SHIPPING INFECTIOUS SUBSTANCES WITH OR WITHOUT DRY ICE

This Standard Operating Procedure (SOP) describes how to prepare a shipment containing materials properly classified as Infectious Substances, Category A for transport by air with a carrier that subscribes to International Air Transport Authority (IATA) standards. The information in this SOP is based on the most current IATA Dangerous Goods Regulations.

This SOP is a supplement to and not a substitute for the DOT/IATA training provided by EHS. Training is required before engaging in any transport-related function and at least every three (3) years thereafter.

SCOPE
This SOP applies to shipments containing only Infectious Substances, Category A materials with or without dry ice. However, packages containing an excepted quantity of certain flammable, corrosive, or other hazard class 9 liquids needed for maintaining the viability, stability, or preventing degradation or neutralization of the material may also be shipped in accordance with this SOP.

Review the EHS SOP – Select Agents and Toxins to verify that the Category A material you want to ship is not a Select Agent. This SOP does not authorize the shipment of Select Agents. All shipments of Select Agents must be coordinated with, and approved by UNL’s Responsible Official (EHS Director) and only after receiving federal pre-authorization.

In addition, this SOP does not address additional permits that may be required by CDC or APHIS when importing, exporting, or conducting intra- or inter-state shipments of human or animal pathogens.

Proper Classification
Dangerous Goods/Hazardous Materials must be properly classified and shipped in accordance with the appropriate packaging and shipping instructions. Do not over- or under-classify dangerous goods/hazardous materials. Materials properly classified as “Patient Specimens” or “Biological Substances, Category B” must be packaged and shipped in accordance with the EHS SOP, Shipping Biological Substances and Patient Specimens.

An Infectious Substance, Category A material is defined as an infectious substance (known or reasonably expected to contain bacteria, viruses, rickettsiae, parasites, fungi,
and other agents such as prions, which can cause disease in humans or animals) which is transported in a form that, when exposure to it occurs, is capable of causing permanent disability, life-threatening or fatal disease in otherwise healthy humans or animals. Examples of Infectious Substances, Category A materials are provided in Appendix A of this SOP.

SAFETY INFORMATION – INFECTIOUS SUBSTANCES
Prior to preparing infectious substances for shipment, review the Safety Data Sheet or agent hazard summary or other technical literature regarding the hazards of the known or suspect organisms. Following is a broad summary of the typical hazards of small quantities of Infectious Substances, Category A shipped in commerce from UNL.

- These materials can cause serious or lethal disease in humans and/or animals.
- These materials are often infectious by inhalation, and may also be infectious by inoculation, ingestion, and contact with broken skin. Because they are often infectious by inhalation, it is very important to avoid aerosol-producing activities and to handle open containers in a Biosafety Cabinet.
- A freshly prepared 10% solution of household bleach with a contact time of 20 minutes is generally effective in disinfecting non-porous equipment, surfaces, and spills of liquid cultures. Efficacy of disinfection is diminished in the presence of heavy organic loading (e.g., lots of dirt, grime, grease, etc.).
- Avoid contact with unprotected skin, eyes, and mucous membranes. Use surgical-type protective gloves, protective eyewear, and protective outer garments when handling.
- Observe good personal hygiene. Wash hands and skin thoroughly after removing Personal Protective Equipment (PPE) and before leaving the work area.
- Seek medical attention following known or suspected exposures. Wash exposed skin thoroughly with soap and water. Flush eyes for 15 minutes after contact.

Sometimes, infectious substances are shipped with dry ice. Following is a broad summary of the hazards of small quantities (e.g., 5 pounds or less) of dry ice shipped in commerce.

- Dry ice sublimes. It changes directly from a solid to a gas. Therefore, packages and over-packs must not be tightly sealed. They must allow gases to escape to prevent the build-up of pressure.
- As dry ice sublimes it creates carbon dioxide gas, which is colorless and odorless. If enough dry ice were to sublime in an unventilated space, it could accumulate to a level that exceeds an occupational exposure limit (5000 ppm expressed as an 8-hour Time-Weighted Average (TWA) or 30,000 ppm as a ceiling limit). Breathing high concentrations of carbon dioxide can lead to labored breathing, increased pulse rate, headache, increased blood pressure, and muscle twitching. At extremely high concentrations, the amount of oxygen available could be reduced to an amount that is insufficient to support life, leading to asphyxiation.
- Dry ice is extremely cold at -109.3°F (-78.5°C). Touching dry ice unprotected can lead to frostbite. Always handle dry ice with care and wear thermally protective gloves and eyewear. Use mechanical device (e.g., tongs) to handle.

