Shipping Biological Substances and Dry Ice

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Why is this training necessary?

- By law, anyone who packs, ships, transports or receives dangerous goods must be properly trained.

- This training must be renewed every 2 years.

- The shipper bares ultimate legal responsibility and liability for properly performing these tasks.

- Penalties for non-compliance with shipping regulations can result in the following fines:
  - Up to $250,000 and up to a year jail sentence for individuals
  - Up to $500,000 per incident for organizations
Important FAA Requirements!
Shipper’s Responsibilities

1. **Classification**: Categorize the type of hazardous material.
2. **Identification**: Select the proper shipping information from the IATA Dangerous Goods Regulations.
3. **Packaging**: Properly pack the hazardous material for shipment.
4. **Marking and Labeling**: Addresses, UN number, etc. must be on package.
5. **Documenting**: Fill in and sign the airway bill. Maintain records of shipments for *two years*.

What is a Dangerous Good?

- A *dangerous good* is any article or substance capable of posing a risk to health, safety, property, or the environment. (IATA)
- A material or substance posing an unreasonable risk to health, safety, and property when transported. (DOT)
- An equivalent term is *hazardous material*, or hazmat.
Shipping Hazard Classes
There are nine hazard classes

- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable Liquids
- Class 4: Flammable Solids
- Class 5: Oxidizers and Organic Peroxides
- Class 6: Toxic (poisonous) and Infectious Substances
  - 6.1 Toxic Substances
  - 6.2 Infectious Substances
- Class 7: Radioactive
- Class 8: Corrosive
- Class 9: Miscellaneous Dangerous Goods (includes dry ice)

Class 6 and Class 9 are most commonly shipped by labs.

Shipper’s Declaration

- This training will allow you to ship certain materials that do NOT require a “Shipper’s Declaration for Dangerous Goods”.

- If you are told that a Shipper’s Declaration is required, OEH&S will ship the package for you!
Infectious Agents are
Class 6.2 Dangerous Goods

Infectious substances are known or reasonably expected to contain pathogens. Pathogens are defined as microorganisms (including bacteria, viruses, rickettsiae, parasites, or fungi) or other agents such as prions, which have the potential to cause transmissible diseases.

There are two major classifications shipping infectious substances:

- **Category A**
- **Category B**

Dry Ice is Class 9 – Miscellaneous Dangerous Goods
Infectious Substance Category A
Can only be shipped by OEH&S

Infectious substances which are transported in a form that when exposure occurs is capable of causing permanent disability; of being life threatening or; capable of causing fatal disease to humans or animals.

Examples:

Hepatitis B virus
(cultures only)
Ebola virus

See Table 3.6.D

Examples of Infectious Agents Categorized as Category A:
Infectious Substance Affecting Humans

- Bacillus anthracis (cultures only)
- Brucella abortus (cultures only)
- Brucella melitensis (cultures only)
- Brucella suis (cultures only)
- Burkholderia mallei - Pseudomonas mallei - Glanders (cultures only)
- Burkholderia pseudomallei - Pseudomonas pseudomallei (cultures only)
- Chlamydia psittaci - avian strains (cultures only)
- Clostridium botulinum (cultures only)
- Coccidioides immitis (cultures only)
- Coxiella burnetti (cultures only)
- Crimean-Congo hemorrhagic fever virus
- Dengue virus (cultures only)
- Eastern equine encephalitis virus (cultures only)
- Escherichia coli, verotoxigenic (cultures only)
- Ebola virus
- Flexal virus
- Francisella tularensis (cultures only)
- Guanarito virus
- Hantaan virus
- Hantaviruses causing hantavirus pulmonary 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
- Marburg virus
- Monkeypox virus
- Mycobacterium tuberculosis (cultures only)
- Nipah virus
- Omsk hemorrhagic fever virus
- Poliovirus (cultures only)
- Rabies virus
- Rickettsia prowazekii (cultures only)
- Rickettsia rickettsii (cultures only)
- Rift Valley fever virus
- Russian spring-summer encephalitis virus (cultures only)
- Sabia virus
- Shigella dysenteriae type 1 (cultures only)
- Tick-borne encephalitis virus (cultures only)
- Variola virus
- Venezuelan equine encephalitis virus
- West Nile virus (cultures only)
- Yellow fever virus (cultures only)
**Infectious Substance Category B**

*After this training you may ship these agents*

Category B infectious agents do not pose a risk of causing permanent disability, life threatening or fatal disease to humans or animals.

Most infectious cultures or clinical specimens are considered Category B and are assigned UN 3373 and follow Packaging Instruction 650.

Examples include:
- Adenovirus
- Herpes Simplex Virus (HSV-1)
- Epstein Barr Virus
- Streptococcal bacteria

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**Exempt Specimens**

- **Definition:** Human, animal, insect, or plant material which do not contain infectious substances or substances which are unlikely to cause disease in humans or animals and are transported for diagnostic or investigational purposes.

