jnm / TECHNICAL NOTES

# Procedures for Receiving and Opening Packages Containing Radioactivity

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***A concise set of procedures is presented to aid laboratory personnel in complying with Part 20.205 of Title 10, Chapter 1, of the* Code of Federal Regulations, *concerning the receipt and monitoring of radioactive materials. Because these regulations were written for a large and diverse community of licensees, they are difficult to implement on a day-to-day basis. The procedures presented here reduce the regulations to an operationally functional form.***

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All recipients of packages containing radioactive materials are required to follow the procedures described in the *Code of Federal Regulations* (Title 10, Chapter 1, Part 20.205). These regulations outline the precautions that must be observed to prove that radioactive materials have been shipped safely and without contamination. They specify when monitoring must be done and when and how to notify authorities if contamination or radiation levels above legal limits are found. The regulations were written for a very diverse community of licensees, both medical and industrial, and include all types, physical states, and quantities of radionuclides. Because they are so all-encompassing, they are difficult to interpret, and as a result some licensees may not be complying with the regulations whereas others may be doing more than is required. The following simplification of the regulations, in the form of a table and list of procedures (derived from Part 20.205 and Appendix C of Part

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**TABLE 1. RADIONUCLIDES USED IN MEDICINE**

| Radionuclide* | Wipe-testing not required if less than (mCi) | Type A quantities (Ci) | Radionuclide* | Wipe-testing not required if less than (mCi) | Type A quantities (Ci) |
|---|---|---|---|---|---|
| Calcium-45 | 1 | 20 | Mercury-197 | 100 | 20 |
| Calcium-47 | 100 | 20 | Molybdenum-99 (generator) | 20,000 | 20 |
| Carbon-14 | 10 | 20 | Phosphorus-32 | 100 | 20 |
| Chromium-51 | 100 | 20 | Potassium-42 | 100 | 20 |
| Cobalt-57† | 1 | 20 | Potassium-43† | 100 | 3 |
| Cobalt-57† (pill) | 20,000 | 20 | Radium-226 (sealed source)† | 1 | 0.001 |
| Cobalt-60 (pill) | 3,000 | 3 | Rubidium-81 | 100 | 3 |
| Gallium-67† | 100 | 3 | Rubidium-86 | 100 | 20 |
| Gold-198 | 100 | 20 | Selenium-75 | 1 | 20 |
| Gold-198 (seeds) | 20,000 | 20 | Sodium-24 | 100 | 20 |
| Hydrogen-3 | 10 | 20 | Strontium-85 | 1 | 20 |
| Indium-111† | 100 | 3 | Strontium-87m | 100 | 3 |
| Indium-113m | 100 | 20 | Sulfur-35 | 10 | 20 |
| Iodine-123† | 100 | 3 | Technetium-99m | 100 | 20 |
| Iodine-125 | 10 | 3 | Thallium-201† | 100 | 20 |
| Iodine-131 | 100 | 3 | Tin-113 (generator) | 20,000 | 20 |
| Iodine-131 (pill) | 3,000 | 3 | Xenon-133 | | |
| Iron-59 | 1 | 20 | (gas, pressure ≤ 14.7 psi) | | 1,000 |
| Krypton-85 | | | Ytterbium-169 | 1 | 3 |
| (gas, pressure ≤ 14.7 psi) | | 1,000 | Zinc-65 | 1 | 20 |

* In liquid form unless otherwise noted.
† These radionuclides are not byproduct material and therefore NRC regulations do not apply.

71), has been found useful in our radiation safety program, which includes a variety of users.

### PROCEDURES FOR RECEIVING RADIOACTIVE PACKAGES

Use the following procedures in conjunction with the accompanying table of radionuclides to determine what action should be taken when radioactive packages are received.

1. When package monitoring is indicated, do it as soon as possible after a package is delivered, but in all cases no later than 3 hr after delivery, if received during normal working hours, or within 18 hr of delivery, if received after normal working hours. A record must be kept showing the results of all required package monitoring.

2. If the radioactivity in the shipping container exceeds the amount listed in Column 1 of Table 1, wipe-test the outside of the package. If contamination exceeds 22,000 dpm per 100 $cm^2$, notify the last delivery carrier and the Nuclear Regulatory Commission (NRC). To notify the NRC, telephone and telegraph the NRC regulatory-operations regional office unless you are in an "agreement state," in which case you notify the equivalent state authorities. Wipe-testing is not required for gases or if the amount is equal to or less than that in Column 1.

3. If the amount is greater than that in Column 2 (Type A quantities), measure the external radiation levels and wipe-test the outside of the package. If the surface reading is greater than 200 mrem/hr, or if the reading at 3 feet is greater than 10 mrem/hr, notify the final delivery carrier and the NRC.

4. To prepare for receipt of packages containing radioactivity greater than that in Column 2:

   (A) Tell the carrier where and to whom the packages should be delivered.

   (B) Be ready to go to the terminal if notified that a shipment of Type A quantity will not be delivered.

   (C) Be certain that your procedures for opening these packages are considered safe by the NRC.