Ray: Any comments will be appreciated Karen

DEPARTMENT OF SURGERY

RADIATION

SAFETY

GUIDE

/(01)

QMG: 15 90
TB: 20 23 26 29 32 35(02)

/ The assays used in our research vary. The following is meant to be a set of(03) basic guidelines that can be applied to all of our assays./(04)

/(05)

/ If any questions arise about what is covered or not covered here please refer(06) to the Wayne State University or the National Institute of Health Radiation Safety(07) Guides found in the file cabinet. It is also good to check with the Nuclear Consultant(08) or the Radiation Safety Officer when problems or questions arise / their names and(09) telephone numbers are listed on the exit door./(10)

/(11)

/ The hospital license (~~AEC~~ NRC # 21/03001/01) is also on file./(12)

2(13)

/(01)

QMG: 15 90
TB: 20 23 26 29 32 35(02)

I ^{51}Chromium (^{51}Cr) Guidelines /Gamma Emitter(03)

/(04)

I. Possession Limits: ~~50~~ 30 mCi/(05)

II. Shipment receipt/(06)

A. Visual check of shipping carton./(07)

1. Note any signs of mishandling/(08)

2. Note any signs of leakage/(09)

B. Geiger counter check/(10)

1. If mR/hr at the package surface is above 20 mR/hr or above 3 mR/hr(11) at 3 feet notify the Radiation Safety Officer/(12)

2. If readings are normal proceed with C./(13)

C. Opening of the package/(14)

1. Wear gloves/(15)

2. Look for signs of leakage/(16)

— a. If ~~none~~ there are no signs of leakage check the package without the isotope, if the mR/hr is < 0.1(17) — discard in regular trash./(18)

D. Open the container that holds the stock solution of the isotope./(19)

1. If bottle is broken or leaking notify the Radiation Safety Officer./(20)

2. Look at the information on the label to be sure the label, the order and(21) the invoice match / check the isotope, concentration, assay date and(22) lot number./(23)

E. Log the isotope noting all findings signficant or not / Log sheets are found(24) in the black binder marked Isotopes./(25)

1. Fill out the sheet marked "package survey"./(26)

2. Make a separate utilization and disposal sheet for each shipment./(27)

/(28)

/(01)

III. Working with ^{51}Cr/(02)

A. Always work in an area designed for isotopic work./(03)

B. Store the stock solution behind lead bricks./(04)

C. Never eat, drink, or smoke in the radioactive work area./(05)

D. Always wear disposable gloves./(06)

E. Wear a whole body and finger badge./(07)

F. Work over absorbant paper with a plastic backing./(08)

G. Use disposable pipets with a "pipet/aid" or an automatic pipettor with disposable(09)
tips. NEVER pipette by mouth./(10)

H. Monitor the work area./(11)

1. Use a geiger counter at the end of an assay./(12)

2. Using filter paper wipe an area 10 x 10 inches / count for 10 minutes(13)
on the gamma counter./(14)

If the geiger counter shows areas that read above background or the(15)
gamma counter indicates $\geq$ 100 dpm decontaminate the appropriate(16)
areas. Decontamination instruction follow the section on beta emmitors.(17)

I. Log the amount of isotope used and method of disposal on the utilization and disposal sheet.(18) —
/(19)

IV. ^{51}Cr Waste/(20)

A. Hold all waste and unused ^{51}Cr for 10 half/lives (^{51}Cr held for 10 months).(21)

1. Solid waste is put in heavy plastic bags./(22)

2. Liquid waste is put in a plastic bottle./(23)

3. Label all bags and jugs as being radioactive indicating the isotope present,(24) —
the current date, concentration of the isotope, and the disposal date.(25)

4. The storage shed is found in the enclosed area behind the Beaver Laboratory.(26)

/(27)

/(01)

B. Discarding waste / after 10 half/lives/(02)

1. The liquid waste is put down the drain / flush with running water for(03) at least one hour./(04)
2. Solid waste is discarded in the regular trash / after removing radioactive(05) labels and checking with a geiger counter to be sure waste has decayed(06) to background mR/hr./(07)
3. Log all disposals in the black book./(08)
   a. Keep a "running total" on all drain disposals./(09)

/(10)

/(01)

