

**PROGRAMMATIC  
INITIAL ENVIRONMENTAL EXAMINATION (PIEE)**

**USAID PROGRAM/ACTIVITY DATA:**

**Country/Region:** Global (GH, AFR, ANE, E&E, LAC, DCHA and EGAT).

**Program/Activity Title:** Global USAID Response to Avian Influenza Outbreak

**Funding Begin:** FY06 **Funding End:** NA **LOP Amount:** \$ NA  
**Sub-Activity Amount:** \$ NA

**IEE Prepared By:** Rochelle Rainey/GH (based on AFR Bureau version by Alan Schroeder)

**IEE Amendment (Y/N):** N

**Current Date:** June 21, 2006

**ENVIRONMENTAL ACTION RECOMMENDED:** (Place X where applicable)

Categorical Exclusion: \_\_\_\_\_ Negative Determination: X  
Positive Determination: \_\_\_\_\_ Deferral: \_\_\_\_\_

**ADDITIONAL ELEMENTS:** (Place X where applicable)

CONDITIONS X PVO/NGO: \_\_\_\_\_

**SUMMARY OF FINDINGS:**

This Programmatic Initial Environmental Examination (PIEE) provides a screening-level environmental examination of the actions USAID anticipates taking globally in response to the ongoing outbreak of the H5N1 subtype of the Influenza A virus, commonly known as “highly pathogenic avian influenza (HPAI)”. This PIEE is intended to help fulfill the environmental review requirements of the U.S. Agency for International Development’s (USAID’s) environmental regulations, found in 22CFR216.

The nature of USAID’s involvement in the global HPAI response can be expected to evolve, and to do so rapidly. This PIEE attempts to anticipate all or most of the types of activities USAID might engage in as part of this response, to provide an environmental examination and threshold decision for these potential actions, and to identify appropriate mitigating measures and best practices to employ.

Because the Agency’s internal policy (ADS 204) requires environmental examinations at the level of the operating unit that has managerial responsibility for an activity, this PIEE must be supplemented by brief country-level IEEs or IEE amendments to the implementing Strategic Objectives covering the HPAI response activities to be supported. It is the intent of this PIEE to provide guidance to which such country-level IEEs can simply refer, rather than repeat. Such country-level IEEs will acknowledge the guidance in this PIEE, assign environmental mitigation responsibilities to those parties responsible for the management of country-level HPAI activities, and address any proposed

discrepancies with PIEE guidance. Specific guidance on the recommended content of country-level IEEs is attached to this document as Appendix C.

Following is a summary of the recommended threshold determinations for the categories of HPAI response activities:

Monitoring and surveillance (M & S) for the presence of avian influenza in wild and domestic animals, as well as humans. This category of activity is recommended for a **Negative Determination with Conditions**, per 22CFR216.3(a)(2)(iii) because of disease transmission and associated risks from these activities. The conditions to follow for this category of activities are spelled out in Section 3.1 of this document.

Disinfection of workers, clothing, shoes/boots, poultry houses, vehicles, tools, medical equipment, culling equipment, and all other equipment and materials which come into contact with the virus or products containing the virus. This category of activity is recommended for a **Negative Determination with Conditions**, per 22CFR216.3(a)(2)(iii). The conditions to follow for this category of activities are spelled out in Section 3.2 of this document.

USAID programs should use a three-stage process for determining the suitability of a pesticide with respect to its registration status:

1. If the product is among the 100 currently registered by USEPA for avian influenza, then the program may use the product, so long as they have approval from the appropriate host government authorities, and complete a country-specific IEE. All HPAI programs should try to use this option.
2. If the product is identical in formulation to one or more of the products on the list above, then the program may use that product, so long as the program can demonstrate that none of the 100 EPA-approved pesticides are available in the country, the product does not infringe on any patents, it can be shown to meet required quality control to be fully effective and not contain harmful contaminants, and the program has approval from the appropriate host government authorities. Using a product that is not on the approved list, even if an identical formulation, does not automatically merit a “negative determination with conditions”. Rather, when any non-exempt pesticide disinfectants are proposed, the environmental review required for approval of their use must fulfill all analytical elements required by 22CFR216.3(b), USAID’s Pesticide Procedures to justify their use. This procedure is discussed below in Section 3.2. If in doubt, the operating unit should contact the REA and BEO for technical advice.
3. If the product in question is not on the EPA-approved list, and is not identical in formulation to any products on that list, then the operating unit should directly contact the REA and BEO to seek approval prior to use of the product in question. The mission should assemble all the information they can about the product in question, preferably including a product label. Among other requirements, the

program must demonstrate that none of the 100 EPA-approved pesticides are available in the country, that the product meets required quality control to be fully effective and not contain harmful contaminants, and that the program has approval from the appropriate host government authorities. As mentioned above, when any non-exempt pesticide disinfectants are proposed, the environmental review required for approval of their use must fulfill all analytical elements required by 22CFR216.3(b), USAID's Pesticide Procedures to justify their use. Section 3.2 covers this procedure in more detail.

Disinfectants are defined by the EPA as a class of pesticides that are used to destroy or inactivate infectious fungi and bacteria, but not necessarily their spores. There is a list of 31 exempted pesticide disinfectants that are not considered by the EPA to be public health or environmental risks (<http://www.epa.gov/docs/fedrgstr/EPA-PEST/1996/March/Day-06/pr-577.html>).

Also, the term pesticide or disinfectant in the context of this PIEE does not apply to cleaning agents such as ordinary soap and water, bleach, or isopropyl alcohol. The use of such non-pesticide products is governed by the need to not waste money through overuse of these products and by common sense.

When any non-exempt pesticide disinfectants are needed, the environmental examination required for approval of their use must fulfill all analytical elements required by 22CFR216.3(b), USAID's Pesticide Procedures. To the extent possible, those analytical elements which are not specific to a country or to a disinfectant product are addressed in Section 3 of this document, and need not be repeated in country-level examinations. The identity of those elements which must be addressed in country-level examinations, and the manner of the analysis needed in each case is also specified in Section 3 of this document.

Animal and human vaccination, veterinary examination and treatment, and human patient examination and treatment. This category of activities is recommended for a **Negative Determination with Conditions**, per 22CFR216.3(a)(2)(iii), because of disease transmission risks from medical waste generated by these activities, and because of the potential for disease transmission to medical and veterinary workers and for retransmission by infected medical and veterinary workers. The conditions to follow for this category of activities are spelled out in Section 3.3 of this document.

Culling of diseased livestock and disposal of diseased livestock, wild birds, and their manure. This category of activities is recommended for a **Negative Determination with Conditions**, per 22CFR216.3(a)(2)(iii), because of disease transmission risks from inappropriately conducting these activities. The conditions to follow for this category of activities are spelled out in Section 3.4 of this document. This type of activity does not include extermination of uninfected wild bird populations or their natural habitats or similar extreme measures that would require a **Positive Determination, Scoping Exercise, and Environmental Assessment**, unless U.S. migratory species are involved in which case an **Environmental Impact Statement** under NEPA procedures would be required.

Provision and training in the use of personal protective equipment (PPE). This category of activities is recommended for a **Negative Determination with Conditions**, per 22CFR216.3(a)(2)(iii). The conditions to follow for this category of activities relate to the proper selection of and training in the use of PPE, as detailed in Section 3.5 of this document.

Communication, public awareness campaigns and training in avian influenza response. This category of activities is recommended for A **categorical exclusion from environmental examination**, per 22CFR216.2(c)(2)(i) [education, technical assistance, training].

As required by ADS 204.5.4, the relevant Strategic Objective (SO) team in each country where HPAI response activities are undertaken must actively monitor ongoing activities for compliance with approved IEE conditions, and modify or end activities that are not in compliance. The SO team must also ensure that provisions of the IEE concerning mitigative measures and the conditions specified herein, along with the requirement to monitor, are incorporated into associated contracts, cooperative agreements, grants and sub-grants.

**APPROVAL OF ENVIRONMENTAL ACTION RECOMMENDED:**

**CLEARANCE:**

Global Health Bureau Environmental Officer

Signed 9/5/06

\_\_\_\_\_  
Michael Zeilinger

**Filename:** Agency HPAI IEE Sept 2006.doc

**ADDITIONAL CLEARANCES:**

Africa Bureau Environmental Officer

Signed by email 8/31/06

\_\_\_\_\_  
Brian Hirsch

Asia/Near East Bureau Environmental Officer

Signed by email 9/18/06

\_\_\_\_\_  
John O. Wilson

Democracy, Conflict and Humanitarian Assistance Bureau Environmental Officer

Signed by email 9/5/06

\_\_\_\_\_  
Carl Gallegos, Acting

Economic Growth, Agriculture and Trade Bureau Environmental Officer

\_\_\_\_\_ Date: \_\_\_\_\_  
(vacant)

Europe and Eurasia Bureau Environmental Officer

\_\_\_\_\_ Signed 9/19/06  
Mohammad Latif, Acting

Latin America and Caribbean Bureau Environmental Officer

\_\_\_\_\_ Signed by email 9/19/06  
Victor Bullen

## **PROGRAMMATIC INITIAL ENVIRONMENTAL EXAMINATION (PIEE)**

### **PROGRAM/ACTIVITY DATA:**

Country/Region: Global (GH, AFR, ANE, E&E, LAC, DCHA and EGAT)

Program/Activity Title: Global USAID Response to Avian Influenza Outbreak

### **1.0 BACKGROUND AND ACTIVITY/PROGRAM DESCRIPTION**

#### **1.1 Purpose and Scope of PIEE**

This Programmatic Initial Environmental Examination (PIEE) provides a screening-level environmental examination of the actions USAID anticipates taking in response to the outbreak of the H5N1 subtype of the Influenza A virus, commonly known as “avian influenza (AI).” This PIEE is intended to help fulfill the environmental review requirements of the U.S. Agency for International Development’s (USAID’s) environmental regulations, found in 22CFR216.

The nature of USAID’s involvement in the regional HPAI response can be expected to evolve, and to do so rapidly. This PIEE attempts to anticipate most, if not all, of the types of activities USAID might engage in as part of this response, provide an environmental examination and threshold decision for these actions, and identify appropriate mitigating measures and best practices.

Because the Agency’s internal policy (ADS 204) requires environmental examinations at the level of the operating unit that has managerial responsibility for an activity, this PIEE must be supplemented by brief country-level IEEs or IEE amendments covering the HPAI response activities to be supported. It is the intent of this PIEE to provide guidance to which such country-level IEEs can simply refer, rather than repeat. Such country-level IEEs will serve to acknowledge the guidance in this PIEE, assign environmental mitigation responsibilities to those parties responsible for the management of country-level HPAI activities, and address any proposed discrepancies with PIEE guidance.

#### **1.2 Background**

Avian Influenza (AI) virus can be serially transmitted between and among wild and domestic bird populations and can decimate domestic production and harm trade. Migrating wild birds may transfer HPAI long distances and across international borders, and are one source of the current outbreaks. Another source is the movement of infected birds in the commercial trade, both caged wild birds and poultry. The HPAI virus may also be transmitted to humans by direct contact with infected birds, body parts and waste, leading to sickness and potential death. The worst-case scenario is that the virus may mutate to become able to be transmitted from human to human, leading to an epidemic or pandemic.

USAID has classified countries into five levels of risk for avian influenza ([http://www.usaid.gov/our\\_work/global\\_health/home/News/news\\_items/avian\\_influenza.html](http://www.usaid.gov/our_work/global_health/home/News/news_items/avian_influenza.html)):

1. Endemic, characterized by widespread and recurring H5N1 infections in animals since Dec 2003 – South Asia, East Asia, and parts of South –East Asia
2. Epidemic, with isolated H5N1 outbreaks in animals since July 2005 – China, India, Europe, Nigeria and proximal countries in West Africa
3. High Risk, countries proximal to endemic or epidemic countries, or at risk of animal outbreaks due to bird migration and/or transport of birds – Africa, except for southern Africa
4. At-Risk due to bird migration and/or transport of birds – southern Africa
5. Pandemic risk, at lower risk of animal outbreaks, but would be affected by a human pandemic – North, Central and South America.

In the spring of 2006, European researchers investigating returning migratory birds from Africa found no avian influenza virus, indicating that this route of transmission is less important than originally believed. Globally, the most important route of spread remains unrestricted poultry movements ([http://www.birdlife.org/action/science/species/avian\\_flu/](http://www.birdlife.org/action/science/species/avian_flu/))

WHO reports on the cumulative number of laboratory-confirmed human cases and deaths from avian influenza. See [http://www.who.int/csr/disease/avian\\_influenza/country/en](http://www.who.int/csr/disease/avian_influenza/country/en)

USAID Health's response to HPAI is found at the following web address: [http://www.usaid.gov/our\\_work/global\\_health/home/News/news\\_items/avian\\_influenza.html](http://www.usaid.gov/our_work/global_health/home/News/news_items/avian_influenza.html). See <http://www.irinnews.org/Avianflu.asp> for a list of African and Asian countries and what each is doing to prepare itself against/for outbreak.

For more information on migration and the potential for spread of HPAI see: [http://www.fao.org/AG/AGAINFO/subjects/en/health/diseases-cards/special\\_avian.html](http://www.fao.org/AG/AGAINFO/subjects/en/health/diseases-cards/special_avian.html).

The primary goal at present is to exclude or contain the spread of the HPAI virus, eliminate it wherever it is found and prevent the spread to humans, which may lead to mutation to human transmissibility. USAID's current plan to assist is listed briefly below under section 1.3.

