FloridaSART
State Agricultural Response Team

SART Radiation Response Training
Animal Surveys

Florida HEALTH

BUREAU OF RADIATION CONTROL

What's a rad accident/event have to do with me ??

2006 Federal Legislation

- **Pet Evacuation and Transportation Standards Act of 2006 – "The P.E.T.S. Act" (10/06/06)**
  - Amends Section 403 of the Stafford Disaster and Relief Emergency Assistance Act "to ensure that State and local emergency preparedness operational plans address the needs of individuals with household pets and service animals following a major disaster or emergency."

- **H.R.5441, Post-Katrina Emergency Management Reform Act (PKEMRA)**
  - Modifies the Stafford Act with PETS Act language, and places significant new responsibilities on DHS/FEMA for coordinating implementation of the PETS Act.

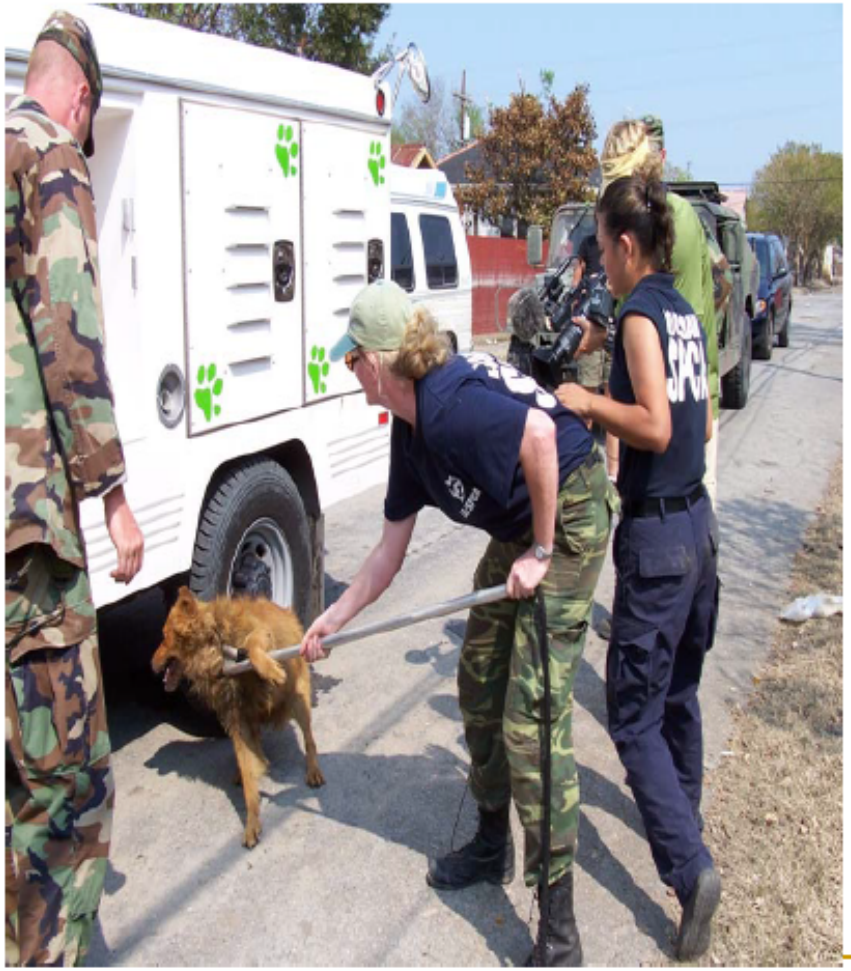
How does the Pet Evacuation and Transportation Standards (P.E.T.S.) Act of 2006 affect States?

- It amends the Stafford Act to ensure that State and local emergency preparedness plans address the needs of individuals with household pets and service animals following a major disaster or emergency."

