

**EMORY UNIVERSITY  
RADIOISOTOPE COMMITTEE II  
APPLICATION FOR NON-HUMAN RADIOACTIVE  
MATERIAL USE**

1. (a) NAME OF APPLICANT Dr. John Doe

(b) MAILING ADDRESS:  
Drawer RQ, Emory PO

(c) ADDRESS OF R/A MATERIAL USE:  
1234 Woodruff, 4321 Clifton Rd

\_\_\_\_\_  
\_\_\_\_\_

2. INDIVIDUALS WHO WILL USE OR DIRECTLY SUPERVISE USE OF LICENSED MATERIAL (Submit Supplement A):

Dr. John Doe TELEPHONE #: 727-9999

\_\_\_\_\_ TELEPHONE #:

3. THIS IS AN APPLICATION FOR (check the appropriate item):

(a)  New authorization

(b)  Renewal of authorization # 900001

4. RADIATION SAFETY CONTACT: Jane Doe

TELEPHONE #: 727-9999

5. OTHER PEOPLE TO USE ISOTOPE(S) UNDER SUPERVISION OF AUTHORIZED USER(S) (Submit Supplement C for each):

Jane Doe

Dr. John Doe

**6.a. SCHEDULE OF RADIOACTIVE MATERIALS**

Element and Mass Number	Chemical Form(s)	Maximum Activity in Possession	Maximum Activity in Any Experiment
<b><math>^3\text{H}</math></b>	<b>Any non-volatile, stable</b>	<b>20 mCi</b>	<b>500 <math>\mu\text{Ci}</math></b>
<b><math>^{32}\text{P}</math></b>	<b>nucleotides, phosphate</b>	<b>30 mCi</b>	<b>10 mCi</b>
<b><math>^{35}\text{S}</math></b>	<b>nucleotides, amino acids</b>	<b>25 mCi</b>	<b>1 mCi</b>
<b><math>^{51}\text{Cr}</math></b>	<b>sodium chromate</b>	<b>15 mCi</b>	<b>1 mCi</b>
<b><math>^{125}\text{I}</math></b>	<b>NaI, proteins, antibodies</b>	<b>10 mCi</b>	<b>2 mCi</b>

**6.b. LIST USES OF LICENSED MATERIAL (Brief titles- Detailed information in item 7.)**

**(1) Labelling of DNA probes, sequencing, hybridization**

**(2) Radiolabelling cell structures in vitro**

**(3) Iodination of proteins and antibodies, RIA using labelled compounds**

**(4)**

**(5)**

**(6)**

**(7)**

**(8)**

**(9)**

**(10)**

**Dr. John Doe**

**6.c. LIST ANY SEALED SOURCES INCLUDING THOSE USED FOR INSTRUMENT CHECK AND CALIBRATION**

<b>Element &amp; Mass #</b>	<b>Manufacturer</b>	<b>Model Number</b>	<b>Serial Number</b>	<b>Activity</b>
125I (mock)	Nuclear Items	ABC1	11-01	0.1 µCi
3H	Beta Counters	XYZ99	None	0.1 µCi
14C	Beta Counters	XYZ98	None	0.1 µCi
137Cs	Atomic Widget	0001-1	999	10 µCi

**Items 7 - 14** Check the appropriate items and/or submit a detailed description of all the requested information. Begin each item on a separate sheet of paper. Identify the item number and the date of the application in the lower right-hand corner of the page.

**7. DESCRIBE PORTIONS OF PROTOCOLS INVOLVING RADIOACTIVE MATERIAL KEYED TO USES IN 6b.**

Attach literature references if available.

**8. INSTRUMENTATION**

Complete Appendix A.

**9. LABORATORY FACILITIES**

Attach diagram noting areas of use and storage of radioactive material. Describe equipment (shielding, fume hoods, storage containers, sinks, etc.) available in use and storage areas. Identify adjacent areas across walls from use and storage areas.

**10. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIALS**

\_\_\_ Detailed information attached.

\_\_\_ Appendix B procedures followed.