Specific regional issues related to avian influenza are described below:

#### Africa

There are two major migration routes for migratory birds coming to Africa to over winter. The Black Sea/Mediterranean Flyway passes from southern Spain along the coast of West Africa through coastal Morocco, Mauritania, and Senegal and then inland across the major water basins in West Africa, including the Senegal River Basin, leading to the

Niger River Basin, the Volta Basin, and finally the Chad Lake Basin. The other flyway follows the Nile Rivers into Egypt, Sudan, Ethiopia, Uganda, Eastern Congo, Kenya and northern Tanzania, where it merges with the flyway that crosses the Sahel. The countries with the highest risk then are these countries that contact the Nile as well as Senegal, The Gambia, Mali, Burkina Faso, Niger, northern Nigeria, northern Cameroon, and Chad.

These water basins form ideal nesting and rest areas for migratory birds and it is believed that these basins could represent the areas of first introduction of the virus into the African continent. West Africa is a major wintering area for many non-passerines, including considerable numbers of some Palearctic duck species, several species of shorebirds and some birds of prey, as well as passerines (song birds). Passerines favor the dry savannah zones, whereas the non-passerines favor the wetlands and large water basins. Large populations of waterfowl such as Northern Pintail ducks and Garganey ducks (a small European duck having a conspicuous white stripe over each eye and down the back of the head in the male) winter there. The populations of Garganeys and Northern Pintails are 2 million and 500 thousand birds respectively.

The inland lowlands with rich soils near wetlands represent approximately 50 percent of the agriculturally available area in West Africa and contain dense human populations. Over wintering birds in Africa's wetlands, rivers, and shorelines may transmit the disease to local wild birds, and from there to domestic poultry, or directly to poultry where the two mix. Farmers grow their crop at the receding water edge at reservoirs, rivers or lakes during the dry season, allowing domestic poultry to roam freely around field crops, houses and the surrounding vegetation. Most people in these areas are poor and are not likely to dispose of dead poultry even if they are diseased, as they represent not only a source of protein but also a source of income.

Regional trade in diseased poultry forms another source of inoculum and is apparently the source of the disease outbreak in West Africa.

At present, the HPAI virus has been found in seven African countries, Egypt, Sudan, Nigeria, Niger, Burkina Faso, Cameroon, and Djibouti, and is expected to move to other countries across Africa.

Asia/Near East ([http://www.birdlife.org/action/science/species/avian\\_flu/](http://www.birdlife.org/action/science/species/avian_flu/))

The first outbreaks of the highly pathogenic version of avian influenza were reported in Asia in 2003. 99 of the 115 human deaths from avian influenza up to May 2006 have been from five countries in Asia (Vietnam, Indonesia, Thailand, China, and Cambodia, [http://www.who.int/csr/disease/avian\\_influenza/country/cases\\_table\\_2006\\_05\\_12/en/index.html](http://www.who.int/csr/disease/avian_influenza/country/cases_table_2006_05_12/en/index.html)) Like in Africa, many smallholders raise chickens or ducks as a source of income and as meat for feasts. Detection and control in these areas will be difficult.

Most outbreaks in south-east Asia can be linked to movements of poultry and poultry products (or accidental transfer of infected material from poultry farms, such as water, straw or soil on vehicles, clothes and shoes). Prior to April 2005, wild birds found dead or dying with H5N1 in Asia were largely sedentary species that scavenge near poultry,

live markets or captive bird populations. The lack of a trail of H5N1 infections along migratory pathways from infected breeding habitats in Mongolia, China and Russia to southern wintering areas in Asia suggests that migratory wild birds are not spreading the disease long distances between continents. With few exceptions, there is limited correlation between the pattern and timing of spread among domestic birds and wild bird migrations. [http://www.birdlife.org/action/science/species/avian\\_flu/](http://www.birdlife.org/action/science/species/avian_flu/).

#### Europe and Eurasia

In the spring of 2006, European researchers investigating returning migratory birds from Africa found no avian influenza virus, indicating that this route of transmission is less important than originally believed.

#### Latin America/Caribbean

While it is possible for the virus to show up in migratory birds in the Americas, according to Robert Webster, historically there is little crossover of flu viruses between American and European migratory birds. USAID places the LAC region in the pandemic risk category, where they would be affected by human-human transmitted disease, but not at risk from migratory flocks.

### **1.3 Description of Activities**

#### **Laboratory Capacity Building:**

- Training lab technicians to identify bird influenza;
- Procurement of essential equipment and supplies (including reagents, mobile Polymerase Chain Reaction (PCRs), ELISA readers, antigen kits, high bio-security lab equipment, Vertical Laminar Air Flow Hood, High security Freeze/thaw, and Virologique Diagnostic Kits); and
- Establishing and implementing lab quality assurance procedures.
- Biohazard handling procedures

#### **Strengthening Surveillance Systems**

- Working with the U.N. Food and Agriculture Organization (FAO) and Ministries of Agriculture/Rural Development/Livestock/Environment and Sanitation to strengthen wild/migratory bird surveillance, including:
  - o Procurement of equipment (laptops, Geographic Information Systems (GIS) equipment, etc.) and supplies for animal surveillance and proper handling of dead birds; and
  - o Training to properly identify sick birds and use established referral mechanisms for dead bird and sample transport.
- Working with Ministries of Health to build on existing human and animal surveillance systems, including existing Integrated Disease Surveillance and Response systems and health facilities.
- Enhance country-level ability to collect and test animal and livestock samples by providing training and necessary supplies.

- Support National Avian Influenza Task Forces to develop animal and human surveillance and rapid response teams at national and district levels, including training border officials to strengthen cross-border surveillance.

### **Building Capacity for Human Response**

- Working with the World Health Organization (WHO) and Ministries of Health to build capacity for human response, including:
  - o Training health workers (including those working at community levels) to identify potentially infected patients and refer them to the appropriate level of care and contact lab facilities for initial testing; and
  - o Procuring essential equipment and supplies (including personal protective equipment).

### **Responding to Animal Infections**

- Working with Ministries of Agriculture to strengthen response to outbreaks in animals. Activities may include:
  - o Procurement of protective gear for field workers handling dead and infected birds;
  - o Procurement of materials and supplies for animal response, including disinfectants and infection prevention materials and materials and equipment for culling;
  - o humane euthanasia and environmentally appropriate carcass disposal
  - o training of appropriate use of personal protective equipment (PPE) and waste/biohazard management, and
  - o Training for local communities on animal quarantine and household management of domestic poultry.

### **Communications and Public Awareness**

- Mass media campaigns (internet, press, radio, television, posters, flyers);
- Community-based awareness and mobilization campaigns;
- Development and use of communications, including informational, educational, and behavior-change materials;
- Messages are targeted to children and adolescents at the appropriate reading level and content
- Risk communications through Information, Education and Communication materials, radio spots, print media advertisements, etc.

## **2.0 COUNTRY AND ENVIRONMENTAL INFORMATION (BASELINE INFORMATION)**

### **2.1 Locations Affected**

All USAID countries have various sizes of extensively and widely scattered populations of domestic poultry that are raised for income, meat and eggs by most rural and many urban peoples. All of these are susceptible to infection by HPAI. Many species of migratory birds coming to Africa from Europe, the Middle East and Asia are thought to be susceptible. According to the World Organization for Animal Health, as of May 18, 2006, 54 countries had reported outbreaks of H5N1 avian influenza virus ([http://www.oie.int/downld/AVIAN%20INFLUENZA/A\\_AI-Asia.htm](http://www.oie.int/downld/AVIAN%20INFLUENZA/A_AI-Asia.htm)).

### **2.2 National [or applicable] Environmental Policies and Procedures [of host country both for environmental assessment and pertaining to the sector]**

A current succinct listing of policies from African, Asian and Middle Eastern countries preparing themselves to exclude, detect, contain and deal with HPAI can be found at this United Nations web address: <http://www.irinnews.org/Avianflu.asp>. Country environmental assessment capabilities will need to be assessed through individual country-specific IEEs.

For individual USAID country missions that write country-specific IEEs for dealing with AI, this section (2.2) is critical and should briefly assess the current physical environment that might be affected by the activities in individual country IEEs. Depending upon the activities proposed, this *could* include an examination of land use, geology, topography, soil, climate, groundwater resources, surface water resources, terrestrial communities, aquatic communities, environmentally sensitive areas (e.g., wetlands or protected species), agricultural cropping patterns and practices, infrastructure and transport services, air quality, demography (including population trends/projections), cultural resources, and the social and economic characteristics of the target communities. This analysis should also draw on the Country Strategy and supportive analysis (such as the Environmental Threats and Opportunities Assessment, and Conflict Vulnerability Assessment). Finally, indicate the status and applicability of host country, Mission Country Strategy Statement, and other policies, programs and procedures in addressing natural resources, the environment, food security, and other related issues.

The Integrated Pest Management (IPM) Collaborate Research Support Project (CRSP) or the Global Health Integrated Vector Management IQC are two resources for Bureaus to access expertise in pest management.

Resources for understanding and dealing with reducing waste (especially plastic) generation through “*green procurement*” or “*Environmentally Preferable Purchasing, or EPP*” can be found at: [www.epa.gov/oppt/epp](http://www.epa.gov/oppt/epp). Resources for understanding and dealing with “*rapid environmental impact assessment in disaster response*” can be found at:

[http://www.benfieldhrc.org/disaster\\_studies/rea/rea\\_index.htm](http://www.benfieldhrc.org/disaster_studies/rea/rea_index.htm) and  
<http://www.reliefweb.int/rw/lib.nsf/db900SID/DPAL-5ZAHW2?OpenDocument>.

### **3.0 EVALUATION OF ACTIVITIES FOR ENVIRONMENTAL IMPACT POTENTIAL RECOMMENDED THRESHOLD DECISIONS and MITIGATION ACTIONS (INCLUDING MONITORING AND EVALUATION)**

#### **3.1 Monitoring and surveillance (M & S) for the presence of avian influenza in wild and domestic animals, as well as humans.**

The main environmental concern regarding monitoring and surveillance activities is the potential to inadvertently transmit avian influenza between monitored locations.

Monitoring and surveillance (M & S) personnel, medical personnel, and animal health officials visiting potentially affected premises should be extremely conscientious that they, through their work in surveillance and epidemiological investigations or vaccination initiatives, could actually be infection and disease spreaders.

The biggest danger is bird droppings or manure. The HPAI virus likes moist, dirty conditions so it is essential to thoroughly disinfect items that have been in contact with bird droppings, including shoes, clothes before working with poultry/entry to a place where poultry are kept, cages, bird processing or culling equipment. M & S personnel will need to reduce exposure to and transfer of bird manure from place to place.

**Threshold Decision:** A **negative determination (with conditions)** is recommended for support to HPAI Monitoring and Surveillance activities per 22CFR216.3(a)(2)(iii).

#### **Conditions:**

1. Through communications and training, ensure that M & S personnel be extremely conscientious that they, through their work in surveillance and epidemiological investigations or vaccination initiatives, could actually be infection and disease spreaders;
2. Provide personal protective equipment and clothes to those that visit the flock or home, including boots for walking through bird manure, gloves for handling birds or people, and masks;
3. Provide portable baths with disinfectant for boots and vehicle tires (use a pre-disinfectant bath to wash off the organic mater before entering disinfectant);
4. Ensure that M & S personnel clean and disinfect equipment, personal protection equipment, tools, and instrumentation;
5. M & S workers should not purchase or transport live or processed birds for food while at work.
6. Ensure that M & S workers properly dispose of used or disposable gloves and masks and other protective clothing and equipment.

## Discussion and Information Resources:

For more discussion on potential risks of transmission by M & S personnel and others, see: [http://www.fao.org/ag/AGInfo/subjects/en/health/diseases-cards/avian\\_qa.html#7](http://www.fao.org/ag/AGInfo/subjects/en/health/diseases-cards/avian_qa.html#7).

### **3.2 Disinfection of poultry workers, clothing, shoes/boots, poultry houses, vehicles, tools, medical equipment, culling equipment, and all other equipment and materials which come into contact with the virus or products containing the virus.**

The environmental issue of concern from disinfection activities is the potential for toxic effects on humans and non-target organisms from exposure to pesticide components in most disinfection products. Many of these pesticides are acutely toxic to people in sufficiently high concentrations and can be toxic to the environment in sufficient quantities.

Disinfectants are defined by the EPA as a class of pesticides that are used to destroy or inactivate infectious fungi and bacteria, but not necessarily their spores. The term pesticide or disinfectant in the context of this PIEE does not apply to cleaning agents such as ordinary soap and water, bleach, or isopropyl alcohol. The use of such non-pesticide products is governed by the need to not waste money through overuse of these products and by common sense.

There is a list of 31 exempted pesticide disinfectants that are not considered by the EPA to be public health or environmental risks ([www.epa.gov/docs/fedrgstr/EPA-PEST/1996/March/Day-06/pr-577.html](http://www.epa.gov/docs/fedrgstr/EPA-PEST/1996/March/Day-06/pr-577.html)). When any non-exempt pesticide disinfectants are proposed, the environmental review required for approval of their use must fulfill all analytical elements required by 22CFR216.3(b), USAID's Pesticide Procedures. ([http://www.epa.gov/pesticides/about/index.htm#what\\_pesticide](http://www.epa.gov/pesticides/about/index.htm#what_pesticide))

Risks from human exposure to pesticide disinfectants include acute poisoning of children who inadvertently come into contact with or ingest the chemicals, people transporting the chemicals in bulk from the port of entry to the storage facility, transport from the storage facility to the point of use, people who mix the chemicals, people who apply the chemicals, people coming into contact with the applied chemicals through meat, eggs, proximity, or ground water contamination, and export meat and egg market certifiers who may be concerned about residues. The HPAI virus may also become resistant to some disinfectants to the extent they are overused, possibly leading to the need for rotation of disinfectant products and active ingredients.