QMG: 15 90
TB: 20 23 26 29 32 35(02)
1 14 Carbon (^{14}C) and Tritium (^{3}H) Guidelines/ Beta Emitters(03) —

/(04)

I. Possession limits: 100 mCi/(05)

II. Shipment receipt/(06)

A. Check the package as described for ^{51}Cr./(07)

1. There should not be any radioactivity found using the geiger counter.(08)

— If there is a positive geiger counter read report to the Radiation Safety(09) —
in^ g

Officer./(10)

2. Wipe the outer carton and the inner carton with separate pieces of filter(11) paper. Put the filter paper into scintillation fluid and count on the liquid(12) scintillation counter. If the reading is <100 dpm above background discard(13) carton with the regular trash./(14)

If the reading is ≥ 100 dpm check with the Radiation Safety Officer.(15)

B. Log shipment/(16)

1. Fill out package survey sheet./(17)

— 2. Fill out an utilization and disposal sheet./(18) —
s ^

III. Working with Beta Emitters/(19)

A. Always work in an area designed for isotopic work./(20)

B. Store isotopes in the small refrigerator/(21)
^ ^

C. Never eat, drink, or smoke in the radioactive work area./(22)

D. Always wear disposable gloves./(23)

E. No badge required.(24)

Ø(25) F. Work over absorbant paper with a plastic backing./(26)

Ł(27)

/(01)

G. Use disposable pipets with a "pipet/aid" or an automatic pipettor with disposable(02) tips. Never pipette by mouth./(03)

H. Monitor the area using the filter paper wipes weekly when a Beta Emitter(04) is used./(05)

I. Log amount used and method of disposal on the utilization and disposal sheet.(06)

J. A monthly bioassay is run on individuals working with Beta Emitters. Procedure(07) follows./(08)

IV. Beta Waste/(09)

A. Solid waste can be disposed of in the regular trash./(10)

Justification: The most isotopic uptake we get by the cells is 5%. The wells(11) are thoroughly washed so it is reasonable to assume that 5% is the most radioactivity(12) remaining in the well. 2 uCi are added to each well therefore 0.01 uCi may be(13) left in the well. There are 96 wells/plate (96 x 0.01 = 9.6 yCi). The plate(14) weighs 350 g / therefore there are 0.028 uCi/g./(15)

0.05 uCi/g can be discarded as regular trash./(16)

B. Aquaeous Beta waste can be discarded down the drain / flushing with running(17) water while discarding and for at least 30 minutes afterwards./(18)

Drain limit/institution/year = 5 Ci./(19)

Reminder: Keep a "running total" on all Beta and Gamma drain disposals.(20)

C. Scintillation Fluid/(21)

1. Can be discarded, in the vial, as toxic waste. (For toxic waste disposal(22) call 616/685/9824)/(23)

Justification: when pooled samples of scintillation fluid were tested(24) we had < 0.02 uCi/ml (limit for toxic waste disposal is 0.05 uCi/ml or(25) 0.05 uCi/g)./(26)

/(27)

/(01)

2. Scintillation Fluid, in the vials, is stored until shipped in 55 gallon drums(02) lined with heavy plastic bags. The vials are layered in the bags with(03) an oil absorbant material (vermiculite)./(04)

The drums are stored in the shed behind the Beaver Laboratory and labeled(05) as being radioactive. When the shipment is picked up by the toxic waste(06) disposal company the radioactive labels are removed./(07)

/(08)

/(01)

QMG: 15 90
TB: 20 23 26 29 32 35(02)

/Decontamination Procedure(03)

/(04)

I. Isolate the contaminated area / ask everyone to leave the area and do not allow(05) others to enter the area./(06)

II. Call the Radiation Safety Officer if contamination is major./(07)

A. Breaking and/or spilling of stock solutions./(08)

B. Storage drum leakage./(09)

C. Storage shed violation / break in/(10)

III. Decontamination/(11)

A. Wear gloves and when appropriate shoe covers./(12)

B. Mark contaminated area i.e., outline the outside of the area with wax pencil.(13)

C. Always work from the least contaminated outer area towards the inner(14) area./(15)

D. For liquid contamination wipe with absorbant paper towels./(16)

E. After all visable contamination is removed apply Count/Off ~~treatment~~ or(17) a similar solution. Allow the decontaminating solution to remian in contact with(18) the area for 5 minutes, wipe dry, rinse with wet toweling and repeat the(19) Count/Off treatment rinsing well./(20)