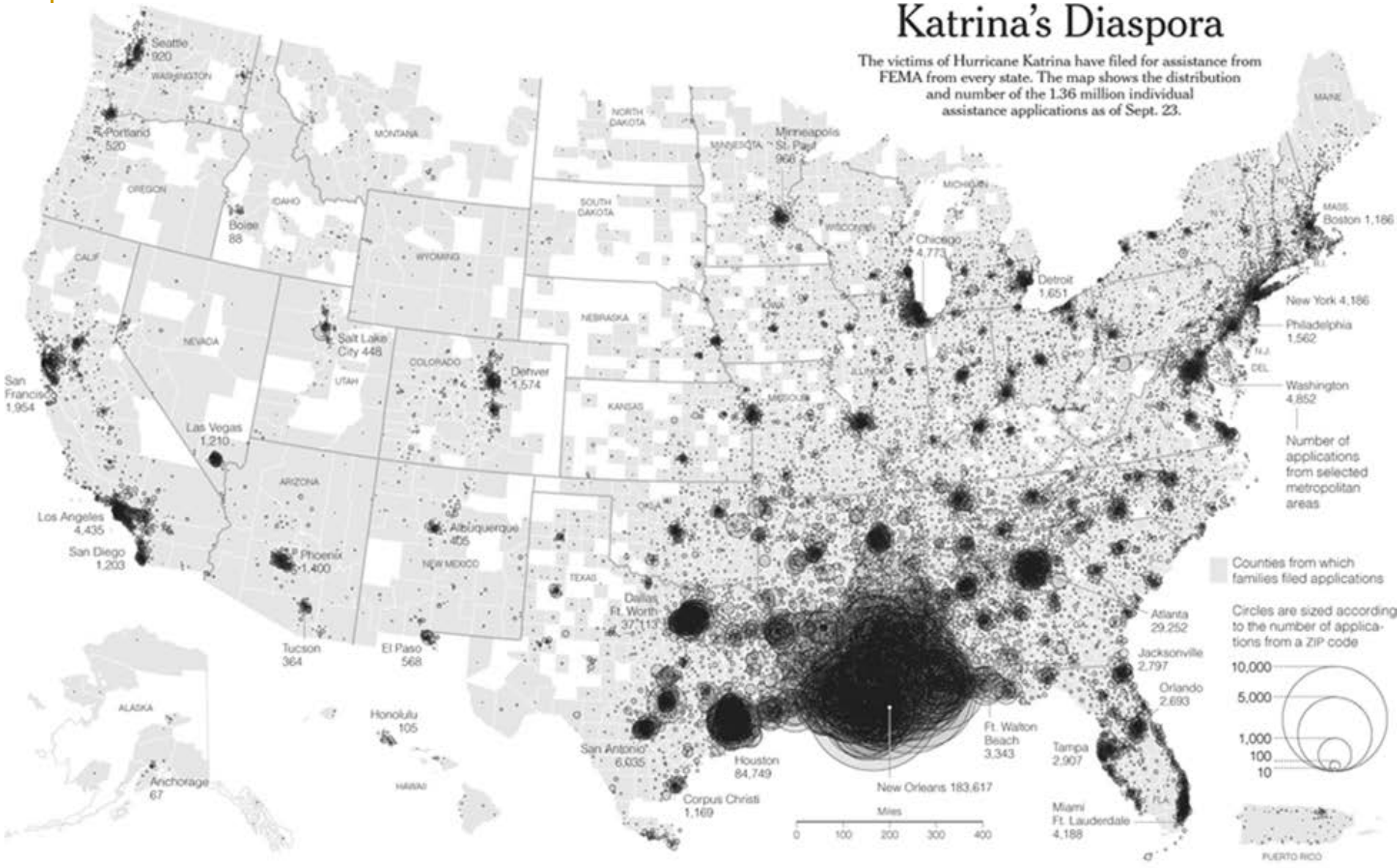
Note:

- "State and local"
- "emergency preparedness"
- "operational plans"

Which state and local animal regulatory authorities now are responsible for animal emergency response?