Pesticide disinfectants can cause harm to aquatic organisms if dumped into waterways and lakes and will disrupt microbial processes in waste treatment facilities. Bulk quantities that are inadvertently spilled may kill all exposed organisms.

Currently, there is a problem in that little or no management of such disinfectants typically occurs in small-scale facilities in countries where USAID works. Training and supplies are minimal. The quality of the products being sold in developing countries may

be in question and require testing for presence and amount of active ingredient(s) and the absence of toxic contaminants from poor quality manufacturing processes in certain countries. Clearly there is a strong precedent for use of safety procedures, training and equipment to reduce human exposure to disinfectants and residues, and properly dispose of them. Individual country IEEs will address these risk issues and missions will devote resources to their mitigation.

**Threshold Decision: A negative determination (with conditions)** is recommended for support to HPAI disinfection activities per 22CFR216.3(a)(2)(iii). The condition is that all IEEs for specific country-level HPAI projects include the pesticide analysis below, with additional country-specific information.

**Pesticide Procedures Analysis for HPAI Disinfection Products (including conditions):**

USAID programs should use a three-stage process for determining the suitability of a pesticide with respect to its registration status:

1. If the product is among the 100 currently registered by USEPA for avian influenza, then the program may use the product, so long as they have approval from the appropriate host government authorities, and complete a country-specific IEE. All HPAI programs should try to use this option.
2. If the product is identical in formulation to one or more of the products on the list above, then the program may use that product, so long as the program can demonstrate that none of the 100 EPA-approved pesticides are available in the country, the product does not infringe on any patents, it can be shown to meet required quality control to be fully effective and not contain harmful contaminants, and the program has approval from the appropriate host government authorities. Using a product that is not on the approved list, even if an identical formulation, does not automatically merit a “negative determination with conditions”. Rather, when any non-exempt pesticide disinfectants are proposed, the environmental review required for approval of their use must fulfill all analytical elements required by 22CFR216.3(b), USAID’s Pesticide Procedures to justify their use. If in doubt, the operating unit should contact the REA and BEO for technical advice. See Appendix A for the list of approved disinfectants.
3. If the product in question is not on the EPA-approved list, and is not identical in formulation to any products on that list, then the operating unit should directly contact the REA and BEO to seek approval prior to use of the product in question. The mission should assemble all the information they can about the product in question, preferably including a product label. Among other requirements, the program must demonstrate that none of the 100 EPA-approved pesticides are available in the country, that the product meets required quality control to be fully effective and not contain harmful contaminants, and that the program has approval from the appropriate host government authorities. As mentioned above,

when any non-exempt pesticide disinfectants are proposed, the environmental review required for approval of their use must fulfill all analytical elements required by 22CFR216.3(b), USAID's Pesticide Procedures to justify their use.

Disinfectants are defined by the EPA as a class of pesticides that are used to destroy or inactivate infectious fungi and bacteria, but not necessarily their spores. There is a list of 31 exempted disinfectants that are not considered by the EPA to be public health or environmental risks (<http://www.epa.gov/docs/fedrgstr/EPA-PEST/1996/March/Day-06/pr-577.html>). See Appendix B for the list of these exempted disinfectants. When any non-exempt pesticide disinfectants are needed, the environmental examination required for approval of their use must fulfill all analytical elements required by 22CFR216.3(b), USAID's Pesticide Procedures.

To the extent possible, those analytical elements which are not specific to a country or to a disinfectant product are addressed in below of this document, and need not be repeated in country-level examinations. The identity of those elements which must be addressed in country-level examinations, and the manner of the analysis needed in each case is also specified. Also identified within this section is additional information and analysis which might be needed in support of supplemental IEEs for country-level programs.

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## **PESTICIDE PROCEDURES ANALYSIS FOR HPAI DISINFECTANTS**

### **Pesticide procedures element a: USEPA registration status of the proposed pesticide**

Intent: Pesticides are registered in the U.S. by active ingredient and by formulation.

“Registration status” possibilities of the active ingredients and the formulated products include active registration, never registered, and cancelled. USAID is effectively limited to using pesticides registered in the U.S. by the U.S. Environmental Protection Agency for the same *or similar* uses. Other pesticides not registered in the U.S. may be authorized, but only if the USAID program can show that no alternatives are available, as required under USAID Pest Management Guidelines for the use on non-U.S. registered pesticides.

Cost and ready availability of an unregistered pesticide is not sufficient reason not to use an EPA registered one. If an unregistered pesticide is required, it must first be shown to be as safe and effective as the EPA registered ones are. This is accomplished through an Environmental Assessment that must be approved by the Bureau Environmental Officer. Given that EPA has approved 100 different disinfectant pesticides made by a number of different companies for AI, it is unlikely that none of these would be available in a given country. Host country pesticide (and disinfectant) registration procedures must also be identified and followed, if they exist.

EPA's list of 100 disinfectant pesticide products registered for use against Avian Influenza virus in the USA is found at:

[http://www.epa.gov/pesticides/factsheets/avian\\_flu\\_products.htm](http://www.epa.gov/pesticides/factsheets/avian_flu_products.htm). As EPA states on this site, “Although there are no antimicrobial products registered specifically against the

H5N1 subtype of **avian influenza A** viruses, EPA believes that the currently registered **avian influenza A** products, when applied in strict accordance with the label directions, will be effective against the H5N1 strain.” See [http://www.fao.org/ag/AGInfo/subjects/en/health/diseases-cards/avian\\_ga.html#7](http://www.fao.org/ag/AGInfo/subjects/en/health/diseases-cards/avian_ga.html#7) for a list of FAO-recommended products and practices.

The relevant Bureau Environmental Officer will use a three-stage process outlined above for determining the suitability of a pesticide with respect to its registration status. :

1. **If the product is among the 100 currently registered by USEPA for avian influenza**, then the Bureau programs may use the product, so long as they have approval from the appropriate host government authorities;
2. **If the product is identical in formulation to one or more of the products on the list** above, then the Bureau programs may consider its use, so long as an amendment to this IEE can show that none of the 100 EPA approved pesticides are available in the country, it does not infringe on any patents, it can be shown to meet required quality control to be fully effective and not contain harmful contaminants, and they have approval from the appropriate host government authorities. Prior to seeking to use such a product, the operating unit should directly contact the REA and BEO to discuss the need to use of the unregistered product in question. The mission should assemble all the information they can about the product in question, preferably including a product label. The registration and/or approval status by the host government must be known.
3. **For any other disinfection product (those neither on EPA list nor with an identical formulation to an EPA approved disinfectant)**, prior to seeking to use a product the operating unit should directly contact the REA and BEO to discuss the need to use of the unregistered product in question. The mission should assemble all the information they can about the product in question, preferably including a product label. The registration and/or approval status by the host government must be known. Approval of such pesticides requires a 22CFR216 Environmental Assessment to justify their use.

*For mission IEE: Identify and describe the product(s) selected and the EPA and local registration status for each. Follow guidance above.*

### **Pesticide procedures element b: Basis for selection of the pesticide**

The main factors likely to be used in the selection of EPA approved disinfectants in USAID programs include availability, efficacy (effectiveness at killing the virus), and price. Other factors to consider include relative safety to human health and quality control considerations, such as the reliability of the manufacturer.

Some products will likely be imported from major international firms like DuPont, Dow, and others; some will be imported from third countries like India, China, South Africa and others; while still other products may be produced locally or regionally. Some

products will be produced locally or third countries under license from the major companies. South Africa has a strong chemicals production and distribution industry and produces many products under contract or license agreement, and distributes others.

The issues of greatest concern on choice of manufacturer will be the presence and quantity of active ingredient; that is, does the container contain what it claims on the label in the same concentrations or concentration ranges? Depending upon the manufacturer as well as storage conditions and age of the product, it may or may not. If a product does not contain enough of the active ingredient, once diluted, it may not be effective against the HPAI virus. A second important concern is that if a formulation is proprietary or under patent, that USAID not support the procurement or use of products that are not manufactured by the owner or under a license.

Product quality control is confirmed in most countries by taking random samples of the product imported or to be purchased and tested to determine what is in the container. This is generally done by a government laboratory but could also be contracted out to private sector labs. Most of the disinfectants are inorganic compounds that could be tested by using color-producing reagents and relatively inexpensive colorimetric devices such as Spectrometer 20, or 'Spec 20s'.

Governments, therefore, should be supported in randomly testing disinfectant products to be imported/used against HPAI.

*For mission IEE: Identify the product(s) selected and the basis for selection for each.*

**Pesticide procedures element c: Extent to which the proposed pesticide use is, or could be, part of an Integrated Pest Management (IPM) program:**

The international—as well as many national—strategies being implemented to deal with HPAI already form an integrated program. In addition to control of the HPAI virus, most initiatives include monitoring and surveillance, zoning and compartmentalization, regulations and quarantine, vaccination, disinfection and disposal of waste (see [http://www.oie.int/eng/AVIAN\\_INFLUENZA/home.htm](http://www.oie.int/eng/AVIAN_INFLUENZA/home.htm)).

See [http://www.encapafrika.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch12-IntegPestMngmt.pdf](http://www.encapafrika.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch12-IntegPestMngmt.pdf) for further ideas in reinforcing an integrated management program that reduces pesticide use.

*For mission IEE: Some description needed of the planning and implementation context and the other activities being implemented by way of AI response.*

**Pesticide procedures element d: Proposed method or methods of application, including the availability of application and safety equipment.**

The best information on how to apply the disinfectants safely will be found on the product or container labels. In the USA, EPA requires that all products have labels containing application and safety procedures. For products that are registered in the USA, use the site: <http://oaspub.epa.gov/pestlabl/ppls.home> to see web copies of the labels. Products not registered in the USA are also likely to have labels with the same type of information, as most international standards require.

See [http://www.encapafrika.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch13-SaferPesticideUse.pdf](http://www.encapafrika.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch13-SaferPesticideUse.pdf) to understand pesticide safety issues.

*For mission IEE: Describe measures being taken to assure that appropriate application and safety equipment will be available.*

**Pesticide procedures element e: Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use, and measures available to minimize such hazards:**

A list of chemicals for disinfecting different items and risk avoidance is found in tables at: [http://www.fao.org/ag/AGInfo/subjects/en/health/diseases-cards/avian\\_qa.html#7](http://www.fao.org/ag/AGInfo/subjects/en/health/diseases-cards/avian_qa.html#7).

Below is a table containing selected disinfectant agents, with information on USEPA acute toxicity, issues with human health and environment, as well as mitigating safety measures to avoid harm.

Note that most disinfectants are inorganic compounds that are only very toxic in the concentrated form in which they are sold. The critical factor is concentration. Most are irritants and corrosives and can harm people, equipment and environment in their most concentrated forms. Once the purchased products are diluted with water, their toxicity decreases measurably so as to not pose a great acute risk to the health of users and others who come into contact with the diluents (with the possible exceptions of formaldehyde gas and hydrochloric acid). Note also that most have few long-term or chronic effects (except formaldehyde which is a known carcinogen). Most should be used with care around open water as they may kill aquatic organisms. See Pesticide procedures element i below for a summary of human and environmental hazards from selected disinfectants.

Soaps and detergents, in most cases, are the most effective and least toxic alternatives readily available. **Conversely, USAID will not approve the use of highly dangerous or cancer causing alternatives such as hydrochloric acid, formaldehyde liquid or formaldehyde gas.** Untrained people should not attempt to use these products.

Expert field guidance will be needed in each country to research the acute and long-term risks of each available chemical or product. One very good source for finding risk data on individual chemicals, as well as products, is: <http://www.pesticideinfo.org/Index.html>, either 'Chemical Search' or 'Product Search'. Important issues will be worker exposure route (oral, skin, eyes, inhalation), time exposed, and dose. Except for soaps, detergents and citric acid, request rapid approval from the appropriate BEO.

*For mission IEE: Particular emphasis should be on the human and other resources being mobilized that will help to minimize the hazards associated with the selected chemicals.*

**Pesticide procedures element f: Effectiveness of the requested pesticide for the proposed use:**

As noted above, the EPA has a list of pesticide disinfectants for use in control of HPAI. Expert field opinion will be required to determine what is most effective for a given country situation and local conditions. A local IEE should capture this information.

*For mission IEE: Identify the evidence on which basis the mission judges the proposed product to be effective, e.g. FAO's list, if the product is on that. It will also be important for the mission to provide assurance that the particular product being purchased is of good quality, including that it contains the full advertised concentration of active ingredient and that it is not contaminated with other ingredients. In the absence of other evidence, the program may need to include product sampling in its AI activities.*

**Pesticide procedures element g: Compatibility of the proposed pesticide use with target and non-target ecosystems:**

Most of the compounds on the EPA list of recommended chemicals and products are not persistent; in the environment they are likely to rapidly break down. Once a specific product is selected, further information on toxicity and persistence can be found at <http://www.pesticideinfo.org/Index.html>. None of the disinfectants are likely to be sprayed over large areas like insecticides might, and are therefore likely to be locally contained. The end result or benefits of eradicating the virus and saving wild birds by using disinfectants to contain transmission are likely to outweigh the risks to wild birds.

