phenylphenol (64103)
- 17 o-Phenylphenol, potassium salt (64108)
- 18 Octanoic acid (128919)
- 19 Octyl decyl dimethyl ammonium chloride (69165)

*** Active Ingredient Active Ingredient Key**

- 20 p-tert-Amylphenol, potassium salt (64111)
- 21 Peroxyacetic acid (63201)
- 22 Phenol
- 23 Phosphoric Acid
- 24 Potassium 2-benzyl-4-chlorophenate (62202)
- 25 Potassium peroxymonosulfate (63604)
- 26 Sodium chloride (13905)
- 27 Sodium chlorites
- 28 Sodium dichloroisocyanurate dihydrate
- 29 Sodium dichloro-s-triazinetrione (81404)
- 30 Sodium hypochlorite
- 31 Sodium phenate
- 32 Iodine

****Manufacturer Contact Information**

ABC Compounding Co. P.O. Box 16247 Atlanta, GA 30321-0247 (800) 593-1021 (262) 539-1122	Brulin & Company, Inc P.O. Box 270 Indianapolis, IN 46206-0270 (800) 776-7149 (317) 923-3211	Caltech Industries, Inc. 2420 Schuette Road Midland, MI (800) 234-7700	Canberra Corporation 3610 Holland-Sylvania Road Toledo, OH 43615 (419) 841-6616
Central Solutions, Inc. P.O. Box 15276 3130 Brinkerhoff Road Kansas City, KS 66115 (800) 255-0262 (913) 621-6542	CIDLines, V/SA Waterpoortstraat 2 B 8900 IEPER Belgium, Europe 011-32-57-217877	Clean Control Corporation P.O. Box 7444 Warner Robins, GA 31095 (800) 841-3904 (478) 922-5340	Clean Earth Technologies, LLC 13378 Lakefront Drive Earth City, MO 63045 (866) 843-6394 (314) 222-4640
Clorox Professional Products Co. c/o PS&RC P.O. Box 493 Pleasanton, CA 94566-0803 (888) 797-7225 (510) 847-6842	Conklin Co., Inc. Consumer Products Division 551 Valley Park Drive P.O. Box 155 Shakopee, MN 55379-0155 (800) 394-6076 (952) 445-6010	Engelhard Corporation 101 Wood Avenue Iselin, NJ 08830-0770 (202) 393-3903	The Dow Chemical Company Midland, MI 48674 (800) 447-4369 (989) 636-1000

****Manufacturer Contact Information**

DuPont Chemical Solutions Enterprise P.O. Box 80402 Wilmington, DE 19880 (800) 441-7515	Ecolab, Inc. 370 N. Wabasha Steet St. Paul, MN 55102 (800) 332-6522	Essential Industries, Inc. P.O. Box 12 Merton, WI 53056-0012 (800) 593-1021 (262) 539-1122	Hess & Clark Inc. 110 Hopkins Drive Randolph, WI 53956- 1316 (608) 221-7378
H&S Chemicals Division c/o Lonza, Inc. 90 Boroline Road Allendale, NJ 07401 (800) 365-8324 (201) 316-3200	Huntington Professional Products A Service of Ecolab, Inc. 370 N. Wabasha Steet St. Paul, MN 55102 (800) 332-6522	Johnson Diversey, Inc. 8310 16th Street Sturtevant, WI 53177 (800) 851-7145 (262) 631-4001	Lonza, Inc. 90 Boroline Road Allendale, NJ 07401 (800) 365-8324 (201) 316-3200
Mason Chemical Company 721 W. Algonquin Road Arlington Heights, IL 60005 (800) 362-1855 (847) 290-1621	Medentech, Ltd. Whitemill Industrial Estate Clonard Road Wexford, Ireland 353 53 60040	Microban Systems, Inc 1135 Braddock Avenue Braddock, PA 15104 (800) 332-6037 (412) 264-8370	Microgen Inc. 33 Clinton Road Suite 102 West Caldwell, NJ 07006 (800) 420-7522 (973) 575-9025
Micro-Scientific Industries 1225 Carnegie Street Rolling Meadows, IL 60008 (888) 253-2536	Preserve International P.O. Box 10527 Zephyr Cove, NV 89448 (800) 995-1607	The Procter & Gamble Company P&G Household Care 5299 Spring Grove Avenue Cincinnati, OH 45217 (800) 332-7787	Reckitt Benckiser Morris Corporate Center IV 399 Interpace Parkway Parsippany, NJ 07054 (800) 228-4722 (800) 677-9218
Sporicidin International 121 Congressional Lane Rockville, MD 20852 (301) 231-7700	Spray Nine Corporation PO Box 290 Johnstown, NY 12095- 0290 (800) 477-7299	Stepan Company 22 West Frontage Road Northfield, IL 60093 (800) 745-7837 (847) 446-7500	SteriFX Inc. 1868 Kings Highway Shreveport, LA 71103 (318) 425-2515
Sterilex Corporation 11409 Cronhill Drive Owing Mills, MD (800) 511-1659	Steris Corporation 7501 Page Avenue St. Louis, MO 63133 (800) 444-9009 Option 4 or Ext. 25064	Virox Technologies, Inc. 2815 Bristol Circle, Unit 4 Oakville, Ontario, L6H 6X5, Canada (800) 387-7578	