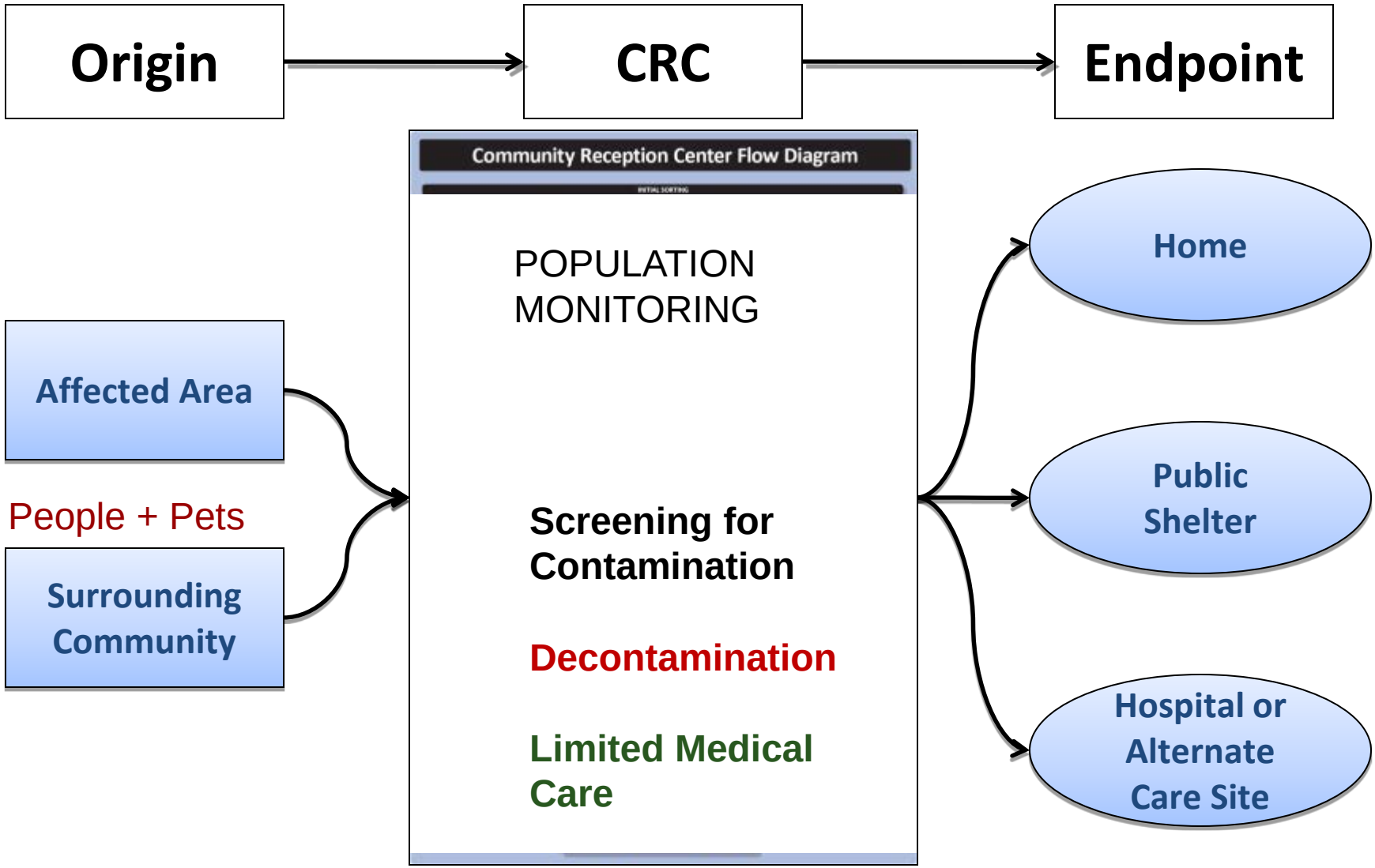


- **#1 State Emergency Management Authority (State EMA) (NEW!)**
- **#2 Local Government Animal Control Authority**
  - Police or Sheriff's Department
  - Have legal jurisdiction and physical custody of all stray and abandoned animals
- **#3 State Department of Agriculture/ Animal Health Commission**
  - State Veterinarian's Office
  - Primary legal authority is for livestock species, rather than pets.
- **#4 State Department of Health**
  - Public Health Veterinarian
  - Zoonotic diseases and animal bite case management
- **#5 State Board of Veterinary Medicine**
  - Licensing of veterinarians and veterinary technicians to practice legally within the state



Florida HEALTH

BUREAU OF RADIATION CONTROL


Origin
CRC
Endpoint
Community Reception Center Flow Diagram
POPULATION MONITORING
Affected Area
People + Pets
Surrounding Community
Screening for Contamination
Decontamination
Limited Medical Care
Home
Public Shelter
Hospital or Alternate Care Site

Let Animal Control do it !

Example: Seminole County

137,000 Households

80,000 Dogs

87,000 Cats

8 Animal Control Officers

Bureau of Radiation Control Resources

~ 80 Technical Personnel

- State Emergency Operations Center (SEOC)
- County EOC
- Mobile Lab
- Field Teams
- Incident/Unified Command Facility

Available for Public Monitoring/Population Registry ??

0

SART

How can SART help?

SART operates as a multiagency coordination group to establish a coordinated preparedness, response, and recovery effort for all hazards that may affect Florida animals and agriculture.

How would you help?

- Conduct and assist with animal screening/decontamination duties where and when needed

Why are we here (specifically)?

- Provide awareness level of radiation fundamentals and safety
- Provide introduction into radiation detection instruments
- Provide basic instruction on surveying **individuals** for radioactive contamination
- Introduce the CDC's Community Reception Center model.

Overview

- Introductions and purpose of course
- Bureau of Radiation Control
- Radiation Fundamentals
- RDD's and WMD's
- Instruments and Dosimetry
- Radiological Incident Command Structure
- County Response Overview
- Population/Pet Monitoring
- Lunch