By law, the product labels of EPA approved pesticides must contain information on the impact of the disinfectant on target and non-target organisms, as well as provide use restrictions and cautions. If the label is unreadable or missing, the information on safe handling, use, and disposal can be found by entering the product registration number on the EPA website pesticide product label database at <http://oaspub.epa.gov/pestlabl/ppls.home>

*For mission IEE: Of greatest importance in this section is to list the use restrictions and cautions for the chosen product and to commit to follow them.*

**Pesticide procedures element h: Conditions under which the pesticide is to be used, including climate, flora, fauna, geography, hydrology, and soils:**

There is little likelihood that disinfectants will spread far from the place where they are used because of the small quantities used and the fact that disinfectants rapidly break down and are diluted in the environment. Application of disinfectants is likely to be limited to indoor or limited-size outdoor settings.

*For mission IEE: Nothing more needed, unless the application locale is a particularly sensitive wildlife habitat, e.g. a protected area.*

**Pesticide procedures element i: Availability of other pesticides or non-chemical control methods:**

Pesticides, disinfectants, and antimicrobial cleaners are subject to labeling requirements under FIFRA. Detergents, including laundry detergents, that make germicidal claims are regulated by EPA and must display the EPA registration number. Dishwashing soaps that make claims to be germicidal would normally be considered to be household cleaners and therefore be regulated by EPA. However, to date, EPA has not registered nor reviewed any germicidal dishwashing soaps. Some germicidal dishwashing soaps are classified and labeled by the manufacturer as hand soaps, which means they fall under the authority of the FDA. The FDA has no current testing requirement in place for germicidal active ingredients, so these "germicidal" labeled dishwashing products are not tested for safety or effectiveness. <http://www.eco-labels.org/label.cfm?LabelID=249>

All HPAI control programs should focus on using EPA-registered pesticide disinfectants or non-pesticide disinfectants such as soaps, detergents and citric acid. Below is an illustrative table adapted from the Australian Government Decontamination Procedures Manual:

[http://www.animalhealthaustralia.com.au/shadomx/apps/fms/fmsdownload.cfm?file\\_uuid=2B50B4BD-E62D-ECF1-C6AB-FA21B96A0ED7&siteName=aahc](http://www.animalhealthaustralia.com.au/shadomx/apps/fms/fmsdownload.cfm?file_uuid=2B50B4BD-E62D-ECF1-C6AB-FA21B96A0ED7&siteName=aahc), which has been adopted by FAO on their HPAI site.

Items and Procedures for Disinfection

<u>Item</u>	<u>Disinfectant/chemical code (see codes below)</u>
Dead birds/carcasses	5
Animal housing/equipment cages	1, 2a, 2b, 2c, 3
Humans	1
Electrical equipment	2a, 2b, 2c
Water tanks	6
Ponds used by poultry/ducks	6

Feed	5
Effluent, manure	5, 4, 3
Human housing	1, 2a, 2b, 2c
Machinery, vehicles	1, 3
Clothing	1, 2a, 2b, 2c, 3
Aircraft	1, 2c

Code Key	Form and final concentration	Contact time and notes
1. Soaps and detergents		Leave in contact 10 minutes
2. Oxidising agents		
2a. Sodium hypochlorite	Liquid, dilute to final 2-3% available chlorine	Not good for organic materials. 10-30 minutes contact.
2b. Calcium hypochlorite	Solid or powder , dilute 2-3% available chlorine (20 g/litre powder, 30g/l solid)	Not good for organic materials. 10-30 minutes contact.
2c. Virkon <sup>®</sup> (on EPA's list)	2% (20 g/litre)	10 minutes. Excellent disinfectant
3. Alkalis		
3a. Sodium hydroxide (caustic soda)(NaOH). Do not use with aluminium and like alloys	2% (= 20 g/litre)	10 mins. Do not use in presence of aluminium
3b. Sodium carbonate anhydrous (washing soda) (Na <sub>2</sub> CO <sub>3</sub> . 10 H <sub>2</sub> O)	4% (=40 g/litre) from powder 100 g/l from crystals	10 mins. Recommended for use in presence of organic materials as above. 30 mins
4. Citric Acid	0.2% (2 g/l)	30 mins, safe for clothes and body decontamination
5. Bury or burn or compost		
6. Drain to pasture if possible		

### **Human and Environmental Toxicity Hazards of Selected Disinfectant Chemicals**

Note: Keep all concentrated products away from children. For First Aid with strong irritants, do not induce vomiting. *Most Class I products—once diluted—become much less toxic.* The greatest health risk will be for the person who mixes the concentrate with water. *Also, note that this list is NOT exhaustive.*

Chemical or Product Name	USEPA Toxicity Range for EPA-Registered Products	Human Health	Environment	Safety Measures
Benzalkonium chloride (one of 3 chemicals found in product sold in Nigeria called “Diskol”)	Danger, Class I (as concentrated product)	<b>Strong irritant.</b> May cause skin, eye, lungs, and mucous membrane burns.	Moderately toxic to fish, crustaceans. Highly toxic to zooplankton.	For people who mix the product with water, wear rubber gloves, goggles, mask, and protective clothing. Avoid breathing the dust. Use care around aquatic environments.
Glutaraldehyde (one of 3 chemicals found in product sold in Nigeria labelled Diskol)	Danger, Class I (as concentrated product)	Irritant. May cause cough, skin & eye redness and pain. Ingestion may cause abdominal pain, diarrhea, nausea.	Moderately toxic to zooplankton. Slightly toxic to fish.	For people who mix the product with water, wear rubber gloves, goggles, mask, and protective clothing. Use care around aquatic environments.
Formaldehyde liquid (one of 3 chemicals found in product labelled Diskol) See <i>formaldehyde gas</i> below.	Danger, Class I (as concentrated product)	<b>Strong irritant.</b> May cause skin, eye, lungs, and mucous membrane burns. <b>Known human carcinogen.</b>	Slightly toxic to zooplankton. Not acutely toxic to other aquatic species.	For people who mix the product with water, wear rubber gloves, goggles, mask, and protective clothing. Avoid breathing the dust.
Soap	Caution, Class III	Ingestion may lead to stomach ache, nausea.	Moderately toxic to fish.	

Sodium dodecylbenzene sulfonate (common detergent ingredient)	Danger, Class I (as concentrated product)	Mild irritant. May cause cough, sore throat upon inhalation; skin & eye redness; diarrhea & vomiting if ingested.	Highly toxic to nematodes & flatworms. Moderately toxic to fish, slightly toxic crustaceans, worms.	Mixers should wear rubber gloves, goggles, mask, and protective clothing. Use care around aquatic environments.
Sodium hypochlorite	Danger, Class I (as concentrated product)	Irritant. May cause cough, skin & eye redness and pain. Ingestion may cause abdominal pain, sore throat, diarrhea, nausea, vomiting.	<b>Highly toxic to fish &amp; insects.</b> Moderately toxic to worms, mollusks & crustaceans.	Mixers should wear rubber gloves, goggles, mask, and protective clothing. <b>Use extreme care around aquatic environments.</b>
Calcium hypochlorite	Danger, Class I (as concentrated product)	Slight irritant. Mildly corrosive to eyes, mucous membranes.	<b>Highly toxic to fish, crustaceans, &amp; mollusks.</b>	Mixers should wear rubber gloves, goggles, mask, and protective clothing. <b>Use extreme care around aquatic environments.</b>
Virkon, Virkon S (which contain mostly potassium peroxymono-sulfate)	Danger, Class I (as concentrated product)	<b>Strong irritant.</b> May cause skin, eye, lungs, and mucous membrane burns.	Harmful to aquatic environments.	Mixers should wear rubber gloves, goggles, mask, and protective clothing. Avoid breathing the dust. Do not allow powder to enter waterways.
Sodium hydroxide	Classes I, II, & III. Danger, Warning, & Caution based on concentration	<b>Strong corrosive.</b> May cause skin, eye, lungs, and mucous membrane burns & blisters.	Not acutely toxic to most aquatic organisms.	Mixers should wear rubber gloves, goggles, mask, and protective clothing. Avoid breathing the dust.

Sodium carbonate	Classes I, II, & III. Danger, Warning, & Caution based on concentration	Slight irritant. May cause irritation to skin, eye, lungs, and mucous membranes.	Not acutely toxic to most aquatic organisms.	Use safety precautions & equipment when mixing concentrated product with water.
Citric acid	Classes I, II, & III. Danger, Warning, & Caution based on concentration	Irritant. May cause irritation to skin, eye, lungs, and mucous membranes.	Not acutely toxic to most aquatic organisms.	Use safety precautions & equipment when mixing concentrated product with water.
Hydrochloric acid <b>Not for general use.</b>	Danger, Class I (as concentrated product)	<b>Very strong corrosive.</b> Will cause serious acid burns and damage to skin, eyes, lungs, and mucous membrane.	Not acutely toxic to most aquatic life due to rapid dilution upon entry to water.	<b>Not for general use.</b> Use only by well trained & protected individuals. Use rubber gloves, goggles or face shield, respirator cartridge mask, boots, and full overalls.
Formaldehyde gas <b>Not for general use.</b>	Danger, Class I (as concentrated product)	<b>Very strong corrosive.</b> May cause skin, eye, lungs, and mucous membrane burns. <b>Known human carcinogen.</b>	Not acutely toxic to most aquatic life.	<b>Not for general use.</b> Use only by well trained & protected individuals. Use rubber gloves, goggles or face shield, respirator cartridge mask, boots, and full overalls.

**For mission IEE:** Identify the other disinfectants that are available to the program in question.

**Pesticide procedures element j: Host country’s ability to regulate or control the distribution, storage, use, and disposal of the requested pesticide.**

HPAI response activities are likely to be conducted as a partnership between the host country government and multiple donors, intergovernmental agencies and non-governmental organizations. USAID operating units should describe the nature of those operations and should discuss, in that context, how the use, distribution, storage, use and disposal of disinfectants will occur. The host country’s ability and role should be a part of that description and discussion.

*For mission IEE: See discussion above.*

**Pesticide procedures element k: Provision for training of users and applicators.**

The Bureau support for use of disinfectants should be accompanied by assurance that adequate safe use training is provided on handling, use and disposal of disinfectants. This should likely be included as a component in broader training on HPAI management in country or regionally.

*For mission IEE: Describe the sufficiency of training for users and applicators, and the measures the USAID program will take to provide for such training, if needed.*

**Pesticide procedures element l: Provision made for monitoring the use and effectiveness of this pesticide.**

Monitoring of the use and effectiveness of disinfectants should be built into the monitoring and evaluation procedures for the overall HPAI response supported by USAID programs. This operation will be guided by field-based experts. Local field staff will need to look for human health and environmental issues related to disinfectant use.

*For mission IEE: Describe the specific monitoring efforts that will be undertaken by the USAID-supported program, or by other partners with whom USAID is working.*

**Additional Conditions:**

1. Children are not to be permitted to have access or exposure to the undiluted disinfectant products. Disinfectants should be stored under lock and key.
2. Produce simple safe disinfectant use training materials, quick reference guides, posters and flyers.

3. Procure simple protective clothing (gloves, masks or organic chemical respirators where toxic gasses are produced, boots, etc.) for ministry staff and others that mix and apply disinfectants.
4. As additional disinfectant choices become available, regularly update the list of registered products and evaluate them following the [12 Pesticide Procedures](#) (a. through l.) found in Regulation 216.3.
5. Have HPAI action-implementing partners put the conditions above into action plan matrices with timelines, assignment of roles/responsibility, deadlines, and sign-off by Chief of Party or responsible authority. The plan with completed actions and signed is sent to USAID to show compliance (this essentially becomes part of monitoring).

#### **Discussion and Information Resources:**

The risk of the impact of disinfectants on health and the environment can be significantly reduced if the above conditions are met. Disinfectants are considered pesticides and as such must meet the requirements of Regulation 216.3 b. Pesticide Procedures.

The above conditions should be part of most if not all HPAI treatment programs using disinfectants. Additional conditions can be written into individual country-specific IEEs as appropriate.

See [http://www.epa.gov/pesticides/factsheets/avian\\_flu\\_products.htm](http://www.epa.gov/pesticides/factsheets/avian_flu_products.htm) to find a list of 100 disinfectants currently registered by EPA for use in treating Avian Influenza A virus in the USA. Since this is a different strain of AI than the H5N1 strain, USAID missions would invoke the “or similar use” proviso.

To search for the registration and risk data for individual disinfectant products and chemicals in the disinfectants, see <http://www.pesticideinfo.org/Index.html>.

See [http://www.encapafrika.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch13-SaferPesticideUse.pdf](http://www.encapafrika.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch13-SaferPesticideUse.pdf) to understand pesticide safety issues in Africa.

See [http://www.encapafrika.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch12-IntegPestMngmt.pdf](http://www.encapafrika.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch12-IntegPestMngmt.pdf) for ideas in developing an integrated pest management program that reduces pesticide use in Africa.

### **3.3 Animal and human vaccination, veterinary examination and treatment, and human patient examination and treatment.**

The environmental concern with this set of activities is the potential for infection and disease spread through exposure to medical and veterinary waste generated through these activities.