Dr. John Doe



**11. EMERGENCY PROCEDURES**

   Detailed information attached.

   Appendix C procedures followed.

**12. WASTE DISPOSAL**

Detail method of disposal of wet and dry waste of each isotope used.  
May use Appendix D for broad description.

**13. RADIONUCLIDE USE IN ANIMALS**

  n/a   Complete Appendix E.

   Attach a copy of instructions provided to animal caretakers for handling animals, animal waste, and carcasses and instructions for cleaning and decontaminating cages.

All applications involving use of animals will be submitted to DAR for veterinary approval on Appendix E before it is circulated to Committee II membership.

**14. PERSONNEL MONITORING**

**15. PERSONNEL TRAINING AND EVALUATION**

**16. ALARA COMMITMENT**

I will evaluate all approved procedures before using radioactive materials to ensure that exposures will be as low as reasonably achievable (ALARA). I express my commitment to maintain exposure ALARA to all laboratory personnel, both users of radioactive material and those who do not use radioactive materials in their laboratory protocols. I will ensure that persons working under my supervision are trained and educated in good radiation safety practices which contribute to maintaining exposures ALARA for all laboratory personnel.

                                John Doe                                  
Signature of Principal Investigator

I CERTIFY THAT I HAVE BECOME FAMILIAR WITH THE EMORY UNIVERSITY RADIATION SAFETY POLICY MANUAL AND WILL IMPLEMENT THE REQUIREMENTS CONTAINED THEREIN IN THE PURSUIT OF THIS WORK.

3/31/94

John Doe

Date Signature of Principal Investigator

Medical Research

Associate Professor

Department Faculty Rank

Dr. John Doe

Detailed Information for Use Listed in 6.b.(1)

All general safety procedures contained in Item 10 will be followed.

$^{32}\text{P}$  or  $^{35}\text{S}$  Nucleotides up to 100  $\mu\text{Ci}$  are incorporated into DNA and RNA strands. The labeled DNA or RNA is chemically degraded, site specifically. Samples are loaded onto analyzed by PAGE, and imaged by autoradiography.

Local plexiglas shielding will be employed when possible when handling  $^{32}\text{P}$ . When local shielding is not practical, time spent handling  $^{32}\text{P}$  will be kept to a minimum. Pipettors and/or tongs will be used to maximize the distance from the unshielded  $^{32}\text{P}$ .

$^{32}\text{P}$ -labeled RNA and DNA probes are synthesized by PCR labelling.  $^{32}\text{P}$  nucleotides, up to 100  $\mu\text{Ci}$  will be added to solutions of purified DNA fragments in Eppendorf tubes.

The tubes will be tightly capped, and amplified by PCR utilizing an automatic cycling heat block. Incorporated probe will be separated from unincorporated nucleotide by thin layer chromatography. Tubes will be spun in microfuge, supernatant drawn off and disposed of as aqueous radioactive waste. Labelled DNA will be washed with buffer, spun, aspirated supernatant will be disposed of as Radioactive waste. Labelled DNA will be cleaved by endonuclease. DNA fractions will be applied to polyacrylamide gel. The gels will undergo electrophoresis to separate DNA bands. Gels will be sealed in plastic, applied to screened film. Film will be stored in labelled -70 degree freezer during exposure. Gel casting plates and electrophoresis equipment are rinsed with buffer. The first rinse will be captured for disposal as radioactive waste. Plates are monitored with GM, if  $<1$  mR/h subsequent rinses may be disposed of in the sanitary sewer. Remaining washes will be to a designated lab sink. After autoradiograph, gels will be discarded in dry radioactive waste.