**IATA TABLE 4.2 ENTRIES - INFECTIOUS SUBSTANCES, CATEGORY A**

Following is information from the IATA 4.2 table for Infectious Substances, Category A and Dry Ice.

### IATA 4.2 Substances Infectious to Animals

<table>
<thead>
<tr>
<th>Proper shipping name:</th>
<th>Infectious substance, affecting animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN/ID No.:</td>
<td>UN 2900</td>
</tr>
<tr>
<td>Class or Division</td>
<td>6.2</td>
</tr>
<tr>
<td>Hazard Label</td>
<td>Infectious Substance</td>
</tr>
<tr>
<td>Packing Group</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Packing Instructions</td>
<td>620</td>
</tr>
<tr>
<td>Maximum Quantity/Package for Limited Quantity Shipment</td>
<td>“E0”- Not permitted as Excepted Quantity</td>
</tr>
<tr>
<td>Passenger/Cargo Aircraft (quantity limitations)</td>
<td>50 g (solid), 50 ml (liquid)</td>
</tr>
<tr>
<td>Cargo Aircraft Only (quantity limitations)</td>
<td>4 kg (solid), 4 L (liquid)</td>
</tr>
<tr>
<td>Special Provisions</td>
<td>A81 – The quantity limits do not apply to body parts, organs, or whole bodies. A140 – When the infectious substances shipped are unknown but are suspected of meeting the criteria for inclusion in Category A, the words “Suspected Category A infectious substance” must appear in parenthesis following the proper shipping name in the Shipper’s Declaration for Dangerous Goods.</td>
</tr>
</tbody>
</table>

### IATA 4.2 Substances Infectious to Humans

<table>
<thead>
<tr>
<th>Proper shipping name:</th>
<th>Infectious substance, affecting humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN/ID No.:</td>
<td>UN 2814</td>
</tr>
<tr>
<td>Class or Division</td>
<td>6.2</td>
</tr>
<tr>
<td>Hazard Label</td>
<td>Infectious Substance</td>
</tr>
<tr>
<td>Packing Group</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Packing Instructions</td>
<td>620</td>
</tr>
<tr>
<td>Maximum Quantity/Package for Limited Quantity Shipment</td>
<td>“E0”- Not permitted as Excepted Quantity</td>
</tr>
<tr>
<td>Passenger/Cargo Aircraft (quantity limitations)</td>
<td>50 g (solid), 50 ml (liquid)</td>
</tr>
<tr>
<td>Cargo Aircraft Only (quantity limitations)</td>
<td>4 kg (solid), 4 L (liquid)</td>
</tr>
</tbody>
</table>
**Special Provisions**

| A81 – The quantity limits do not apply to body parts, organs or whole bodies. |
| A140 – When the infectious substances shipped are unknown but are suspected of meeting the criteria for inclusion in Category A, the words “Suspected Category A infectious substance” must appear in parenthesis following the proper shipping names in the Shipper’s Declaration for Dangerous Goods. |

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**IATA 4.2 Dry Ice**

| Proper shipping name: | “Carbon dioxide, solid” or “Dry ice” |
| UN/ID No.: | UN 1845 |
| Class or Division | 9 |
| Hazard Label | Miscellaneous |
| Packing Group | Not Applicable |
| Packing Instructions | 954 |
| Maximum Quantity/Package for Limited Quantity Shipment | “E0” - Not permitted as Excepted Quantity |
| Passenger/Cargo Aircraft (quantity limitations) | 200 kg |
| Cargo Aircraft Only (quantity limitations) | 200 kg |
| Special Provisions | A48 (package test not required); A151: A805 |

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**PACKAGING - INFECTIOUS SUBSTANCES, CATEGORY A**

Specification packaging is required (indicated by the manufacturer’s specification marking on the package that indicates it is suitable for hazard class 6.2 dangerous goods). Packaging must be compatible with the contents and consist of three components:

1. Primary receptacle(s) that is/are leak- or sift-proof (liquids or solids, respectively) and have positive means of closure (e.g., tape reinforced lid closure);
2. Secondary packaging that is leak- or sift-proof (liquids or solids, respectively) and have positive means of closure (e.g., tape reinforced lid closure); and
3. Rigid outer packaging. If dry ice is included in the package, then the outer package must be designed and closed in a manner that will allow off-gassing vapors to escape.