Transmission of disease through infectious waste is the greatest and most immediate threat from healthcare and veterinary waste. Human healthcare and veterinary waste is dangerous and risks from exposure to HPAI virus are highly hazardous. If handled, treated, or disposed of incorrectly it can spread disease and potentially poison people, livestock, wild animals, plants and ecosystems. People who come in direct contact with the waste are at greatest risk. Examples include healthcare and veterinary workers, cleaning staff, patients, visitors, waste collectors, disposal site staff, waste pickers, drug addicts and those who knowingly or unknowingly use “recycled” contaminated syringes and needles.

Medical and veterinary waste as defined by this PIEE includes (but is not limited to): disposable gloves, disposable masks and safety clothing, ELISA test kits, antigen kits, other diagnostic kits and diagnostic reagents, infection prevention materials, vaccines, pharmaceuticals, needles, scalpels and other metal laboratory equipment, plastics like bags, containers and syringe vials. Special precautions need to be taken if plastics are to be burned as they release very carcinogenic chemicals like furans. Needles, scalpels and other sharp objects present additional risks beyond transmission of HPAI and require special attention.

Diseased patients will come into contact with health care providers, presenting opportunities for the virus to reenter the field on the health care workers, on their clothes, and through the disposal of medical waste and for the virus to mutate and become transmissible among humans. Health care workers can reduce their risk of exposure to the virus by taking basic protective measures, such as use of safety equipment and proper hygiene measures.

Currently, little or no management of healthcare wastes typically occurs in small-scale facilities in Africa. Training and supplies are minimal. Common practice in urban areas is to dispose of healthcare waste along with the general solid waste or, in peri-urban and rural areas, to bury waste, without treatment, in an unlined pit. In some cities small hospitals and veterinary clinics may incinerate waste in dedicated on-site incinerators, but often they fail to operate them properly. Unwanted pharmaceuticals and chemicals may be dumped into the local sanitation outlet, be it a sewage system, septic tank or latrine.

Many Africans may not have access to optimal safety equipment, safety procedures, clean water, or training on dealing with AI-infected people and wastes. Further, at the point of a human pandemic, if it happens, safety equipment and disinfectants will need to be quickly procured in bulk and used by health care workers. Large-scale vaccination programs may also take place that produces quantities of medical waste including

syringes, needles, and different types of plastics. The safe handling and disposal of these will take on additional significance during a pandemic.

Clearly, waste management plans will be needed for each country that embarks on HPAI management, and USAID should assist in this regard.

**Threshold Decision: A negative determination (with conditions)** is recommended per 22CFR216.3(a)(2)(iii) because of disease transmission risks from inappropriately conducting these activities. This type of activity does not include extermination of uninfected wild bird populations or their natural habitats or similar extreme measures. If these activities are proposed, this would require a **Positive Determination, Scoping Exercise, and Environmental Assessment**, unless U.S. migratory species are involved in which case an **Environmental Impact Statement** under NEPA procedures would be required.

### **Conditions for Disposing of Medical and Veterinary Waste Including Sharps and Plastics and Patient Care Hygiene:**

1. Work with partners to assure, to the extent possible, that the medical facilities and operations involved have adequate procedures and capacities in place to properly handle, label, treat, store, transport and properly dispose of blood, sharps and other medical waste. The Africa Bureau's Environmental Guidelines for Small Scale Activities in Africa (EGSSAA) Chapter 8 [http://www.encapafrika.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch08-Healthcare-waste.pdf](http://www.encapafrika.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch08-Healthcare-waste.pdf) contains a final section on "Questions to help guide development of a healthcare waste management program". Use this questionnaire to assess adequate partner procedures and capacities for waste disposal.
2. Produce written patient hygiene, and waste management and disposal plans with clear responsibilities, written internal rules, and follow the plan.
3. Perform short-term safety training on patient care hygiene, handling and proper disposal options for medical and veterinary waste (can and likely should be included as a component in overall training on HPAI management).
4. Children are not to be permitted to have access or exposure to the medical and veterinary waste. Before disposal, waste should be stored under lock and key.
5. Produce simple safe hygiene and waste disposal training materials, quick reference guides, posters and flyers.
6. Procure simple protective clothing (gloves, masks, clothing, boots, etc.) for ministry staff and others that have contact with patients and handle and dispose of medical and veterinary waste.

7. Highly hazardous healthcare wastes including sharps, highly infectious non-sharp waste, large quantities of expired or unwanted pharmaceuticals, feces from HPAI infected birds and patients, and AI-infected bird byproducts and bodily fluids of HPAI patients should be destroyed and buried on-site away from water sources and bodies of water.

8. Practice good hygiene principles and vaccinate workers as feasible.

9. Minimize waste by reusing and recycle materials as appropriate, and sort and separate waste by risk and how it should be treated and disposed of. *The most important function of treatment is disinfection.* It is the high concentration of infectious agents that makes infectious waste dangerous.

10. Have HPAI action-implementing partners put the conditions above into action plan matrices with timelines, assignment of roles/responsibility, deadlines, and sign-off by Chief of Party or responsible authority. The plan with completed actions and signed is sent to USAID to show compliance (this essentially becomes part of monitoring).

#### **Discussion and Information Resources:**

The risk of the impact of medical and veterinary waste on health and the environment can be significantly reduced if the following conditions are met. The following conditions should be part of most if not all HPAI treatment programs producing medical and veterinary waste. Additional conditions can be written into individual country-specific IEEs as appropriate.

USAID should work with its partners to ensure that a medical waste management and disposal plan is in place and implemented which achieves destruction and burial of all waste products and includes the identification of roles, responsibilities, and a timeline for action completion (and Action Plan).

See Africa Bureau's EGSSAA Chapter 8 on Health Care Waste (cited above). This chapter contains guidance which should inform the Team's activities to promote proper handling and disposal of medical waste, particularly in the section titled, "Minimum elements of a complete waste management program." The program is also encouraged to make use of the attached "Minimal Program Checklist and Action Plan" for handling healthcare waste, which was adapted from the above EGSSAA chapter and which should be further adapted for use in individual USAID country programs.

See <http://www.reusablebags.com/facts.php?id=8> for dealing with plastic waste, like plastic bags, containers, and the plastic syringe cylinder. If not contaminated by pathogenic waste, plastic bags for moving and containing products can be recycled or reused, as can plastic syringe cylinders.

See <http://environmentalrisk.cornell.edu/AgPlastics/> for information on dealing with and recycling agricultural plastics.

For a study on recycling plastics from medical and health care facilities, see [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list\\_uids=12092754&dopt=Abstract](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12092754&dopt=Abstract). Also, plasticware that is not contaminated with human or animal blood or other potentially infectious biological material may be disposed of in sturdy cardboard boxes.

See Annex C for Safe Management of Healthcare Wastes, or also [http://www.jhpiego.org/scripts/pubs/category\\_detail.asp?category\\_id=9](http://www.jhpiego.org/scripts/pubs/category_detail.asp?category_id=9) for specific infection prevention, quality assurance, waste management, including incineration related issues of plastics, infectious materials, and other wastes in healthcare facilities with limited resources.

Other important references to consult in establishing a waste management program are “WHO’s Safe Management of Wastes from Healthcare Activities” [http://www.who.int/water\\_sanitation\\_health/medicalwaste/wastemanag/en/](http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/).

During a human pandemic, other than likely requiring the quarantine of infected people, the conditions for dealing with infected patients will be the same as those above, except with much greater urgency and greater quantities of activities, waste products, and all forms of risk to human and environmental quality. Information on the USA response to a potential pandemic is found at the following two sites: <http://www.cdc.gov/flu/avian> and <http://www.pandemicflu.gov/>. The proper use of safety equipment, good hygiene, disinfectants and vaccines will likely reduce the spread of a pandemic outbreak of HPAI H5N1.

The above conditions should be part of most if not all HPAI treatment programs generating medical and veterinary waste. Additional conditions can be written into individual country-specific IEEs as appropriate.

### **3.4 Culling of diseased livestock, and disposal of diseased livestock, wild birds, and their manure.**

The environmental concern with this type of activity is the potential for HPAI transmission through exposure to diseased livestock, wild birds and their manure and surroundings.

Poultry manure is a primary source of transmission of HPAI among birds. Avian Influenza virus from waterfowl can remain viable in feces and water for up to 32 days. HPAI can spread through fecal-contaminated materials such as bird cages, pallets, eggs, manure and feedstuffs, and from people going from farm to farm without appropriate cleaning and disinfection procedures. Infected dead birds are another source and reservoir of HPAI transmission and infection potential, as are eggs and other bird byproducts. Biosecurity of commercial poultry flocks is essential in preventing outbreaks and spread of HPAI.

Wild endemic and migratory fowl will become infected, potentially decimating populations of non-target and, in some cases, endangered wild bird species. There is an environmental imperative to reducing transmission opportunities to wildlife through domestic poultry carcass, manure and byproduct management.

In disease outbreaks, large numbers of poultry may need to be killed for control, containment or eradication purposes. Infected poultry should preferably be slaughtered on the affected farm, as close as possible to where they are housed to reduce exposure from handling and transport. Methods for killing large numbers of poultry in commercial operations include dangerous alternatives such as gassing with carbon dioxide (method of choice), carbon monoxide, hydrogen cyanide, nitrogen, argon, and anesthetics, as well as electrocution, and mechanical means. Use of some of these methods presents risks to human health including death. A local IEE should recognize, anticipate, and reduce these risks. These scenarios should be incorporated into the National HPAI Control Strategies.

Clearly, poultry manure, diseased birds, dead wild birds, eggs, and other infected bird byproducts must be disposed of and taken out of exposure to other birds and vectors or carriers of the virus like flies and scavengers. It *can not* be left in the open or buried in open pits. It must be covered by soil away from water sources. All poultry manure, carcass and byproduct handling equipment must be disinfected.

**Threshold Decision:** A **negative determination (with conditions)** is recommended per 22CFR216.3(a)(2)(iii).

#### **Conditions for Dealing with Poultry Manure, Diseased Poultry, and Wild Birds:**

1. Work with partners to assure, to the extent possible, that poultry manure and dead birds are properly handled, treated, stored, transported and disposed.
2. Produce a written manure and diseased bird management and disposal plan with clear responsibilities, written internal rules, and follow the plan.
3. Perform short-term safety training on handling and proper disposal options for manure and diseased birds (can and likely should be included as a component in overall training on HPAI management).
4. Children and the elderly are not to be permitted to have access or exposure to diseased birds, manure and body parts. Before disposal, waste should be stored securely.
5. Produce simple safe manure and diseased bird disposal training materials, quick reference guides, posters and flyers.
6. Procure simple protective clothing (gloves, masks, clothing, boots, etc.) for ministry staff and others that regularly handle and dispose of manure and diseased birds.
7. Practice good hygiene principles and vaccinate workers as feasible.

8. Regularly disinfect all manure and diseased bird handling and culling equipment.
9. Do not attempt to cull potentially infected wild bird populations as they will likely scatter and further spread HPAI. Take measures to reduce the trade in wildlife and wild birds.
10. Have HPAI action-implementing partners put the conditions above into action plan matrices with timelines, assignment of roles/responsibility, deadlines, and sign-off by Chief of Party or responsible authority. The plan with completed actions and signed is sent to USAID to show compliance (this essentially becomes part of monitoring).

### **Discussion and Information Resources:**

Properly managed, livestock production can enhance land and water quality, biodiversity, and social and economic well-being. However, when improperly managed, livestock production may cause significant economic, social and environmental damage such as by transmission of disease-causing agents to other animals and potentially humans like that occurring with HPAI. Livestock product processing can also have negative impacts on the environment and human health. Further, many species of wild birds, migratory and local, terrestrial and aquatic, can be infected by HPAI and can serve as reservoirs of and vehicles for transmission. Some species like ducks and likely other birds may carry and transmit the disease, show no serious signs of infection, and may not die.

For guidelines on dealing with manure, see EGSSAA Chapter 11 on Livestock Production: [http://www.encapafrica.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch11-Livestock.pdf](http://www.encapafrica.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch11-Livestock.pdf).

See [http://www.oie.int/eng/AVIAN\\_INFLUENZA/home.htm](http://www.oie.int/eng/AVIAN_INFLUENZA/home.htm) (the web site of the World Organization for Animal Health) for best practices in dealing with HPAI issues, including: Methods of humane killing for disease control purposes and carcass disposal.

See [http://www.frameweb.org/ev.php?ID=13653\\_201&ID2=DO\\_TOPIC](http://www.frameweb.org/ev.php?ID=13653_201&ID2=DO_TOPIC) to understand the conservation and biodiversity community's response to HPAI in Africa.

The SO team shall work with implementing partners to assure that the livestock production activities are designed and implemented in such a way as to avoid potential harmful impacts as much as possible. The above EGSSAA Livestock chapter's table titled, *Mitigation and Monitoring Issues Environmental Mitigation and Monitoring Issues for Livestock Projects* shall be used as guides in the design. Implementing partners should monitor for and report on adverse impacts, particularly land and habitat degradation.

The above conditions should be part of most if not all HPAI treatment programs dealing with or advising on disposal of poultry manure and sick or dead birds. Additional conditions can be written into individual country-specific IEEs as appropriate.

### **3.5. Provision and training in the use of personal protective equipment (PPE)**

The environmental concerns regarding this type of activity is simply to assure that the equipment procured is appropriate to the application and that sufficient equipment is procured to support the anticipated activities.

#### ***Personal Safety Equipment***

People who use safety equipment (masks, gloves, boots, etc.) when handling diseased or dead birds, manure, byproducts, infected patients, body fluids, and disinfectants greatly reduce their risks of transferring or contracting HPAI and being directly harmed by disinfectants.