F. Check decontamination/(21)

1. Gamma contaminant is checked with a geiger counter then checked using(22) the filter paper wiping procedure outlined above./(23)

2. Beta contamination is checked by placing the filter paper wipe into liquid(24) scintillation fluid as described above./(25)

Repeat E. until ≤100 dpm above background./(26)

/(27)

(01)

QMG: 15 90
TB: 20 23 26 29 32 35(02)

/Urine Bioassay Procedure(03)

(04)

I. Frequency of urine collection(05)

A. Monthly when Beta Emitters are in routine use.(06)

B. Within 30 days from the ~~last~~ Beta Emitter contact, when they are used irregularly.(07)

(08)

II. Procedure(09)

A. 1 ml of urine is put into 10 ml of Aquasol^{Tm} Scintillation fluid(10)

B. Cool over night(11)

C. Count along with a control urine and a set of standards for 20 minutes/sample.(12)

D. See Isotope book - Bioassay section for calculation and determination of normality.(13)

(14)

RADIATION SAFETY

INTRODUCTION

Radioactivity is a process by which unstable atoms' nuclei spontaneously decay or disintegrate via one or more discrete energy transitions until they reach a stable state. The energy transitions or radioactive emissions are of 3 types:

1. Alpha Particles: These particles are the least penetrating of the 3 types and can be stopped by a few centimeters of air or a thin piece of paper. This type of radiation is not used in our Laboratory.

2. Beta Particles: These particles are negatively charged. They have the same mass and charge as an electron and are known as high speed electrons. They require only a few millimeters of aluminum to stop them. This type of radiation is rarely used in the laboratory.

3. Gamma Rays: These rays are a type of electromagnetic radiation which travel at the speed of light and have no charge. This type is the most common in the laboratory.

Radiation is capable of producing biological damage. Before damage can occur, however, several conditions must first occur. The damage caused by radiation depends on the type of radiation, its energy, the kind of tissue it has entered, the age and gender of the individual, rate of absorption, the area exposed, etc. The level of radiation an individual is exposed to in the laboratory is usually extemely minute. The risk of any biological damage due to this type of exposure is severely limited. Nevertheless, safety precautions have been developed and must be adhered to in order to reduce the possibility of an accident occurring.

LICENSE

Hutzel Hospital is licensed by the Nuclear Regulatory Commission to use radioactive material in accordance with the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, and Title 10, Code of Federal Regulations, Chapter 1, Parts 30, 31, 32, 34, 35, 36, 40, and 70. A copy of the license may be found in the laboratory and/or Administration.

GENERAL STANDARDS OF PERSONAL AND LAB SAFETY WHEN HANDLING RADIOACTIVE MATERIALS

A. All laboratory safety policies are to be adhered to when handling radioactive materials.

B. Do not allow radioactive material to contact the skin.

C. Do not breathe radioactive dust or the vapors of volatile radioactive material

D. Keep all radioactive materials in closed containers or tightly capped when not in use.

E. Do not contaminate work areas, glassware, or lab apparatus.

F. Do not cross-contaminate different radioactive materials.

G. Assume that anything in a restricted area not known to be non-radioactive is contaminated, and is to be treated and disposed of as if it were radioactive.

H. All work areas are to be covered with absorbent matting and discarded after each days' use in the appropriate labelled containers.

I. Disposable gloves must be worn when handling radioactive material during testing procedures.

J. Decontamination of Glassware.

1. Wear gloves and plastic aprons.

2. Dilute Multi-terge decontamination solution using 20 ml of Multi-terge into 1 liter of water.

3. Completely immerse object in cold solution for 3-24 hours or in a boiling solution for 10-20 minutes.

4. After treatment, rinse thoroughly with tap water, then rinse with distilled water.

PERSONNEL RESTRICTIONS

As per Federal and State rgulations, all personnel working on or frequenting any portion of a restricted area will be thouroughly instructed by the Laboratory Safety Officer on the following topics before working in a restricted area.