In addition,

1. Inner packages containing liquids must have sufficient headspace to allow for expansion of the liquid due to temperature/pressure changes.
2. Inner packages must be packed, secured, or cushioned against leakage and/or breakage.
3. Packages cannot be vented except for venting of dry ice vapors.
4. Packages containing liquids must be orientated with the closures in an upright position, and sufficient absorbent placed between the primary and secondary containers to absorb the entire content. For multiple inner packages in a single secondary packaging, each inner package must be wrapped individually.

5. Other dangerous goods must not be packed in the same packaging with *Infectious Substances, Category A* unless they are necessary for maintaining viability, stabilizing or preventing degradation, or neutralizing the hazards of potentially infectious substances; and then the quantity is limited to thirty (30) mL or less of Class 3 (flammable and combustible liquids), 8 (corrosive), or 9 (miscellaneous) per each primary receptacle. Maximum net quantity of the excepted quantities of dangerous goods per outer package is 500 mL. This excepted quantity provision is limited to the chemicals listed in the Hazard Class Table below. If the excepted quantity material that you intend to ship is not listed on this table, consult EHS prior to preparing the shipment.

<table>
<thead>
<tr>
<th>Hazard Class</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Acetone</td>
</tr>
<tr>
<td>3</td>
<td>Acetonitrile</td>
</tr>
<tr>
<td>3</td>
<td>Ethanol</td>
</tr>
<tr>
<td>3</td>
<td>Methanol</td>
</tr>
<tr>
<td>8</td>
<td>Formaldehyde ≥ 25%</td>
</tr>
<tr>
<td>8</td>
<td>Hydrochloric or Sulfuric acid (not fuming)</td>
</tr>
<tr>
<td>8</td>
<td>Acetic acid</td>
</tr>
<tr>
<td>8</td>
<td>≤ 20% Nitric acid (not fuming)</td>
</tr>
<tr>
<td>9</td>
<td>Formaldehyde solutions 10-25%</td>
</tr>
<tr>
<td>Not a dangerous good</td>
<td>Formaldehyde solutions &lt; 10%</td>
</tr>
<tr>
<td>Example: 10% buffered formalin</td>
<td></td>
</tr>
<tr>
<td>Not a dangerous good</td>
<td>Dimethyl Sulfoxide (DMSO)</td>
</tr>
<tr>
<td>Not a dangerous good</td>
<td>&lt; 24% aqueous solution of ethanol</td>
</tr>
</tbody>
</table>

6. An itemized list of the content must be included between the primary and secondary packaging.

7. Refrigerant, if used, must be placed outside of the secondary packaging. If dry ice is used as the refrigerant, seal the outside package in a manner that allows carbon dioxide gas that forms to be released, preventing build-up of pressure that could rupture the packaging.

8. Packages must be packed so the contents do not shift as the refrigerant changes physical state or disappears.
9. Maximum package quantities must not be exceeded (as indicated in the 4.2 table)

MARKING & LABELING - INFECTIOUS SUBSTANCES, CATEGORY A
General marking and labeling requirements must be observed, such as: all markings must be in English; all markings and labels must be durable and in the correct location with no overlapping or folding from one surface dimension of the package to the other, and; only relevant markings and labels are allowed. The following marking and labeling is required on the outer package:

1. Complete name and address of the shipper. The shipper’s telephone number must also be recorded on the outer container. This does not need to be a 24-hour emergency response number, but it should be for someone that is knowledgeable of the hazards of the shipment.
2. Complete name and address of the consignee.
3. The proper shipping name, UN number, and net quantity of infectious substance in the package in letters at least 6 mm (about ¼ inch) high. If the substance is infectious to both humans and animals, use the proper shipping name of Infectious substance, affecting humans. If dry ice is included, the package must also contain the additional proper shipping name, UN number, and net amount of dry ice in the package (in Kilograms).
4. An Infectious Substance Hazard Class label; and a Miscellaneous Hazard Class label if the package also contains dry ice.
5. “Orientation” arrows if the package contains liquids.
6. “Overpack” if applicable.
7. If excepted quantities of dangerous goods are packed with the Infectious Substance, Category A material, DO NOT add the Excepted Package Mark. Packing Instruction 620 allows primary receptacles to contain 30 mL or less of certain flammable, corrosive, or other hazard class 9 liquids needed for maintaining the viability, stability, or preventing degradation or neutralization of the material by default. Maximum net quantity of the excepted quantities of dangerous goods per outer package is 500 mL.