  *Includes the following:*
  - Excreta (urine, feces)  
  - Secreta (saliva, sweat)
  - Blood or its components  
  - Tissues and Fluids

*Routine blood, serum or urine samples from patients shipped to a laboratory for routine testing are exempt only if, in your professional judgment (based on medical history, symptoms and individual circumstances of the source) the patients have a minimal likelihood of being infectious.*

- Specimens suspected of being infectious should be shipped as infectious agents.
- Live animals or infected animal specimens are not considered exempt.
- **PACKAGING REQUIREMENTS FOR LIQUID SPECIMENS ARE THE SAME AS FOR CATEGORY B (UN3373) NON-EXEMPT SPECIMENS!**
Other Exempt Biological Specimens

- **Neutralized or inactivated biological substance**: Substances in a form that any present pathogens have been neutralized or inactivated such that they no longer pose a health risk.

- **Microorganisms which are non-pathogenic to humans or animals** and do not pose a threat to the environment.

- **Environmental Samples**: (including food and water samples), which are not considered to pose a significant risk of infection.

- **Dried blood spots**: Collected by applying a drop of blood on to absorbent material or fecal occult blood screening tests.

- **Transfusion materials**: (Uninfected) Blood components which have been collected for the purposes of transfusion or the preparation of blood products to be used for transfusion or transplantation.

Selecting the Proper Packaging

- Federal regulations state that packaging used to ship hazardous materials must be capable of performing up to regulatory standards for ability to withstand: vibrations, rainfall, drops, puncture, pressure, leaks, stacking, etc.

- Diligence in selecting the proper packaging will safeguard your shipment, and reduce your liability in case of a shipping accident.

- The outer packaging must be a cardboard box – do **not** ship in styrofoam boxes that are not within cardboard!
Triple Packaging System for Shipping ALL Liquid Biological Materials

1. Primary watertight, leakproof, securely closed receptacles (Eppendorf tube, conical or vial) Parafilm can be used to secure the seal of tubes. Specimen bags should be taped shut. You may ship multiple containers in the same package.

2. Leak-proof secondary container (in case primary containment fails) with sufficient absorbent material to completely absorb the contents in the event of a spill.

   An itemized list of contents should be placed between the secondary container and the outer package.

3. Durable outer container (box/packaging): styrofoam boxes should be placed within a durable cardboard box.

* The proper shipping names “Biological Substance, Category B”; “Clinical Specimen”; and “Diagnostic Specimen” are authorized until December 31, 2006. From January 1, 2007 only the proper shipping name “Biological Substance, Category B” will be authorized.

† If multiple fragile primary receptacles are placed in a single secondary packaging they must be either individually wrapped or separated to prevent contact

Note: Follow package manufacturer’s closure instructions
Packing for Category B

According to packing instruction 650, your package must:

- withstand 95kPa of pressure and temperatures between 40°F and 130°F
- contain no more than 4 liters in the outer packaging, excluding ice
- include an itemized list of contents between the secondary packaging and outer packaging
- be marked with the proper shipping name, “Biological Substance, Category B”
- display the name and telephone number of a responsible contact person on the exterior
- be labeled with the UN3373 marking
Packaging:
Exempt Human/Animal Specimens

- Human or animal materials being transported for diagnostic or investigational purposes that are not believed to harbor infectious agents are exempt from dangerous goods regulations.
- If there is more than a minimal likelihood that a specimen is infectious, it should be shipped as an infectious agent.
- Specimens should be shipped using the triple packaging system.
- The outer package must be durable enough for its intended use with at least one side measuring 100 x 100 mm (~4 square inches)
- The outer package must be marked with “Exempt human specimen” or “Exempt animal specimen”.

Specimens in Fixatives

- Specimens in formaldehyde, glutaraldehyde, or any other chemical fixative may be shipped as long as the amount of chemical is 30 ml or less in each individual container.

- Samples with more than 30 ml of fixative must be shipped as a chemical hazard by OEH&S.
Shipping Biological Substances and Dry Ice

Marking and Labeling Exempt Materials on Dry Ice

Shipper:
Dr. John Doe
Wayne State University
School of Medicine
540 E. Canfield
Detroit, MI 48201

UN 1845, Dry Ice
3 kg

Exempt Human / Animal Specimens

Cconsignee:
Name
Organization
Street Address
City, State, Zip

Shipping Dry Ice

Dry ice is considered hazardous during transportation!

1. Explosion hazard: Dry ice releases a large volume of carbon dioxide gas as it sublimes. If packaged in a container that does not allow for release of the gas, it may explode, causing personal injury or property damage.

2. Suffocation hazard: A large volume of carbon dioxide gas emitted in a confined space may displace oxygen and create an oxygen deficient environment.