A. Occurrence of radiation.

B. Purpose and functions of protective devices.

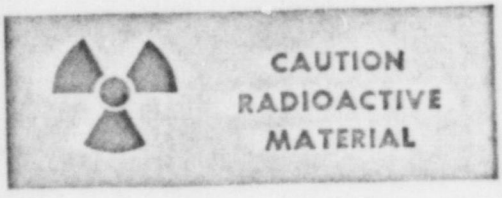
C. Appropriate responses to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material.

D. Inform workers of their responsibilities as per posted form NRC-3 (9-78) 10 LFR 19, 10 CFR 20, "Standards for Protection against Radiation"; "Instructions and Reports to Workers".

E. Observe all Hospital and Laboratory safety policies.

WARNING SIGNS AND LABELS

A. Label all areas where radioactive materials are stored or used with official N.R.C. approved magenta and yellow "Caution Radioactive Materials" signs.



B. Label all containers of radioactive waste with N.R.C. "Caution Radioactive Materials" signs.

RECEIPT OF RADIOACTIVE MATERIAL

External monitoring of packages for radioactive leaks received in the lab is not required by Federal or State regulations due to the small amount of radioactivity in the packages.

A. Daytime deliveries

1. All radioactive packages for the laboratory are to be delivered from the dock area directly to the laboratory administrative assistant.

2. Radioactive packages will be logged in the laboratory requisition book and directed to the appropriate section (RIA).

3. Upon receipt of radioactive package(s) the section will:

   a. open and inspect for damage or leakage.

   b. check to see that the order is complete.

   c. record appropriate information in the radioactive inventory log book. (Example of log sheet is attached; 8-3). Allocate one line per kit received.

   d. date the contents on receipt and expiration date.

   e. if a package is damaged, inform Administrative Assistant, Lab Safety Officer, and/or Clinical Chemist.

B. Off hour deliveries

1. A security officer will bring the package to the 1 West laboratory.

2. Lab personnel accepting the package will immediately place it in the RIA Refrigerator marked with radioactive hazard symbol.

3. A note will be placed on the refrigerator door containing the following information:

   a. date and time of receipt.

   b. name of item or manufacturer.

   c. tech #.

4. The next morning, step #3 of the daytime deliveries will be followed.

   NOTE: Paper work should be sent to Assistant Administration to be logged in Lab Requisition Book.

C. If there is a change in the isotope, procedure or quantity of isotope stored, the Laboratory Safety Officer must receive written notification within 10 days of the change.

HUTZEL HOSPITAL
CHEMISTRY

RIA RADIOACTIVITY INVENTORY LOG

DATE REC'VD	TECH #	ANALYTE	MANUFACTURER	I. D.	ISO-TOPE	LOT #	EXP. DATE	TUBES/ KIT	μCi/kit	CONDITION ON RECEIPT	DATE USED	TECH #	COMMENTS

Hutzel Hospital Laboratory
Administrative - Safety

SUMMARY OF RADIONUCLIDES IN THE LABORATORY

TEST	MANUFACTURER	RADIOISOTOPE	ACTIVITY/KIT	TUBES/KIT	KITS/MONTH
B-hCG Pregnancy	Becton-Dickson	I^{125}	< 20 uCi	100	5
Cortisol	Kallestad	I^{125}	< 4.0 uCi	200	1
Digoxin	Micromedic	I^{125}	< 10.05 uCi	200	5
Ferritin	Corning	I^{125}	< 8.0 uCi	125	1
Folate	Corning	I^{125}	< 6.0 uCi	200	2
Estriol	Micromedic	I^{125}	< 10.0 uCi	200	1
Human Placental Lactogen	Cambridge	I^{125}	< 10.0 uCi	100	1
Testosterone	Diagnostic Products	I^{125}	< 4.0 uCi	100	1
T_3 Uptake	NDI	I^{125}	< 10.3 uCi	200	2
T_4 (Thyroxine)	Micromedic	I^{125}	< 10.0 uCi	200	3
TSH	Micromedic	I^{125}	< 10.0 uCi	200	2
Vitamin B 12	Corning	Co^{57}	< 3.0 uCi	200	2
Cyclosporin	Immunonuclear Corp.	I^{125}	< 6.0 uCi	100	4
Cyclosporin (kit)	Sandoz	^{3}H	< 4.0 uCi	200	2

STORAGE OF RADIOACTIVE MATERIALS

A. Radioactive material will be placed in designated storage areas only. Designated areas are those labelled with a radiation hazard sign.

