DEPARTMENT OF TRANSPORTATION

HAZARDOUS MATERIAL TRAINING

Provided by:

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INTRODUCTION

The United States Department of Transportation (DOT) regulates the transportation of hazardous materials. To ensure safe transport, the DOT has created a set of regulations that ensures all shipments containing hazardous materials are transported in a very specific manner. Therefore, anyone involved with the transportation of hazardous materials is required, by the DOT, to complete training as outlined in Title 49 CFR 171 – 180. Training is to include General Awareness/Familiarization, Function-specific and Safety Training.

GENERAL AWARENESS/FAMILIARIZATION TRAINING

The DOT has categorized radioactive materials as being a hazardous material. Since nuclear medicine technologists deal with the transportation of radioactive materials they are considered a hazmat employee. According to Title 49 a hazmat employee is anyone who “directly affects the hazmat transportation safety including loading, unloading, handling or preparing hazmat for transportation.” Therefore, for nuclear medicine technologists, this training focuses on the receiving and shipping of radioactive materials in packages provided by a vendor or radiopharmacy.

Training for a hazmat employee is required within 90 days of being hired and is to be repeated every 3 years after initial training. The training document must include the trainee’s name, date of training, name of trainer, copy of or location of training and testing.

FUNCTION-SPECIFIC TRAINING

In most cases, technologists deal with shipping and receiving radioactive packages on a daily basis. In order to maintain the integrity of the DOT regulations, many steps have to be followed when either shipping or receiving a package.
Shipping a Radioactive Package

1. Identify material/classification – 2 types of shipments are possible: normal form or limited quantity. The difference between these 2 types is the amount of activity in the package. **If the activity within the package is within the table listed below, it is a Limited Quantity Package; if it is greater than these amounts then it is a Normal Form Package.**

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Limited Quantity Shipment Limit (mCi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-57</td>
<td>27</td>
</tr>
<tr>
<td>Cs-137</td>
<td>1.6</td>
</tr>
<tr>
<td>Cr-51</td>
<td>81</td>
</tr>
<tr>
<td>F-18</td>
<td>1.6</td>
</tr>
<tr>
<td>Ga-67</td>
<td>8.1</td>
</tr>
<tr>
<td>I-123</td>
<td>8.1</td>
</tr>
<tr>
<td>I-131</td>
<td>1.9</td>
</tr>
<tr>
<td>In-111</td>
<td>8.1</td>
</tr>
<tr>
<td>Mo-99</td>
<td>2.0</td>
</tr>
<tr>
<td>Sr-89</td>
<td>1.6</td>
</tr>
<tr>
<td>Tc-99m</td>
<td>11.0</td>
</tr>
<tr>
<td>Tl-201</td>
<td>11.0</td>
</tr>
<tr>
<td>Xe-133</td>
<td>270</td>
</tr>
<tr>
<td>Y-90</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Activity Limits for Limited Quantity Shipment – Table 7 in 49 CFR 173.425

2. Packaging – for limited quantity packages, specific packaging is not required; the package must be in good enough condition to withstand shipment. For normal form packages, a security seal and type A package must be used. **A type A package means that it has passed drop, water spray, compression and penetration tests.**

3. Radiation limits – the package must be tested for removable contamination, which is done by performing a wipe test of 300 cm$^2$ of the outside of the package (which is approximately the size of a radioactive placard). The results of the wipe test cannot exceed 22 dpm/cm$^2$ or 6600 dpm/300 cm$^2$ or 2200 dpm/100 cm$^2$.

4. Markings – the package must have a “Radioactive” label visible on the outside.

5. Labels – there are 4 different labels based on the activity in the package.

*Excepted Package – Limited Quantity*  
 Package cannot exceed 0.5 mR/hr (this is what is often on the flip-side of the placard on the radiopharmacy containers.)
<table>
<thead>
<tr>
<th>Label</th>
<th>Surface Radiation Level (mrem/hr)</th>
<th>Transport Index (1 Meter)</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>White I</td>
<td>Up to 0.5</td>
<td>N/A</td>
<td><img src="image" alt="Radioactive White I" /></td>
</tr>
<tr>
<td>Yellow II</td>
<td>&gt;0.5 – 50</td>
<td>&gt;0.1 – 1.0</td>
<td><img src="image" alt="Radioactive Yellow II" /></td>
</tr>
<tr>
<td>Yellow III</td>
<td>&gt;50 – 200</td>
<td>&gt;1 – 10</td>
<td><img src="image" alt="Radioactive Yellow III" /></td>
</tr>
</tbody>
</table>

The radioactive placard must include the radionuclide, activity in SI units (Bq) and Transport Index (TI) when applicable. The placard must be on 2 opposite sides of the package. The package must also have the name of the shipper and receiver listed on it, as well as the proper shipping name and identification number (available in 49 CFR 172.101).

6. Shipping Papers – both the Bill of Lading and Shipper’s Certificate must be kept next to the transporter.

Bill of Lading includes: shipping name, hazard class (7 = radioactive), UN #, name of each radionuclide and description of physical and chemical form, activity in SI units (Bq), category of label applied to shipment (Radioactive White I) and TI if applicable.

Shipper’s Certificate includes: the signature of the shipper and the following certification “This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of DOT. 49 CFR 172.204 (a).”

Shipping records should be kept for 3 years for normal form packages and 1 year for limited quantity packages.
Receiving a Radioactive Package

Each facility creates a procedure for receiving packages when applying for a radioactive materials license. The procedure used for this training is an abbreviated model procedure from the NRC’s NUREG 1556, Vol. 9, Rev. 2, App. P.

The following steps are done for Type A Quantity packages and should be done within 3 hours of receiving the package or within 3 hours of the start of the business day.

1. Put on gloves to prevent hand contamination.
2. Visually inspect the package for any sign of damage. If damage is noted, stop and contact the RSO immediately.
3. Monitor the external surfaces for radioactive contamination with survey meter and wipe tests. Verify that readings agree with placard and do not exceed contamination levels.
4. Remove the packing slip and verify that the contents agree with the packing slip.
5. Make a record of the receipt.

SAFETY TRAINING

For hazmat training purposes, safety training applies to the time while the package is in transit. The package’s Bill of Lading and Shipper’s Certificate need to be readily available during transport. The transporter must also have available a 24-hour phone number for the shipper. The information on this paperwork will aid emergency responders in the case of an accident during transport.

Emergency Response

If you receive a package that is contaminated, you are to contact your RSO immediately.
If a package is lost, you are to contact your RSO immediately.

Measures to Protect the Employee

1. Training – both radiation safety training and hazmat training
2. Protective clothing – lab coats, disposable coveralls if needed
3. Survey Meter
4. Procedures – allow for early detection of contamination
5. ALARA principles – time, distance and shielding
REFERENCES