Unfortunately, most Africans do not use safety equipment for reasons of knowledge, cost, inconvenience or comfort, thus increasing their risks. Provision of safety equipment and training on the necessity and use of such equipment will reduce the rate of non-compliance and risk. Missions will need to plan and implement programs to provide, train, monitor and properly dispose of safety equipment. AFR's Health Program plans to donate safety equipment, and missions can augment this process by planning and determining the areas of greatest need.

**Threshold Decision: A negative determination (with conditions)** is recommended per 22CFR216.3(a)(2)(iii).

#### **Conditions:**

1. Provide training on the proper use and disposal of safety equipment.
2. Ensure a reasonably high level of quality for the equipment procured.
3. Use care to procure the type of equipment specially required for the type of disinfectants to be used, the viral load and transmission routes, and the risks to be encountered.
4. Ensure that donations of disinfectants are accompanied by safety equipment.

#### **Discussion and Information Resources:**

The proper use of safety equipment can greatly reduce risk of harm to human health from chemicals used to combat the disease, to exposure to the virus, and to domestic poultry health from disease transmission. The Bureau for Africa EGSSAA web reference [http://www.encapfrica.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch13-SaferPesticideUse.pdf](http://www.encapfrica.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch13-SaferPesticideUse.pdf) provides a table that matches types of chemicals (basically liquid, solid or gas) and the special types of safety equipment needed for each.

The above conditions should be part of most, if not all, HPAI treatment programs using or advising on use of personal safety equipment. Additional conditions can be written into individual country-specific IEEs, as appropriate.

### ***Training***

Training courses provide an avenue for teaching skills to health, veterinary and agricultural technical staff involved in dealing with the HPAI outbreaks. For USAID, Regulation 216 requires that such training include not only human safety but environmental issues as well. The training can be short and use the train the trainer methodology, turning those trained into topic experts and reinforcing what they have learned.

Such training can include the following topics:

- Description of the disease and symptom recognition;
- Regulatory and quarantine issues;
- Surveillance; zoning and compartmentalization;
- Proper use of personal safety equipment,
- Proper handling, use and disposal of disinfectants;
- Proper handling, use and disposal of medical and veterinary waste;
- Environmental issues and protection;
- Proper disposal of poultry manure and bird parts;
- Vaccines and diagnostic methods;
- Methods of humane killing for disease control purposes and carcass disposal;
- Food safety;
- Planning and record keeping; and
- Safety of animal products in international trade.
- Incineration as a disposal method for waste, special treatment of plastics, and sharps
- Dealing with wild birds and wild bird die-off

### **3.6 Communication, public awareness campaigns and training in avian influenza response.**

One of the cheapest methods for disseminating public messages on HPAI management campaign risk reduction is through internet, radio and television outlets, and use of posters, billboards and informational flyers. These are methods for informing or ‘training’ a large number of people in a very short timeframe and can increase public awareness of the importance of animal quarantine issues and household egg and meat management, handling, and cooking requirements. These methods should be supported by and integrated into USAID’s response in each affected country. AFR’s Health Program plans to invest in communication technologies and methodologies to raise awareness and reduce risks. Missions can augment this process by planning and determining the areas of greatest need.

**Threshold Decision:** This category of activities is recommended for a **categorical exclusion from environmental examination**, per 22CFR216.2(c)(2)(i) [education, technical assistance, training].

### **3.7 Monitoring and Evaluation**

As required by ADS 204.5.4, the SO team will actively monitor ongoing activities for compliance with approved IEE recommendations, and modify or end activities that are not in compliance. If additional activities that are not described in this document are added to this program, an amended environmental examination must be prepared.

Basic mitigation is covered above by the conditions under each negative determination, and one level of monitoring can be achieved by collecting the completed, signed-off on by Chief of Party action plans from implementing partners.

A country-specific IEE should include a short description of how the SO Team intends to conduct monitoring, ensure compliance, and report on status. Some examples, which the SO Team can build upon include:

- \* Implementing partners' annual reports and, as appropriate, progress reports shall contain a brief update on mitigation and monitoring measures being implemented, results of environmental monitoring, and any other major modifications/revisions in the development activities, and mitigation and monitoring procedures.

- \* USAID/(Country) will report to the REO and the BEO on an annual basis on the status of environmental screening and review and the implementation of mitigation and monitoring requirements. This report should draw upon implementing partners' progress and annual reports, as well as on periodic site visits by the MEO and REO.

- \* USAID/(Country) is responsible for monitoring and evaluation of activities after implementation with respect to environmental effects. A process will be integrated into the SO's pertinent Performance Monitoring and Evaluation Plan which will involve periodic field visits.

- \* USAID/(Country) is responsible for assuring that implementing partners have the human capacity necessary to incorporate environmental considerations into program planning and implementation and to take on their role in the Environmental Screening Process. Implementing partners should seek training as needed, such as through participation in the Africa Bureau's regional ENCAP training courses.

## Glossary

AFR	Bureau for Africa, USAID
AI	Avian Influenza
BEO	Bureau Environmental Officer, USAID
CFR	Code of Federal Regulations
CS	Country Strategy
EGSSAA	USAID/Africa's Environmental Guidelines for Small Scale Activities in Africa
ELISA	Enzyme-Linked Immunosorbent Assay
EPA	U.S Environmental Protection Agency
EPP	Environmentally Preferable Purchasing
FAO	U.N. Food and Agriculture Organization
GC	General Counsel, USAID
GIS	Geographic Information Systems
H5N1	Hemagglutinin 5, Neuraminidase 1 (highly pathogenic strain of AI virus)
HPAI	Highly Pathogenic Avian Influenza. H5N1 strain of avian influenza
IEE	Initial Environmental Examination
NGO	Non-Governmental Organization
M&S	Monitoring and Surveillance
OIE	World Organization for Animal Health (Office International des Epizooties)
PCR	Patient Care Reports
PEA	Programmatic Environmental Assessment
PIEE	Programmatic Initial Environmental Examination
PVO	Private Voluntary Organization
REA	Rapid Environmental impact Assessment
REDSO	Regional Economic Development Support Office, USAID
RCSA	Regional Center for Southern Africa, USAID
SD	Office of Sustainable Development, AFR
SO	Strategic Objective
USAID	U.S. Agency for International Development
WARP	West Africa Regional Program, USAID
WHO	U.N. World Health Organization

## References

OIE Avian Influenza web site [http://www.oie.int/eng/AVIAN\\_INFLUENZA/home.htm](http://www.oie.int/eng/AVIAN_INFLUENZA/home.htm)

Guidelines for the Surveillance of Avian Influenza  
[Current Appendix 3.8.9. of the OIE Terrestrial Animal Health Code](#) - 2005

Guidelines for slaughter of poultry for disease control purposes  
J.W. Galvin - [Discussion paper](#)

Interim Guidelines on protection of farmers and slaughterhouses workers (WHO) - WHO  
Regional office for the Western Pacific, Manila, 26 January 2004 [File pdf](#)

FAO Avian Influenza web site  
[Http://Www.Fao.Org/Ag/Againfo/Subjects/En/Health/Diseases-Cards/Special\\_Avian.Html](Http://Www.Fao.Org/Ag/Againfo/Subjects/En/Health/Diseases-Cards/Special_Avian.Html)

[Global Strategy for the Progressive Control of Highly Pathogenic Avian Influenza \(HPAI\)](#)

Guiding Principles for Highly Pathogenic Avian Influenza Surveillance and Diagnostic Networks in Asia

USAID Avian Influenza Response  
[http://www.usaid.gov/our\\_work/global\\_health/home/News/news\\_items/avian\\_influenza.html](http://www.usaid.gov/our_work/global_health/home/News/news_items/avian_influenza.html) and  
<http://ghintranet.usaid.gov/aiunit/> and  
[http://inside.usaid.gov/EE/avian\\_influenza/](http://inside.usaid.gov/EE/avian_influenza/)  
[World Health Organization \(WHO\) Avian Influenza: Assessing the Pandemic Threat - January 2005](#) [PDF, 2.5MB]

See [http://www.encapafrika.org/EPTM/AnnexF-AFR\\_EPTM\\_Mar2005b.pdf](http://www.encapafrika.org/EPTM/AnnexF-AFR_EPTM_Mar2005b.pdf) for PEA details. A PIEE is justified as the present perceived risk does not rise to the level justified for a PEA.

Office International des Epizooties (OIE) and Food and Agriculture Organization (FAO) Guidelines. See [http://www.oie.int/eng/AVIAN\\_INFLUENZA/home.htm](http://www.oie.int/eng/AVIAN_INFLUENZA/home.htm) and [http://www.fao.org/ag/againfo/subjects/en/health/diseases-cards/special\\_avian.html](http://www.fao.org/ag/againfo/subjects/en/health/diseases-cards/special_avian.html)

USAID Health's response to HPAI is found at the following web address:  
[http://www.usaid.gov/our\\_work/global\\_health/home/News/news\\_items/avian\\_influenza.html](http://www.usaid.gov/our_work/global_health/home/News/news_items/avian_influenza.html). See <http://www.irinnews.org/Avianflu.asp> for a list of African countries and what each is doing to prepare itself against/for outbreak.

An up-to-date succinct listing of policies from each African country for preparing themselves to exclude, detect, contain and deal with HPAI can be found at this United Nations web address: <http://www.irinnews.org/Avianflu.asp>.

Many species of migratory birds coming to Africa from Europe, the Middle East and Asia are thought to be susceptible. See [http://www.birdlife.org/action/science/species/avian\\_flu/](http://www.birdlife.org/action/science/species/avian_flu/) for a statement on HPAI.

See [http://www.epa.gov/pesticides/factsheets/avian\\_flu\\_products.htm](http://www.epa.gov/pesticides/factsheets/avian_flu_products.htm) to find a list of 100 disinfectants currently registered by EPA for use in treating Avian Influenza A virus in the USA. Since this is a different strain of AI than the H5N1 strain, USAID missions would invoke the “or similar use” proviso.

To search for the registration and risk data for individual disinfectant products and chemicals in the disinfectants, see <http://www.pesticideinfo.org/Index.html>.

See [http://www.encapafrika.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch13-SaferPesticideUse.pdf](http://www.encapafrika.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch13-SaferPesticideUse.pdf) to understand pesticide safety issues in Africa well.

See [http://www.encapafrika.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch12-IntegPestMngmt.pdf](http://www.encapafrika.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch12-IntegPestMngmt.pdf) for ideas in developing an integrated pest management program that reduces pesticide use in Africa.

See [http://www.encapafrika.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch08-Healthcare-waste.pdf](http://www.encapafrika.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch08-Healthcare-waste.pdf) which is Chapter 8 on Health Care Waste of USAID Bureau for Africa’s Environmental Guidelines for Small Scale Activities in Africa (EGSSAA).

See <http://www.reusablebags.com/facts.php?id=8> for dealing with plastic waste, like plastic bags, containers, and the plastic syringe cylinder. If not contaminated by pathogenic waste, plastic bags for moving and containing products can be recycled or reused, as can plastic syringe cylinders.

See <http://environmentalrisk.cornell.edu/AgPlastics/> for information on dealing with and recycling agricultural plastics.

For a study on recycling plastics from medical and health care facilities, see [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list\\_uids=12092754&dopt=Abstract](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12092754&dopt=Abstract). Also, plasticware that is not contaminated with human or animal blood or other potentially infectious biological material may be disposed of in sturdy cardboard boxes.

See: [http://www.jhpiego.org/scripts/pubs/category\\_detail.asp?category\\_id=9](http://www.jhpiego.org/scripts/pubs/category_detail.asp?category_id=9) for specific infection prevention, quality assurance, waste management, including incineration related issues of plastics, infectious materials, and other wastes in healthcare facilities with limited resources,

Other important references to consult in establishing a waste management program are “WHO’s Safe Management of Wastes from Healthcare Activities”

[http://www.who.int/water\\_sanitation\\_health/medicalwaste/wastemanag/en/](http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/).

For guidelines on dealing with manure, see EGSSAA Chapter 11 on Livestock Production: [http://www.encapafrica.org/EGSSAA/current\\_EGSSAA\\_sections/EGSSAA-Pt2Ch11-Livestock.pdf](http://www.encapafrica.org/EGSSAA/current_EGSSAA_sections/EGSSAA-Pt2Ch11-Livestock.pdf).

See [http://www.oie.int/eng/AVIAN\\_INFLUENZA/home.htm](http://www.oie.int/eng/AVIAN_INFLUENZA/home.htm) (the web site of the World Organization for Animal Health) for best practices in dealing with HPAI issues, including: Methods of humane killing for disease control purposes and carcass disposal.

See [http://www.frameweb.org/ev.php?ID=13653\\_201&ID2=DO\\_TOPIC](http://www.frameweb.org/ev.php?ID=13653_201&ID2=DO_TOPIC) to understand the conservation and biodiversity community’s response to HPAI in Africa.

Information on the USA response to a potential pandemic is found at the following two sites: <http://www.cdc.gov/flu/avian/> and <http://www.pandemicflu.gov/>.

New initiatives are underway to reduce negative environmental impacts that arise from or exacerbate disasters. Several groups are currently focusing on this issue. They include Relief Web at <http://www.reliefweb.int/rw/lib.nsf/db900SID/DPAL-5ZAHW2?OpenDocument>, the REA Centre at [http://www.benfieldhrc.org/disaster\\_studies/rea/rea\\_index.htm](http://www.benfieldhrc.org/disaster_studies/rea/rea_index.htm), among others.