Example Packages - See Appendix B

DOCUMENTATION – INFECTIOUS SUBSTANCE, CATEGORY A
Two shipping documents are required: 1) an Airway bill; and 2) a Shipper’s Declaration for Dangerous Goods. Copies of both shipping documents must be retained for a minimum of two years. The following information must be recorded on the airway bill:
   1. Name and address of consignor and consignee.
   2. If applicable, complete the dry ice section
   3. The appropriate box must be checked to indicate “shipment contains dangerous goods as per attached Shipper’s Declaration.”
   4. Complete remaining sections (total packages, payment, etc.).

Most of the information regarding the hazardous nature of the shipment will be contained on the Dangerous Goods Declaration form, which is cross referenced to the airway bill. The following instructions for completing the Dangerous Goods Declaration form assume that FedEx will be the carrier. Other carriers will have different requirements.
   1. The Declaration must be prepared using FedEx approved vendor software, preapproved shipper proprietary software, or FedEx Express Automated Shipping Solutions that have dangerous goods error checks. The declaration must be a specific format and color. The airway bill can be hand printed rather than typed.
   2. The airway bill number must be recorded on the Declaration to retain the proper reference between the two documents. The name of the person preparing the shipment (if different from the person indicated as the “shipper”) should be printed in Section 2 of the airway bill.
   3. In the “Transport Details” section of the Declaration, complete the full name of airport of departure and airport of destination (or leave blank). In addition, the non-applicable category for “Passenger or Cargo/Cargo Only” must be deleted.
   4. In the “Nature and Quantity of Dangerous Goods” section of the form, record the information below in the appropriate columns. Note that a separate line entry will be required if dry ice is included in the shipment.
      a. UN 2900 or UN2814, as appropriate.
      b. Proper shipping name: Infectious substance, affecting animals (or humans, as applicable). This proper shipping name must be supplemented with the name of the infectious substance in
parentheses; or “Suspected Category A Infectious Substance” if unknown.

c. Division: 6.2
d. Packing group: leave blank.
e. Quantity and type of packaging: list the number of packages, the type of packaging, and the net quantity of infectious material (i.e., 1 fiberboard box x 5 ml).
f. Packing instructions: 620.
g. Authorization: If shipping body parts, organs or whole bodies record “A81” in this column. Otherwise leave blank.
h. Complete the following lines: name, title, and signature of the signatory. This person must have current training credentials.
i. In the section titled “Additional Handling Information,” Type the following:
   - “For Chemical Emergency, Spill, Leak, Fire, Exposure or Accident, Call CHEMTREC Day or Night. Within USA or Canada 1-800-424-9300.”
   - In the space indicated, type the 24-hour emergency telephone number: 1-800-424-9300 for domestic North American shipment.

5. If the shipment contains dry ice, indicate such on the airway bill in the appropriate section. Also record a second line of information on the Declaration form that is indicative of dry ice.
   a. UN1845.
   b. Proper shipping name: “Carbon dioxide, solid” or “Dry ice.”
   c. Hazard class: 9.
   d. Packing group: Not Applicable.
   e. Since more than one type of dangerous goods are packed in a single outer container, indicate “All packed in one [container type; e.g., fiberboard box].
   f. When an overpack is used, the wording “Overpack Used” must be inserted on the declaration immediately following all the relevant entries relating to the packages within each overpack.
   g. Packing instructions: 954.

Example Documentation - See Appendix B

International Shipments

Contact EHS for instructions and detailed information for any international shipments that require a Declaration for Dangerous Goods. DO NOT initiate any international shipment requiring a Declaration for Dangerous Goods without consulting EHS.

UNL has a contract with Chemtrec to use Chemtrec’s 24 hour emergency number on the Shipper’s Declaration of Dangerous Goods. This contract is only good for North America (Canada, United States, and Mexico). Shipments to any other country will be quoted on a case-by-case basis by Chemtrec.
NOTIFICATION TO CHEMTREC
Prior to shipment, a Safety Data Sheet or agent hazard summary must be submitted to CHEMTREC to facilitate response in the event of an emergency. Fax the following information to CHEMTREC at 1-703-741-6090:
- The organization name: “University of Nebraska – Lincoln”
- UNL’s CHEMTREC customer number: 227166
- A copy of the Safety Data Sheet for the dangerous goods being shipped