**Dr. John Doe - Item 7 3/31/94**

**Detailed Information for Use Listed in 6.b.(2)**

**All pertinent safety procedures detailed in Item 10 will be followed.**

**Cell cultures will be incubated with  $^{35}\text{S}$  amino acids,  $^3\text{H}$  thymidine, or  $^{51}\text{Cr}$  sodium chromate, up to 1  $\mu\text{C}$  per well. Culture will be incubated in designated, labelled incubators. Due to the potential for  $^{35}\text{S}$  volatilization during incubation, incubators used with  $^{35}\text{S}$  will have an activated charcoal trap placed in the incubator (slurry, mat or bulk charcoal will suffice). Charcoal will be disposed of as radioactive waste. Interior of incubator will be surveyed for contamination before its next use. Cells will be washed and filtered, resuspended, lysed, spun, separated, and analyzed by PAGE, autoradiography, or LSC. Assay for release of chromium after treatment with cytotoxic cell, or leukocyte adherence to endothelial cells are measured.**

**Dr. John Doe - Item 7 3/31/94**



### **Detailed Information for Use Listed in 6.b.(3)**

**All general safety procedures contained in Item 10 will be followed.**

**Antibodies, peptides and proteins will be iodinated by Chloramine T, lactoperoxidase (H<sub>2</sub>O<sub>2</sub>), or IODOBEADS method in a sealed vessel using 2 mCi of Na<sup>125</sup>I. Purification will be by gel filtration, or dialysis. Labeled fractions will be expressed from the column, and identified by GM. Remaining free fraction will be expressed into a single waste container and disposed of through Radiation Safety. Column will be capped and disposed of as dry radioactive waste.**

**All procedures will be performed in the designated fume hood. Personnel not involved in the iodination will not be present in the lab. When possible, local lead shielding will be employed to minimize radiation exposure. Charcoal odor masks or half face respirators will be worn by iodinating personnel. Hood and other affected equipment will be monitored during and after procedure.**

**Hood performance check, air sample, and bioassay will be scheduled through Radiation Safety before the iodination.**

**Radioimmunoassay using custom iodinated, or pre-labelled compounds. The tracer is added to a solution of the antibody and the test compounds. Supernatant containing the free tracer is aspirated into liquid radioactive waste, bound tracer is precipitated and centrifuged. Analysis is done by gamma scintillation counting.**

**Dr. John Doe - Item 7 3/31/94**

**EMORY UNIVERSITY**  
**RADIATION SAFETY OFFICE**  
**DOCUMENTATION OF INSTRUMENTATION**  
**AND SAFETY EQUIPMENT**

**SURVEY METER(S)**

<i>PI - John Doe</i>	<i>Instrument 1</i>	<i>Instrument 2</i>
<i>Manufacturer :</i>	<i>Ludlum</i>	
<i>Model Number :</i>	<i>3</i>	
<i>Serial Number :</i>	<i>100</i>	
<i>Range :</i>	<i>0-2000 mR/hr</i>	
<i>Detector :</i>	<i>Pancake 44-9</i>	
<i>Location - Bldg. &amp; Room:</i>	<i>1234 WMB</i>	

**LIQUID SCINTILLATION COUNTER(S)**

	<i>Instrument 1</i>	<i>Instrument 2</i>
<i>Manufacturer :</i>	<i>Atomic Widgets</i>	
<i>Model Number :</i>	<i>1001</i>	
<i>Location - Bldg. &amp; Room :</i>	<i>1234 WMB</i>	
<i>Calibration Method / Frequency:</i>	<i>Yearly, service contract</i>	

**GAMMA COUNTER(S)**

	<i>Instrument 1</i>	<i>Instrument 2</i>
<i>Manufacturer :</i>	<i>Nuclear Items</i>	
<i>Model Number :</i>	<i>999</i>	
<i>Location - Bldg. &amp; Room :</i>	<i>1234 WMB</i>	
<i>Calibration Method / Frequency :</i>	<i>Yearly, service contract</i>	

**OTHER**

	<i>Instrument 1</i>	<i>Instrument 2</i>
<i>Instrument Type :</i>	<i>Fume Hood</i>	
<i>Manufacturer :</i>	<i>Airs-A-Lot</i>	
<i>Model Number :</i>	<i>Unk.</i>	
<i>Location - Bldg. &amp; Room :</i>	<i>1234 WMB</i>	

*P.O. Drawer P or FAX 7-5904 Dr. John Doe Item 8 3/31/94*

**\*\*\*Item 9 Laboratory Facilities - lab - shielding - hood - storage - sink  
Draw map showing areas of use, storage & adjacent areas**