The Pesticide Action Network has information on toxicity and persistence in the environment for many pesticides. See <http://www.pesticideinfo.org/Index.html>

For missing or unreadable product labels on registered pesticide disinfectants, the EPA pesticide product label database is found at <http://oaspub.epa.gov/pestlabl/ppls.home>

## Appendix A. EPA list of 100 approved pesticide disinfectants for Avian Infuenza

[http://www.epa.gov/pesticides/factsheets/avian\\_flu\\_products.htm](http://www.epa.gov/pesticides/factsheets/avian_flu_products.htm) downloaded May 30, 2006

These EPA-registered disinfectant products are registered and labeled with a claim to inactivate “avian influenza A” viruses on hard, non-porous surfaces. Typical sites listed on these product labels include: veterinary premises, poultry houses, farm premises and equipment, and other industrial and institutional settings. Although there are no antimicrobial products registered specifically against the H5N1 subtype of **avian influenza A** viruses, EPA believes 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, which are typically in liquid or spray form, are available at retail establishments, and users should look for an EPA registration number on the label (e.g., EPA Reg. No. XXX-XX). The label will also indicate if the disinfectant product is effective against **avian influenza A** virus. [General information about disinfecting for avian flu.](#)

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](#). 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](#).

	Registration Number	Product Name
1	106-72	Maxima 128
2	106-73	Maxima 256
3	106-79	Broadspec 256
4	106-81	Maxima RTU
5	134-65	DC&R Disinfectant
6	211-25	Pheno Cen Germicidal Detergent
7	211-32	Pheno Cen Spray Disinfectant
8	211-50	Q5.5-5 NPB 2.5 HW
9	211-62	Low pH Phenolic
10	303-91	Hi-Tor Germicidal
11	303-92	Quanto Germicidal
12	464-689	Ucarsan Sanitizer 420
13	464-696	Ucarsan Sanitizer 4128
14	464-700	Ucarcide 14 Antimicrobial
15	464-702	Ucarcide 42 Antimicrobial
16	464-715	Ucarsan 442 Sanitizer
17	464-716	Ucarsan 414 Sanitizer

18	1043-91	LpH Master Product
19	1677-129	Oxonia Active
20	1677-158	Vortexx
21	1677-203	OXYSEPT LDI
22	1839-86	BTC 2125 M 10% Solution
23	1839-154	Scented 10% BTC 2125M Disinfectant
24	1839-155	BTC 2125M 20% Solution
25	1839-173	7.5% BTC 885 Disinfectant
26	3838-36	Quat 44
27	3838-37	Quat Rinse
28	6836-70	Bardac 205M 7.5B
29	6836-71	Lonza Formulation Y-59
30	6836-75	Lonza Formulation S-21
31	6838-77	Lonza Formulation S-18
32	6836-78	Lonza Formulation R-82
33	6836-136	Lonza Formulation S-18F
34	6839-139	Lonza Formulation R-82F
35	6836-140	Lonza Formulation S-21F
36	6836-152	Lonza Formulation DC-103
37	6836-233	Bardac 205M-50
38	6836-252	Phencide 256
39	6836-253	Phenocide 128
40	6836-266	Bardac 205M-10
41	6836-277	Bardac 205M 1.30
42	6836-278	Bardac 205M 14.08
43	6836-302	Bardac 205M 5.2
44	6836-303	Bardac 205M 7.5B
45	10324-56	Maquat 256
46	10324-58	Maquat 128
47	10324-59	Maquat 64
48	10324-63	Maquat 10
49	10324-67	Maquat MQ615-AS
50	10324-72	Maquat 615 HD
51	10324-80	Maquat 5.5M

52	10324-81	Maquat 705M
53	10324-85	Maquat 86 M
54	10324-94	Maquat 20M
55	10324-96	Maquat 50DS
56	10324-99	Maquat 10
57	10324-115	Maquat 750 M
58	10324-117	Maquat 710 M
59	10324-118	Maquat 256 EBC
60	10324-119	Maquat 128 EBC
61	10324-120	Maquat 64 EBC
62	10324-131	Maquat A
63	10324-142	Maquat MQ2425 M 14
64	10324-143	Maquat 10B
65	10324-145	Maquat FP
66	10324-162	Maquat 2420 Citrus
67	10324-164	Maquat 256 PD
68	11600-4	Sanox II
69	11725-7	Tek-Trol Disinfectant
70	14955-33	SMS Disinfectant Sanitizer
71	34797-75	Canine Parvovirus Disinfectant
72	47371-6	Formulation HS 652Q
73	47371-7	Formulation HS 821Q
74	47371-36	HS-867Q
75	47371-37	HS-267Q germicidal Cleaner
76	47371-141	Formulation HH 652Q
77	61178-1	D-125
78	61178-2	Public Places
79	61178-4	Public Places Towelette
80	61178-5	CCX-151
81	61178-6	D-128
82	66171-1	Advantage 256
83	66243-1	Odo-Ban Ready to Use
84	66243-2	Odo-Ban
85	66243-3	Quik Control

86	67619-9	PJW-622
87	70263-6	Microban QGC
88	70623-8	Microban Professional
89	70627-2	Disinfectant DC 100
90	70627-6	Phenolic Disinfectant HG
91	70627-10	Johnson's Forward Cleaner
92	70627-15	Johnson's Blue Chip Germicidal
93	70627-21	Virex II 128
94	70627-22	Virex RTU
95	70627-23	Virex II 64
96	70627-24	Virex II 256
97	71355-1	Virocid
98	71654-6	Virkon S
99	71847-2	Klor-Kleen
100	81073-1	Peridox

For further questions, contact the Antimicrobial Division hotline at 703-308-0127, 703-308-6467 (FAX) or email at [info\\_antimicrobial@epa.gov](mailto:info_antimicrobial@epa.gov).

## Appendix B. EPA exempted disinfectants

<http://www.epa.gov/fedrgstr/EPA-PEST/1996/March/Day-06/pr-577.html> downloaded May 30, 2006

Minimum risk pesticides-- (1) Exempted products. Products containing the following active ingredients are exempt from the requirements of FIFRA, alone or in combination with other substances listed in this paragraph, provided that all of the criteria of this section are met.

- Castor oil (U.S.P. or equivalent)
- Cedar oil
- Cinnamon and cinnamon oil
- Citric acid
- Citronella and Citronella oil
- Cloves and clove oil
- Corn gluten meal
- Corn oil
- Cottonseed oil
- Dried Blood
- Eugenol
- Garlic and garlic oil
- Geraniol
- Geranium oil
- Lauryl sulfate
- Lemongrass oil
- Linseed oil
- Malic acid
- Mint and mint oil
- Peppermint and peppermint oil
- 2-Phenethyl propionate (2-phenylethyl propionate)
- Potassium sorbate
- Putrescent whole egg solids
- Rosemary and rosemary oil
- Sesame (includes ground sesame plant) and sesame oil
- Sodium chloride (common salt)
- Sodium lauryl sulfate
- Soybean oil
- Thyme and thyme oil
- White pepper
- Zinc metal strips (consisting solely of zinc metal and impurities)

## Appendix C: Guidance for Country-level IEEs for AI Response Activities

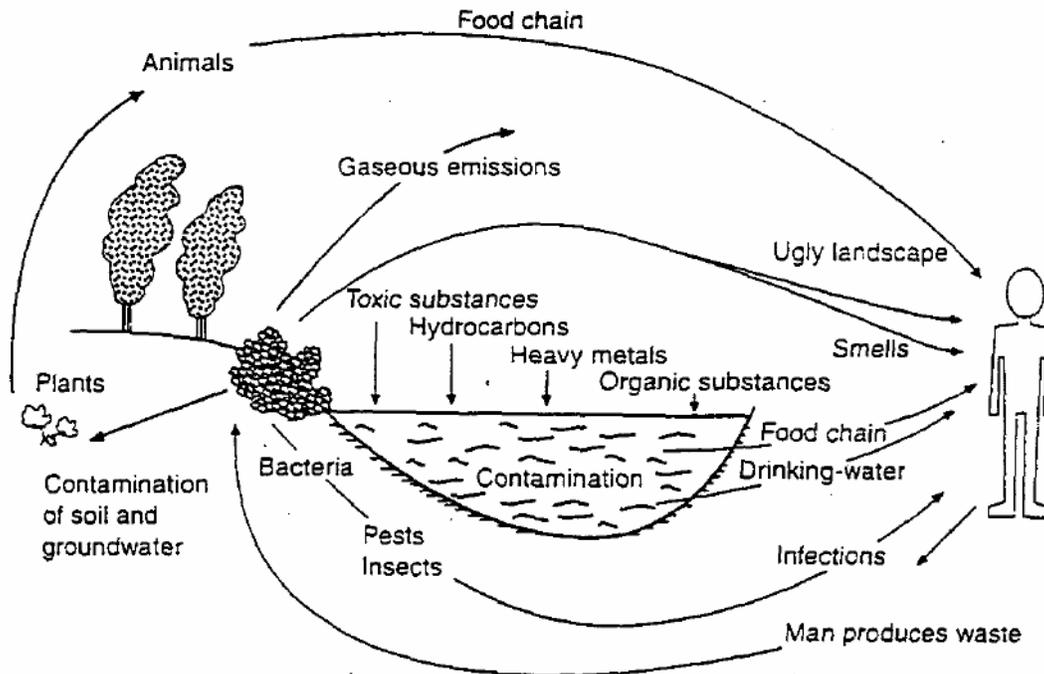
Because the Agency's internal policy (ADS 204) requires environmental examinations at the level of the operating unit that has managerial responsibility for an activity, this PIEE must be supplemented by brief country-level IEEs or IEE amendments covering the AI response activities to be supported. It is the intent of this PIEE to provide guidance to which such country-level IEEs can simply refer, rather than repeat. Such country-level IEEs will serve to acknowledge the guidance in this PIEE, to assign environmental mitigation responsibilities to those parties responsible for the management of country-level AI activities, and to address any proposed discrepancies with PIEE guidance.

In the interest of further streamlining the IEEs to be prepared at the country level, following are recommendations regarding the content needed in these country-level IEEs, including guidance on how the PIEE can be used to inform those analyses:

- Summary of Findings/Facesheet** – (about 2 pages)
1. **Background/Activity Description** – a brief summary what USAID is being asked to do, by whom (to the extent that is known). You should identify the full range of activities that might be anticipated. (~1 page)
  2. **Country and Environmental Information** – This is important. Where will the work be done? How will the work be managed, by whom? What other actors are involved? (~1 page)
  3. **Evaluation of Activities for Environmental Impact** -- Refer to the PIEE's Section 3 here and do not repeat. To the extent that local conditions are unique, those should be referenced. (~1/2 page)
  4. **Recommended Threshold Decisions/Monitoring and Mitigation Measures** – This may be your most important section. It's important that your program managers and mission director be informed of the conditions to which you are signing on, so some degree of PIEE content is advisable here. For all of the activities that might be supported, identify the recommended threshold determinations and the conditions associated with those. Also, identifying the management approach by which mitigation measures will be assured and activities and impacts will be monitored is important. (~2-3 pages)
  5. **When disinfectants will be used in the program supported, include an attachment which addresses the information called for by the Pesticide Procedures, per 22CFR216.3(b), elements (a-1).** The content in this attachment should follow the model of the part of this document in Section 3 titled, "PESTICIDE PROCEDURES ANALYSIS FOR AI DISINFECTANTS." The attachment should address the specific additional information not covered in this PIEE, which is identified above for each of the elements (a-1) with "For mission IEE:..."

## ANNEX D - SAFE MANAGEMENT OF WASTES FROM HEALTH-CARE ACTIVITIES

**Figure 1. Routes of exposure to hazards caused by open dumping**



### Land disposal

#### Municipal disposal sites

If a municipality or medical authority genuinely lacks the means to treat wastes before disposal, the use of a landfill has to be regarded as an acceptable disposal route. Allowing health-care waste to accumulate at hospitals or elsewhere constitutes a far higher risk of the transmission of infection than careful disposal in a municipal landfill, even if the site is not designed to the standard used in higher-income countries. The primary objections to landfill disposal of hazardous health-care waste especially untreated waste may be cultural or religious or based on a perceived risk of the release of pathogens to air and water or on the risk of access by scavengers.

There are two distinct types of waste disposal to land -- *open dumps* and sanitary landfills.

- Open dumps are characterized by the uncontrolled and scattered deposit of wastes at a site; this leads to acute pollution problems, fires, higher risks of disease transmission, and open access to scavengers and animals. Healthcare waste should not be deposited on or around open dumps. The risk of either people or animals coming into contact with infectious pathogens is obvious, with the further risk of subsequent disease transmission, either directly through wounds, inhalation, or ingestion, or indirectly through the food chain or a pathogenic host species (see Fig. 1).
- Sanitary landfills are designed to have at least four advantages over open dumps: geological isolation of wastes from the environment, appropriate engineering preparations before the site is ready to accept wastes, staff present on site to control operations, and organized deposit and daily coverage of waste. Some of the rules applicable to sanitary landfills are listed in Box 1. Disposing of certain types of health-care waste (infectious waste and small quantities of pharmaceutical waste) in sanitary landfills is acceptable; sanitary landfill prevents contamination of soil and of surface

water and groundwater, and limits air pollution, smells, and direct contact with the public.