B. Radioactive material must be stored in original containers.

MONITORING

In regulatory agencies there has been a need to establish some legal boundaries to allowable limits of exposure. The maximum permissible dose equivalent for occupational exposure set forth by the NRC 10 CRF, Section 20, 101 a is:

Rems per Calendar Quarter

1. Whole body 1.25

2. Skin of whole body . . . 7.5

3. Hands 18.75

The State of Michigan also sets an additional limit in Rule R 325.5 205.

4. Fertile women
(with respect to fetus). 0.5

The average exposure for a Hutzel Lab employee is considerably less than the above, nevertheless, certain monitoring precautions are performed in our laboratory.

A. Personnel

Film badges are used to measure external radiation exposure in the restricted area over a period of time (1 month period at Hutzel). The following policies have been adopted for use of the film badge.

1. Film badges are to be worn by personnel handling or frequenting RIA-Special Chemistry.

2. All film badges are to be kept dry and away from unnecessary sunlight or heat. If a badge is accidentally affected by any of these conditions, a written notification must be submitted to the Radiology Department immediately. Written notification is to include the following:

a. name and number of badge.

b. date of incident.

c. where incident took place.

d. brief statement regarding incident.

3. Film badges originate from the Radiology Department. If a new employee needs a badge, notify Radiology in writing including the name of employee, sec, birthdate, and social security number.

4. Film badges are issued by the Radiology Department on the first of the month and used badges must be returned to the same department by the 10th of the month. (See film Badge Log).

5. Film badges are to be worn on chest or abdomen.

6. Employee records on the amount of exposure received are open to inspection in the Radiology Department (or Clinical Chemistry Office).

B. Surfaces of Rooms and Equipment

Everything used for work with radioactive materials may be subject to widespread contamination. In order to prevent contamination of employees and work area, monthly surveys of the work area are to be performed. The surveys will use wipe tests to determine contamination levels. Results of the surveys are to be written in the Monitor Log Book.

C. Contamination Measurement of Work Area

WIPE TEST:

POLICY:

Wipe tests to monitor radioactive contamination of RIA work areas will be performed on a monthly basis. The results will be recorded on the RIA Wipe Test Form.

PROCEDURE:

NOTE: While performing the wipe test, the Technologist MUST wear disposable gloves.

1. Using ½ of a moist towelette, wipe down the designated areas to be monitored starting with area #1.

2. Fold the towelette and place it into a 12 x 75 mm test tube.

3. Repeat for each area to be monitored indicated on the report form.

4. Place the test tubes in a Gamma Scintillation Counter and count the tubes for 10 minutes. (NOTE: Prior to counting the wipe test, count the radioactive source and calculate the efficiency of the Gamma Counter).

5. Subtract the background counts from the results and convert into counts per minute (CPM) per 100 square centimeters (cm^2).

HUTZEL HOSPITAL LABORATORY
Chemistry - RIA

RIA WIPE TEST

DATE: _____

TECH. _____

GAMMA COUNTER: _____

EFFICIENCY: _____

*ACCEPTABLE LEVELS: Less than _____ cpm/100 cm^2

LOCATION	AREA SIZE (cm^2)	FACTOR	RESULT
1. TELEPHONE & RECEIVER	100	--	
2. INTERCOM	100	--	
3. REFRIGERATOR SC 1 A	100	--	
4. REFRIGERATOR SC 1 B	100	--	
5. REFRIGERATOR SC 1 C	100	--	
6. Freezer SC 1	100	--	
7. WATER BATH SC 1	100	--	
8. SINK DECANT AREA	200	cpm/2	
9. IEC CENTRIFUGE - INNER BOWL	800	cpm/8	
10. SINK INNER SURFACE	600	cpm/6	
11. BECKMAN CENTRIFUGE- INNER BOWL	400	cpm/4	
12. CLAY-ADAMS CENTRI. INNER BOWL	200	cpm/2	
13. TOP OF ROTATOR	150	cpm/1.5	
14. WORK AREA #1 - TRAY	230	cpm/2.3	
15. WORK AREA #2 - TRAY	230	cpm/2.3	
16. WORK AREA #3 - TRAY	230	cpm/2.3	
17. WORK AREA #4 - TRAY	230	cpm/2.3	
18. CONCEPT 4 AUTOPAK DISPENSER	100	--	
19. AREA BELOW AUTOPAK DISPENSER	100	--	
20. SAMPLE TUBE LOADING AREA	400	cpm/4	
21. MACC KEYBOARD	200	cpm/2	
22. WASTE BOTTLE OUTSIDE	200	cpm/2	
23. 2/200 GAMMA COUNTER	400	cpm/4	
24. HEWLETT PACKARD COMPUTER	200	cpm/2	
25. DOOR KNOBS	100	--	