**Item 10 General Rules - Appendix B**

**Appendix B**

**Safe Use of Radioactive Material**

**This section should include the following items plus any additional precautions particular to your protocols.**



## **Appendix B**

### **Safe Use of Radioactive Material**

- 1. Wear laboratory coats or other protective clothing at all times while using radioactive materials.**
- 2. Wear disposable gloves, and protective eyewear at all times while handling radioactive material.**
- 3. Monitor hands and clothing for contamination, if applicable, after each procedure or before leaving the area.**
- 4. Do not eat, drink, smoke, apply cosmetics, or store personal effects in any area where radioactive material is used or stored. Do not store food or drink in restricted area.**
- 5. Wear film badges at all times while in areas where radioactive materials are used or stored. Badges should be worn at chest or waist level. When film badges are not being worn to monitor occupational exposure, they should be stored in a designated low background area. Wear dosimeters (badges) as described in Item 14.**
- 6. Never pipette by mouth.**
- 7. Confine radioactive solutions in covered containers plainly identified and labeled with the name of the radionuclide, date, activity, and radiation levels, if applicable.**
- 8. Always transport high energy beta or gamma emitting material in shielded containers.**

**Dr. John Doe - Item 10**



## DETAILED INFORMATION IN ADDITION TO APPENDIX B

### SAFE USE OF RADIOACTIVE MATERIAL (cont)

9. Follow any special instructions of the Principal Investigator, or of the Radiation Safety Office.
10. Perform contamination and radiation surveys as directed. Record the results on the forms provided.
11. Follow any additional safety precautions provided by the radioisotope manufacturer or vendor. Maintain a copy of any package inserts.
12. Radioactive material users will familiarize themselves with the experimental protocols, special precautions, and any required equipment prior to performing the procedure.
13. Before attempting an experiment for the first time, perform a 'dry run', using water or saline instead of the radioisotope solution.
14. Before beginning an experiment, assemble all materials, reagents and equipment necessary to perform the experiment.
15. Work only in a designated area.
16. Cover the benches where radioactive materials are used with a layer of absorbent paper.
17. Whenever possible, work with radioactive solutions or storage of liquid radioactive solutions should be confined to a tray capable of containing the entire volume of the radioactive material.
18. Never leave radioactive materials unsecured. Never leave a radioactive experiment unattended unless the area is clearly marked 'RADIOACTIVE MATERIAL IN USE - DO NOT DISTURB'. Advise others in the lab of the status of the experiment.
19. Immediately report any unsafe situation to the Principal Investigator, and to the Radiation Safety Office.

**Dr. John Doe - Item 10**

**DETAILED INFORMATION IN ADDITION TO APPENDIX B**

**Sharp objects will be disposed of in puncture proof containers, then into dry waste.**

**All persons routinely exposed to penetrating radiation will wear film badges to measure exposure to the body.**

**All persons routinely exposed to localized radiation fields where extremity exposures of 5 mR/h at 1 cm occur will wear finger badges to measure exposure to the extremities. Those persons who are only occasionally exposed may not be required to wear radiation monitors.**

**When employing local shielding to minimize exposure to the torso, such as an 'L' shield, the body badge should be worn on the collar.**

**All transfers of concentrated radioactive material will be made with remote handling equipment ie. tongs, pipettors.**

**Whenever possible local shielding will be employed to minimize personnel exposure.**

**Concentrated solutions of potentially volatile isotopes will be handled only in a properly functioning and certified fume hood.**

**Work areas, hands and feet will be monitored routinely throughout and following radioisotope use.**

**Hoods, microfuges, refrigerators, and freezers will be designated for radioisotope work, and properly labelled.**

**Solutions of radioactive material will be heated only in a properly functioning and certified fume hood. Fume hoods will be used only if their sash is at or below the indicated opening height.**

**Dr. John Doe - Item 10**

## APPENDIX C

### EMERGENCY PROCEDURES

#### MINOR SPILLS:

1. **NOTIFY:** Notify persons in the area that a spill has occurred.
2. **PREVENT THE SPREAD:** Cover the spill with absorbent paper.
3. **CLEAN UP:** Use disposable gloves and remote handling tongs. Carefully fold the absorbent paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Also insert all other contaminated materials such as disposable gloves into the plastic bag.
4. **SURVEY:** With a low-range, thin-window GM survey meter, check the area around the spill, hands, and clothing for contamination. Perform a wipe survey of the affected areas.
5. **REPORT:** Report incident to the Radiation Safety Officer. If assistance is needed for steps 1-4, notify Radiation Safety Officer first.