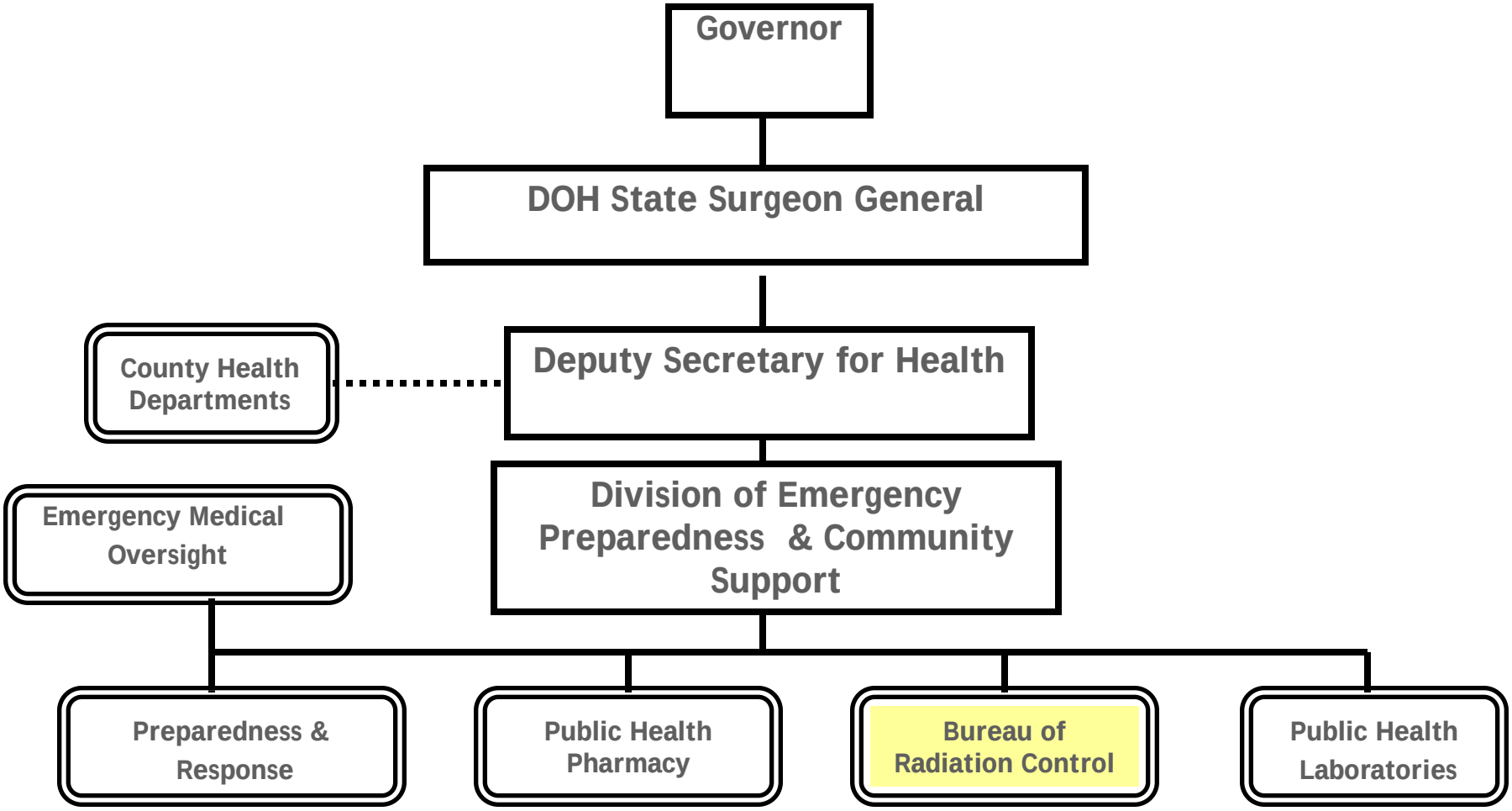
Overview cont'd PM

Instrument Proficiency Stations

Review and Discussion

Adjourn

DOH Organization Structure



Bureau Programs

The BRC implements five principal regulatory programs...