3. Contact hazard: Dry ice is a cryogenic material that causes severe frostbite upon contact with skin

WSU Office of Environmental Health & Safety, www.oehs.wayne.edu, 577-1200, fax: 993-4079
Packaging Dry Ice

Basic Requirements
1. Gas Venting
2. Package Integrity
3. Package Materials
4. Airbill
5. Labeling

- The maximum amount of dry ice that can be shipped is 200 kg.
- A styrofoam box alone is not sufficient packaging.
- The outer package must be a fiberboard box.

Package Integrity

- Package must allow for release of CO₂ gas.
- Do not tape completely around the seam of the lid and box.
- Package must be of adequate strength for intended use & withstand conditions of transport.
Labeling & Marking Dry Ice Packages

- Class 9 “Miscellaneous” Label
- Words: “Dry Ice”
- UN 1845
- Net Weight of Dry Ice in Kg
- Name & Address of Shipper & Consignee (To/From)

Outer Package

- **IMPORTANT:** Dangerous goods (including dry ice) cannot be shipped in FedEx packaging or left in FedEx Drop Boxes.

- Reusing a dry ice box is a good use of resources. If you choose to reuse a box, completely obliterate all unnecessary markings such as addresses, hazard labels, FedEx or other courier labels, barcodes, etc.

- Only reuse a box if you can personally verify it is not contaminated and its integrity is intact.

- A box should not be reused if it is torn, cut, stained or if the insulation is cracked or broken.
Recommendations

- Secure your samples so that when the dry ice sublimates, samples will not move freely inside the insulated box.
- This can be accomplished by wedging your samples in place with cardboard or styrofoam.
- Fragile containers such as glass tubes or vials should be wrapped with cushioning material.

Recommendations

- Shipments are generally recommended to contain 5-10 pounds (2.27-4.54 kg) of dry ice per 24 hours.
- Refer to pkg. manufacturer’s recommendations.
- Make arrangements with your consignee to make sure the package will be received on it intended delivery date.
- Take into account holidays or closings that might delay package receipt.
FedEx US Airbill
UN3373 Biological Substances Category B

You must declare a value ($1.00)

FedEx US Airbill
Exempt Human or Animal Specimens

You must declare a value ($1.00)
FedEx US Airbill – Dry Ice

You must declare a value ($1.00)

Using UPS CampusShip

- UPS CampusShip is a less expensive way to ship than Fedex.
- When you’ve completed the online form, print out the address label and affix all appropriate hazard labels to attach to your package.
- Remember, packages with dry ice must always have a “9” UN Label with Dry Ice, UN 1845, and the weight of the dry ice in the package.

www.campusship.ups.com
When you open CampusShip, this is the first page.

If package contains dry ice, you must choose “other” as your packaging type.

If package contains dry ice, be sure to check this box!
Indicate the weight of the dry ice in the package here.

Review your information on this page before clicking “Ship Now”.

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If package contains dry ice, make sure it is indicated here on the label!

- Print the label and follow directions for affixing it to the box. Don’t tape it over any seams on the box.
- Make a copy of the label to keep as your shipping record. Records must be kept for two years. This is a FAA Requirement!

International Shipments

- Contact OEH&S for assistance with shipping internationally.
- International shipments require additional paperwork, including a Commercial Invoice, and possibly other forms depending on the contents.
- We can either ship the package for you, or walk you through the correct steps to ensure that it arrives at its destination with no delays.
Important FAA Documentation Requirements

- Training Records: Training must be renewed every two years.
- The completed airbill is your documentation of the shipment. Keep a copy for your records.
- In addition to the airbill, keep documentation stating exactly what you shipped in the package.
- Records of shipments should be maintained for two years following the shipment.

DOT Security Awareness consists of...

- Understanding the nature of security risks.
- Recognizing potential security risks.
- Methods to address and reduce these risks.
- Actions to take in the event of a security breach.
DOT Security Awareness

- **Remember**... many materials that are classified as hazardous are essential products in industry, but potentially deadly weapons in the hands of a terrorist.

- It is important to understand that certain classifications of Dangerous Goods (hazardous materials) can be intentionally misused for terrorist type activities.

- The most likely terrorist threats are external (non-university employees), but there have been instances of “inside jobs” when it comes to criminal activities.

DOT Security Awareness

- An improperly labeled package, poor package condition, or incomplete documentation (e.g.; airway bill and shipping address on package not matching) may be perceived as a suspicious package.

- This validates the necessity for proper training, recordkeeping, labeling and packaging of DG shipments.
DOT Security Awareness

- Be aware of your surroundings and the people you are dealing with when transporting or offering a shipment for processing.
- Do not leave packages in unsecured buildings or drop-off spots.
- If you feel there is any suspicious activity, immediately report it to WSU Police (577-2222) and then notify your PI/Supervisor.

Training Quiz

To receive a certificate you must take the quiz at the link below. Download the document and follow the instructions for submitting your answers.

Shipping Training Quiz

Office of Environmental Health & Safety
313.577.1200 phone
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www.oehs.wayne.edu