#### MAJOR SPILLS:

1. **CLEAR THE AREA:** Notify all persons not involved in the spill to vacate the room.
2. **PREVENT THE SPREAD:** Cover the spill with absorbent pads, or paper. Do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread of contamination.
3. **SHIELD THE SOURCE:** If possible, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.
4. **CLOSE THE ROOM:** Leave the room and lock the door(s) to prevent entry.
5. **CALL FOR HELP:** Notify the Radiation Safety Officer immediately. If possible, have someone who is not directly involved in the spill should call for help.
6. **PERSONNEL DECONTAMINATION:** Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

**Dr. John Doe - Item 11**

**PERSONNEL TO CONTACT IN THE EVENT OF AN EMERGENCY:**

**RADIATION SAFETY OFFICER** \_\_\_ Betty

**Goetz** \_\_\_\_\_

**OFFICE PHONE** 404-727-5922

**DIGITAL PAGER** 404-837-0724

**ALTERNATE CONTACTS (PI):**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**PHONE NUMBERS:**

\_\_\_\_-\_\_\_\_-\_\_\_\_\_  
\_\_\_\_-\_\_\_\_-\_\_\_\_\_  
\_\_\_\_-\_\_\_\_-\_\_\_\_\_

**Dr. John Doe Item 11**

## APPENDIX D

### WASTE DISPOSAL

**NOTE:** In view of the recent problems with shallow-land burial sites used by commercial waste disposal firms, Radiation Safety is encouraging your support to aid Emory in reducing the volume of waste sent to these facilities. Important steps in volume reduction are to segregate waste by radioactive, chemical and physical properties. Segregate radioactive from non-radioactive waste, short half-life radioisotopes from long half-life isotopes, wet waste from dry waste, and waste with hazardous chemicals from wastes without hazardous chemicals.

**1. Liquid waste will be disposed of (check as appropriate):**

By delivery to Radiation Safety.

In the sanitary sewer after holding for at least ten half-lives to complete decay and analysis of an aliquot in gamma well counter or liquid scintillation counter to determine that activity is no greater than background.

In the sanitary sewer in accordance with (4) (c) of Rule 391-3-17-.03, Department of Natural Resources.

**2. Solid waste will be (check as appropriate):**

By delivery to Radiation Safety.

Held for decay until radiation levels, as measured in a low background area with a low-level survey meter and with all shielding removed, have reached background levels (10 half-lives minimum). All radiation labels will be removed or obliterated, and the waste will be disposed of in normal trash.



**Dr. John Doe - Item 12**

## DETAILED INFORMATION IN ADDITION TO APPENDIX D

### WASTE DISPOSAL

When possible all waste will be collected and delivered to Radiation Safety Office for disposal. Waste will be kept in properly marked containers. Containers will be suitable to contain the types of material within. Waste will be separated by:

Radiological Properties -	Short half-life from long half-life
Physical Properties -	Liquid from dry
Chemical properties -	Non-hazardous from hazardous waste
	Biological properties -
	Biologicals (prone to decay)
	and biohazardous from all other wastes

All waste will be maintained on inventory until final disposal through Radiation Safety, sewer disposal or total decay. When necessary waste will be shielded. Shielding will be appropriate for the radioisotope.

Sewer disposal may be used for some aqueous, non-hazardous waste, particularly when decontaminating non-disposable labware such as gel casting plates. Any disposal via the sanitary sewer will be in a single sink which is designated for this use, and labelled 'CAUTION RADIOACTIVE MATERIAL'. Records of sewer disposal will be maintained and will include the isotope, activity, date, GM reading of the waste before disposal, the model and serial number of the instrument used, and the initials of the person doing the disposal. A summary of this record will be sent to Radiation Safety at the end of each month.