**Box 1. Some essential elements for design and operation of sanitary landfills**

- Access to site and working areas possible for waste delivery and sits vehicles.
- Presence of site personnel capable of effective control of daily operations.
- Division of the site into manageable bases appropriately prepared before landfill starts.
- Adequate sealing of the base and sides of the site to minimize the movement of wastewater (leachate) off the site.
- Adequate mechanisms for leachate collection and treatment systems if necessary.
- Organized deposit of wastes in a small area, allowing them to be spread, compacted, and covered daily.
- Surface water collection trenches around site boundaries.
- Construction of a final cover to minimize rainwater infiltration when each phase of the landfill is completed.

Upgrading from open dumping directly to sophisticated sanitary landfills may be technically and financially difficult for many municipalities. It has often been found impossible to sustain such efforts from the available local resources. However this is no reason for municipal authorities to abandon the move towards safer land disposal techniques, perhaps by a gradual approach, such as that outlined in Box 2.

In the absence of sanitary landfills; any site from a controlled dump upwards could accept health-care waste and avoid any measurable increase in infection risk. The minimal requirements would be the following:

- an established system for rational and organized deposit of wastes which could be used to dispose of health-care wastes;
- some engineering work already completed to prepare the site to retain its wastes more effectively;
- rapid burial of the health-care waste, so that as much human or animal contact as possible is avoided.

It is further recommended that health-care waste be deposited in one of the two following ways:

- In a shallow hollow excavated in mature municipal waste in the layer below the base of the working face, and immediately covered by a 2-metre layer of fresh municipal waste. Scavenging in this part of the site must be prevented. The same method is often used for hazardous solid industrial wastes; it is specifically intended to prevent animals and scavengers from re-excavating the deposited healthcare waste.
- In a deeper (1-2m) pit excavated in mature municipal waste (i.e. waste covered at least 3 months previously). The pit is then backfilled with the mature municipal waste that was removed. Scavenging in this part of the site must be prevented.

Alternatively, a special *small burial pit* could be prepared to receive health-care waste only. The pit should be 2m deep and filled to a depth of 1-1.5m. After each waste load, the waste should be covered with a soil layer 10-15cm deep. If coverage with soil is not possible, lime may be deposited over the waste. In case of outbreak of an especially virulent infection (such as Ebola virus), both lime and soil cover may be added. Access to this dedicated disposal area should be

restricted, and the use of a pit would make supervision by landfill staff easier and thus prevent scavenging. A typical example of pit design for health-care waste is shown in Fig. 2.

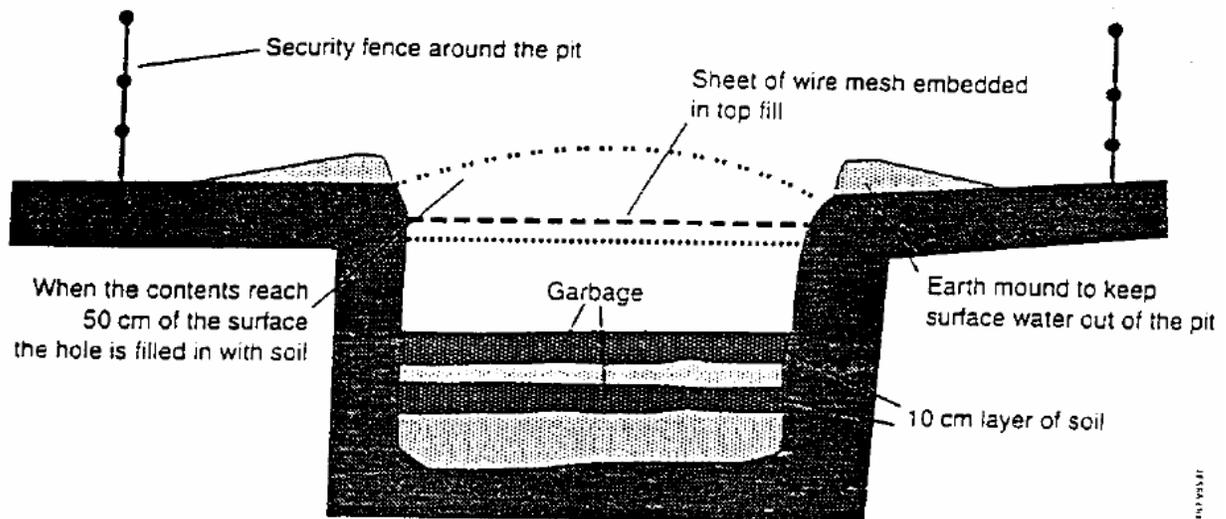
**Box 2. Proposed pathway for gradual upgrading of landfills<sup>1</sup>**

1. **From open dumping to "controlled dumping"**. This involves reduction of the working area of the site to a more manageable size (2ha for a medium-size town), covering unneeded areas of the site with soil, extinguishing fires, and agreeing rules of on-site working with scavengers if they cannot be excluded completely.
2. **From controlled dumping to "engineered landfill"**. This involves the gradual adoption of engineering techniques to prevent surface water from entering the waste, extract and spread soils to cover wastes, gather wastewater (leachate) into lagoons, spread and compact waste into thinner layers, prepare new pans of the landfill with excavation equipment, and isolate the waste from the surrounding geology (e.g. with plastic sheeting under the waste).
3. **From engineered landfill to "sanitary landfill"**. This involves the continuing refinement with increasing design and construction complexity, of the engineering techniques begun for engineered landfill. In addition, there should be landfill gas control measures, environmental monitoring points and bore holes (for monitoring air and groundwater quality), a highly organized and well trained work force, detailed record-keeping by the site office, and, in some circumstances, on-site treatment of leachate.

<sup>1</sup> Adapted from Rushbrook & Pugh(1997).

Before health-care wastes are sent for disposal, it is prudent to inspect Landfill sites to ensure that there is sensible control of waste deposition.

**Figure 2.** Example of a small burial pit for health-care waste



**Encapsulation**

Disposal of health-care waste in municipal landfills is less advisable if it is untreated than if it is pretreated. One option for pretreatment is encapsulation, which involves filling containers with waste, adding an immobilizing material, and sealing the containers. The process uses either cubic

boxes made of high-density polyethylene or metallic drums, which are three-quarters filled with sharps and chemical or pharmaceutical residues. The containers or boxes are then filled up with a medium such as plastic foam, bituminous sand, cement mortar, or clay material. After the medium has dried, the containers are sealed and disposed of in landfill sites.

This process is relatively cheap, safe, and particularly appropriate for establishments that practice **minimal programs** for the disposal of sharps and chemical or pharmaceutical residues. Encapsulation alone is not recommended for non-sharp infectious waste, but may be used in combination with burning of such waste. The main advantage of the process is that it is very effective in reducing the risk of scavengers gaining access to the hazardous health-care waste.

### **Safe burial on hospital premises**

In health-care establishments that use minimal programs for healthcare waste management, particularly in remote locations, in temporary refugee encampments, or in areas experiencing exceptional hardship, the safe burial of waste on hospital premises may be the only viable option available at the time. However, certain basic rules should still be established by the hospital management:

- Access to the disposal site should be restricted to authorized personnel only.
- The burial site should be lined with a material of low permeability, such as clay, if available, to prevent pollution of any shallow groundwater that may subsequently reach nearby wells.
- Only hazardous health-care waste should be buried. If general hospital waste were also buried on the premises, available space would be quickly filled up.
- Large quantities (>1 kg) of chemical wastes should not be buried at one time. Burying smaller quantities avoids serious problems of environmental pollution.
- The burial site should be managed as a landfill, with each layer of waste being covered with a layer of earth to prevent odors, as well as to prevent rodents and insects proliferating.

The safety of waste burial depends critically on rational operational practices. The design and use of the burial pit are described in the previous section and illustrated in Fig. 2. The bottom of the pit should be at least 1.5 meters higher than the groundwater level.

### **Land disposal of residues**

After disinfection or incineration, infectious health-care waste becomes non-risk waste and may be finally disposed of in landfill sites. However, certain types of health-care waste, such as anatomical waste, will still have an offensive visual impact after disinfection, and this is culturally unacceptable in many countries. Such wastes should therefore be made unrecognizable before disposal, for example by incineration. If this is not possible, these wastes should be placed in containers before disposal.

### **Inertization**

The process of "inertization" involves mixing waste with cement and other substances before disposal in order to minimize the risk of toxic substances contained in the waste migrating into surface water or groundwater. It is especially suitable, for pharmaceuticals and for incineration ashes with a high metal content (in this case the process is also called "stabilization").

For the inertization of pharmaceutical waste, the packaging should be removed, the pharmaceuticals ground, and a mixture of water, lime, and cement added. A homogeneous mass is formed and cubes (e.g. of 1m<sup>3</sup>) or pellets are produced on site and then can be transported to a

suitable storage site. Alternatively, the homogeneous mixture can be transported in liquid state to a landfill and poured into municipal waste.

The following are typical proportions for the mixture:

- 65% pharmaceutical waste
- 15% lime
- 15% cement
- 5% water

The process is reasonably inexpensive and can be performed using relatively unsophisticated equipment. Other than personnel, the main requirements are a grinder or road roller to crush the pharmaceuticals a concrete mixer, and supplies of cement, lime, and water.

The main advantages and disadvantages of the various treatment and disposal options addressed in this handbook are outlined in Table 1.

**Table 1. Summary of main advantages and disadvantages of treatment and disposal options.**

<b>Treatment/ disposal method</b>	<b>Advantages</b>	<b>Disadvantages</b>
Rotary kiln	<ul style="list-style-type: none"> <li>• Adequate for all infectious waste, most chemical waste and pharmaceutical waste.</li> </ul>	<ul style="list-style-type: none"> <li>• High investment and operating costs.</li> </ul>
Pyrolytic incineration	<ul style="list-style-type: none"> <li>• Very high disinfection efficiency.</li> <li>• Adequate for all infectious waste and most pharmaceutical and chemical waste.</li> </ul>	<ul style="list-style-type: none"> <li>• Relatively high investment and operating costs.</li> </ul>
Single-chamber incineration	<ul style="list-style-type: none"> <li>• Good disinfection efficiency</li> <li>• Drastic reduction of weight and volume of waste.</li> <li>• The residues may be disposed of in landfills. No need for highly trained operators.</li> <li>• Relatively low investment and operating costs.</li> </ul>	<ul style="list-style-type: none"> <li>• Significant emissions of atmospheric pollutants.</li> <li>• Need for periodic removal of slag and soot.</li> <li>• Inefficiency in destroying thermally resistant chemicals and drugs such as cytotoxins.</li> </ul>
Drum or brick incineration	<ul style="list-style-type: none"> <li>• Drastic reduction of weight and volume of waste.</li> <li>• Very low investment and operating costs.</li> </ul>	<ul style="list-style-type: none"> <li>• Destroys only 99% of microorganisms.</li> <li>• No destruction of many chemicals and pharmaceuticals.</li> <li>• Massive emission of black smoke, fly ash, toxic flue gas, and odors.</li> </ul>
Chemical disinfection*	<ul style="list-style-type: none"> <li>• Highly efficient disinfection under good operating conditions.</li> <li>• Some chemical disinfectants are relatively inexpensive.</li> <li>• Drastic reduction on waste volume</li> </ul>	<ul style="list-style-type: none"> <li>• Requires highly qualified technicians for operation of the process.</li> <li>• Uses hazardous substances that require comprehensive safety measures.</li> <li>• Inadequate for pharmaceutical, chemical and some types of infectious waste.</li> </ul>

**Table 1 continued.**

<b>Treatment/ disposal method</b>	<b>Advantages</b>	<b>Disadvantages</b>
Wet thermal treatment*	<ul style="list-style-type: none"> <li>• Environmentally sound</li> <li>• Drastic reduction in waste volume.</li> </ul>	<ul style="list-style-type: none"> <li>• Shredders are subject to frequent breakdowns and poor functioning.</li> <li>• Operation requires qualified technicians.</li> <li>• Inadequate for anatomical, pharmaceutical, and chemical waste and waste that is not readily stream-permeable.</li> </ul>
Microwave irradiation	<ul style="list-style-type: none"> <li>• Good disinfection efficiency under appropriate operating conditions.</li> <li>• Drastic reduction in waste volume.</li> <li>• Environmentally sound</li> </ul>	<ul style="list-style-type: none"> <li>• Relatively high investment and operating costs</li> <li>• Potential operation and maintenance problems.</li> </ul>
Encapsulation	<ul style="list-style-type: none"> <li>• Simple, low-cost, and safe</li> <li>• May also be applied to pharmaceuticals.</li> </ul>	<ul style="list-style-type: none"> <li>• Not recommended for non-sharp infectious waste.</li> </ul>
Safe burying	<ul style="list-style-type: none"> <li>• Low costs.</li> <li>• Relatively safe if access to site is restricted and where natural infiltration is limited.</li> </ul>	<ul style="list-style-type: none"> <li>• Safe only if access to site is limited and certain precautions are taken.</li> </ul>
Inertization	<ul style="list-style-type: none"> <li>• Relatively inexpensive.</li> </ul>	<ul style="list-style-type: none"> <li>• Not applicable to infectious waste.</li> </ul>

\* May not apply to more sophisticated, self-contained, commercial methods.

It should be kept in mind that safe on-site burial is practicable only for relatively limited periods, say 1-2 years, and for relatively small quantities of waste, say up to 5 or 10 tonnes in total. Where these conditions are exceeded, a longer-term solution, probably involving disposal at a municipal solid waste landfill, will need to be found.