Security Awareness Training
Hazmat employees must receive training relative to security. Following is a summary of the security awareness information included in the EHS IATA training program. Reduce the possibility of unauthorized access, possession, and use by securing all hazardous materials/dangerous goods. The following general guidelines represent minimum requirements:
- Packages containing hazardous materials/dangerous goods must be kept in a secured area, or under the supervision of a designated shipper, or other authorized employee(s) until picked up by the carrier. Limit access to areas where dangerous goods/hazardous materials packages are prepared for shipment, received, stored, unpacked or used to authorized employees only. Report latches and locks on doors or other security devices that are damaged, sticky, or have been tampered to your supervisor and the Building Maintenance Reporter.
- Make sure the carrier picking up dangerous goods/hazardous materials shipments has identification (e.g., company ID, uses a clearly identified company vehicle, or wears a company uniform).
- Report suspicious individuals, behavior, stolen or missing dangerous goods/hazardous materials, and known or suspected unauthorized entry into secured areas to your supervisor and to the UNL Police Department 402-472-2222. Be aware of your surroundings; look for out-of-place vehicles and abandoned or out-of-place backpacks, bags, or other containers.
- Limit information concerning hazardous materials/dangerous goods shipments to individuals who need to know, such as other authorized employees, carrier personnel, and supervisors. Do not share information on dangerous goods/hazardous materials shipments with casual acquaintances or strangers.
- Be familiar with emergency procedures in place at UNL and know what to do if a package is leaking or damaged.
# APPENDIX A

## EXAMPLES - INFECTIOUS SUBSTANCES, CATEGORY A

<table>
<thead>
<tr>
<th>UN Number and Proper Shipping Name</th>
<th>Micro-organism</th>
</tr>
</thead>
</table>
| UN2814 Infectious substance affecting humans | Bacillus anthracis (cultures only)  
Bacillus cereus biovar anthracis (cultures only)  
Brucella abortus (cultures only)  
Brucella melitensis (cultures only)  
Brucella suis (cultures only)  
Burkholderia mallei – Pseudomonas mallei – Gianders (cultures only)  
Burkholderia Pseudomallei – Pseudomonas pseudomallei (culture only)  
Chlamydia psittaci – avian strains (cultures only)  
Clostridium botulinum (cultures only)  
Coccidioides immitis (cultures only)  
Coxiella burnetii (cultures only)  
Congo-Crimean hemorrhagic fever virus  
Dengue virus (cultures only)  
Eastern equine encephalitis virus (culture only)  
Escherichia coli, verotoxigenic (cultures only)  
Ebola virus  
Flexal virus  
Francisella tularensis (cultures only)  
Guanarito virus  
Hantaan virus  
Hantavirus causing hemorrhagic fever with renal syndrome  
Hendra Virus  
Hepatitis B virus (cultures only)  
Herpes B virus (cultures only)  
Human immunodeficiency virus (cultures only)  
Highly pathogenic avian influenza virus (cultures only)  
Japanese encephalitis virus (cultures only)  
Junin virus  
Kyasanur Forest disease virus  
Lassa virus  
Machuco virus  
Marburg virus  
Monkeypox virus  
Mycobacterium tuberculosis (cultures only)  
Nipah virus  
Omsk hemorrhagic fever virus  
Poliovirus (cultures only)  
Rabies virus (cultures only) |
<table>
<thead>
<tr>
<th>UN2900</th>
<th>Infectious substances affecting animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>All listed infectious substances affecting animals are considered Category A when transported in cultures.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B
EXAMPLE PACKAGES AND DOCUMENTATION – INFECTIOUS SUBSTANCES, CATEGORY A

The example above is for a package containing a material properly classified as Infectious Substance, Category A. Required markings and labeling do not change if the package also contains an excepted quantity of class 3, 8, or 9 material that is necessary for maintaining viability, stabilizing or preventing degradation, or neutralizing the hazards of potentially infectious substances.

The example above is for a package containing a material properly classified as Infectious Substance, Category A that also contains Dry Ice. Required markings and labeling do not change if the package also contains an excepted quantity of class 3, 8, or 9 material that is necessary for maintaining viability, stabilizing or preventing degradation, or neutralizing the hazards of potentially infectious substances.
The example above is a properly completed Dangerous Goods Declaration for a package containing a culture of human immunodeficiency virus (HIV) and Dry Ice. Record appropriate information as applicable to the specific shipment and omit language that is not relevant. For example, do not indicate “overpack” if an overpack is not used.
Note: The example above is for a shipment containing an Infectious Substance, Category A and Dry Ice. Section 6 of the airway bill must indicate the quantity of dry ice (in kilograms), if included in the package. If the package does not contain Dry Ice, then omit the information in section 6 relative to dry ice.