Before disposing of radioactive waste in the sanitary sewer, the tap water will be run for several minutes. During this time the sink will be checked for proper functioning of the drain, i.e. no blockages or leaks. After the sewer disposal the tap water will be run for several minutes to flush the drain system. A contamination check of the sink area will be performed.

Sewer disposal will be limited to the activities below:

Isotopes with half-lives :	Maximum disposal :
Less than 90 days -	50 uCi per month
Less than 1 year but more than 90 days -	100 uCi per month
$^3\text{H}$ or $^{14}\text{C}$ -	100 uCi per week

Any storage for decay will be done only by the specific approval of Radiation Safety, who will help to ensure that possession limits are not exceeded, and that radiation exposure is maintained As Low As Reasonably Achievable.

**Dr. John Doe - Item 12**

## **Personnel Monitoring**

**Persons routinely exposed to radiation will wear a body monitor. Those persons who are routinely exposed to local radiation to the extremities will also wear a finger monitor.**

**Wear film badges at all times while in areas where radioactive materials are used or stored. Badges should be worn at chest or waist level. When film badges are not being worn to monitor occupational exposure, they should be stored in a designated low background area.**

**Those persons who participate in iodinations will have routine thyroid bioassay performed by the Radiation Safety Office.**

ITEM 15

PERSONNEL TRAINING PROGRAM

All individuals working in or frequenting any portion of a restricted area shall be:

- a. ...informed of the storage, transfer or use of radioactive materials within that area.
- b. ...instructed in the health protection problems associated with exposure to such radioactive materials or radiation including biological risks to embryos or fetuses, in precautions to minimize exposure, and in the purposes and functions of protective devices employed.
- c. ...instructed in, and instructed to observe, the applicable portions of Departmental regulations and license conditions for the protection of employees, patients and the public from ionizing radiation.
- d. ...instructed in their responsibility to promptly report any conditions which may lead to or cause any violation of the regulations or license conditions.
- e. ...advised as to the availability of the results of radiation exposure reports and bioassays.
- f. ...trained upon beginning work in or around a restricted area and must receive refresher training tri-annually.

The implementation of these instructions will be carried out through the Principal Investigator or the Radiation Safety Office.

**Dr. John Doe - Item 15**

**SUPPLEMENT A**

**1. NAME OF USER:**

<b>John Doe</b>
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**2. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES:**

<b>FIELD OF TRAINING</b>	<b>LOCATION OF DATE(S) OF TRAINING</b>	<b>LECTURE/ LABORATORY HOURS</b>
<b>RADIATION PHYSICS AND INSTRUMENTATION</b>	<b>Excalibur University 1986-87</b>	<b>50</b>
<b>RADIATION PROTECTION</b>	<b>Excalibur University 1986-87</b>	<b>50</b>
<b>MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY</b>	<b>Excalibur University 1986-87</b>	<b>50</b>
<b>RADIATION BIOLOGY</b>	<b>Excalibur University 1986-87</b>	<b>50</b>
<b>RADIOPHARMACEUTICAL CHEMISTRY</b>	<b>Excalibur University 1986-87</b>	<b>50</b>

**3. EXPERIENCE WITH RADIATION**

<b>TYPE OF EXPERIENCE</b>	<b>PLACE AND DURATION OF EXPERIENCE</b>	<b>RADIOISOTOPES AND MAXIMUM ACTIVITY USED</b>
<b>Performed nick translation, labeled probes, iodinated protein, performed RIA, Labeled cultured cells</b>	<b>NIH, 1988-1991 Molecular Biology Institute 1991-1992</b>	<b><math>^{35}\text{S}</math> - 10 mCi <math>^{32}\text{P}</math> - 25 mCi <math>^{125}\text{I}</math> - 10 mCi <math>^3\text{H}</math> - 10 mCi</b>