*ACCEPTABLE LEVELS:

200 DPM/100 cm^2 X $\frac{\quad}{\text{(Efficiency of Gamma Counter)}}$ = Cutoff

%Efficiency = $\frac{\text{CPM}}{\text{DPM (Source)}}$ X 100

2.2×10^6 DPM/uCi X $\frac{\quad}{\text{(Source)}}$ uCi = DPM

Reviewed By _____ Date: _____

Revised 8-19-84

QUALITY CONTROL

6. NRC regulations stipulate that areas displaying greater than 200 dpm/100 cm^2 must be decontaminated. To establish a cutoff value:

$$200 \text{ dpm}/100 \text{ cm}^2 \times \text{Efficiency counter} = \text{cpm}/100 \text{ cm}^2 \text{ (cutoff)}$$

Any area displaying counts greater than the established background cutoff must be decontaminated and the wipe test repeated.

ACCIDENTS

A. Report all accidents to Chemistry Supervisor or Clinical Chemist. Major incidents must also be reported to the Radiation Safety Officer.

B. Spills

1. Wear gloves and plastic aprons before cleaning spills.
2. Dispose of glass (if any) in radioactive labeled waste container.
3. Outline the area of the spill with a marker.
4. Use a heavy pad of paper towels or spill control pillow to absorb the liquid.
5. Work toward the center to avoid spreading the contamination.
6. Discard towels/pillows in properly labeled waste container.
7. Decontaminate area.
   a. Pour a 50% solution of Multi-Terge on the area of the spill;
   b. Allow to stand for 20 minutes;
   c. Wipe with paper towel or spill pillows;
   d. Discard towels in properly labeled waste container;
   e. Rinse area with distilled water;
   f. Let dry.
8. Survey area using contamination measurement procedure (i.e., wipe test), and record results.

C. If an employee is contaminated by a wet spill:

1. Wash the area thoroughly with soap and water.
2. Fill out an incident report and give it to the Laboratory Safety Officer.

DISPOSAL OF RADIOACTIVE MATERIAL

A. Solid

1. All solid radioactive waste is to be disposed of in the following manner:

   a. Destroy any radioactive insignia on all bottles and containers.

   b. Throw in general trash.

B. Liquid

According to NRC, Title 10, Chapter 1, 20.303, discharge of radioactive waste into the sanitary sewage system is permissible if our waste (that consists of 98% I^{125}) does not exceed 10 microcuries per day. Our average per day is below this limit. Flush liquid waste with large amounts of water.

Reviewed By: [signature], Ph.D. On: 12 JUNE 85

CONVERSATION RECORD

TIME

DATE 2/16/85

TYPE ☐ VISIT ☐ CONFERENCE ☑ TELEPHONE ☐ INCOMING ☑ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO.
Ray Carlson	Hutzel	

SUBJECT Info needed

ROUTING	
NAME/SYMBOL	INT

SUMMARY

Spoke to Ray concerning the following;
Procedures & materials used in surgery lab & location
Clarify research procedures, are they synthesizing material (kits) or using prepackaged kits?
Also informed Ray about multiple conditions added or to be added to the license.

ACTION REQUIRED

6/20/85

Jim,

1. Still need to make phone record on this one.
2. I'm thinking like you; it is OK but there are a lot of conditions to cover "loose ends" If you think an inspector can understand program, go ahead & issue.
Bruce H.

NAME OF PERSON DOCUMENTING CONVERSATION: James Mullaney

SIGNATURE

ACTION TAKEN

SIGNATURE

TITLE