Environmental Radiation

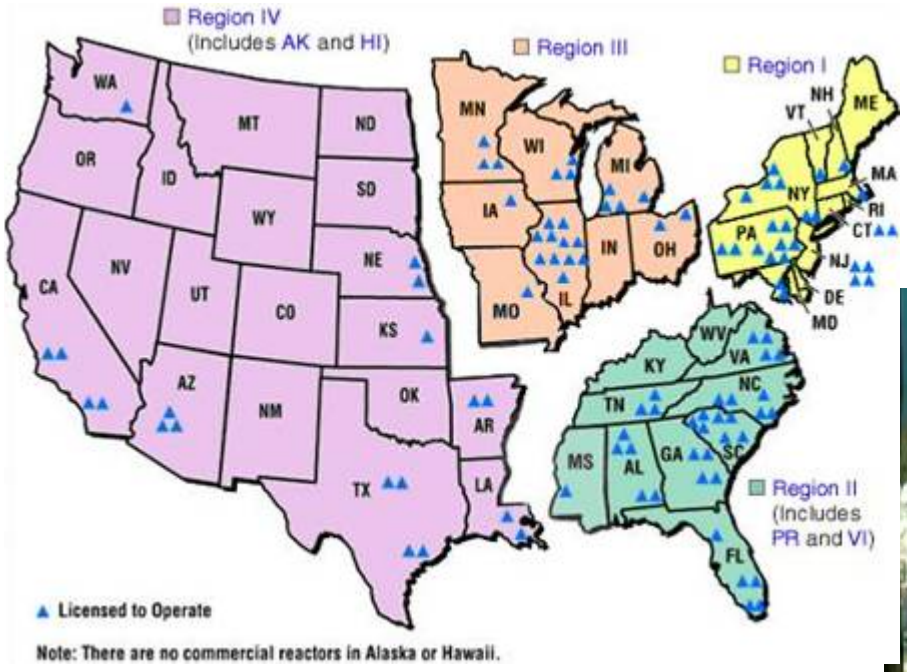
Radiologic Technology

Radioactive Materials

Radiation Machines

Non-ionizing Radiation

NPP Surveillance & Drills



Nuclear Power plants

Federal State and Local

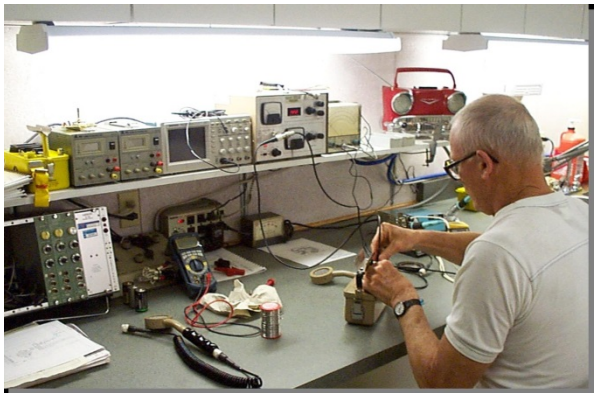
St Lucie Units 1&2

Surveillance at work!

Fishing on the job??

Environmental sampling

Radiation Instrument Calibration & Repair Services



Florida HEALTH

BUREAU OF RADIATION CONTROL

Incident Response

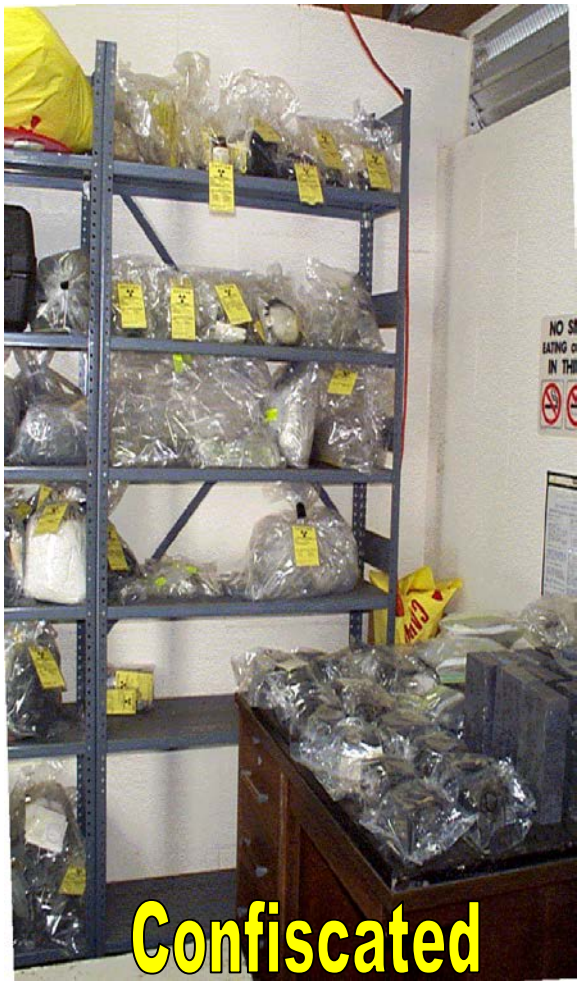
Radiological Training

FL State Fire College Approved

Awareness, Operations & Technician Classes

Inspection of LLRW

RAM Interim Storage



Radiation Emergency Medicine

BRC @ NASA Launches

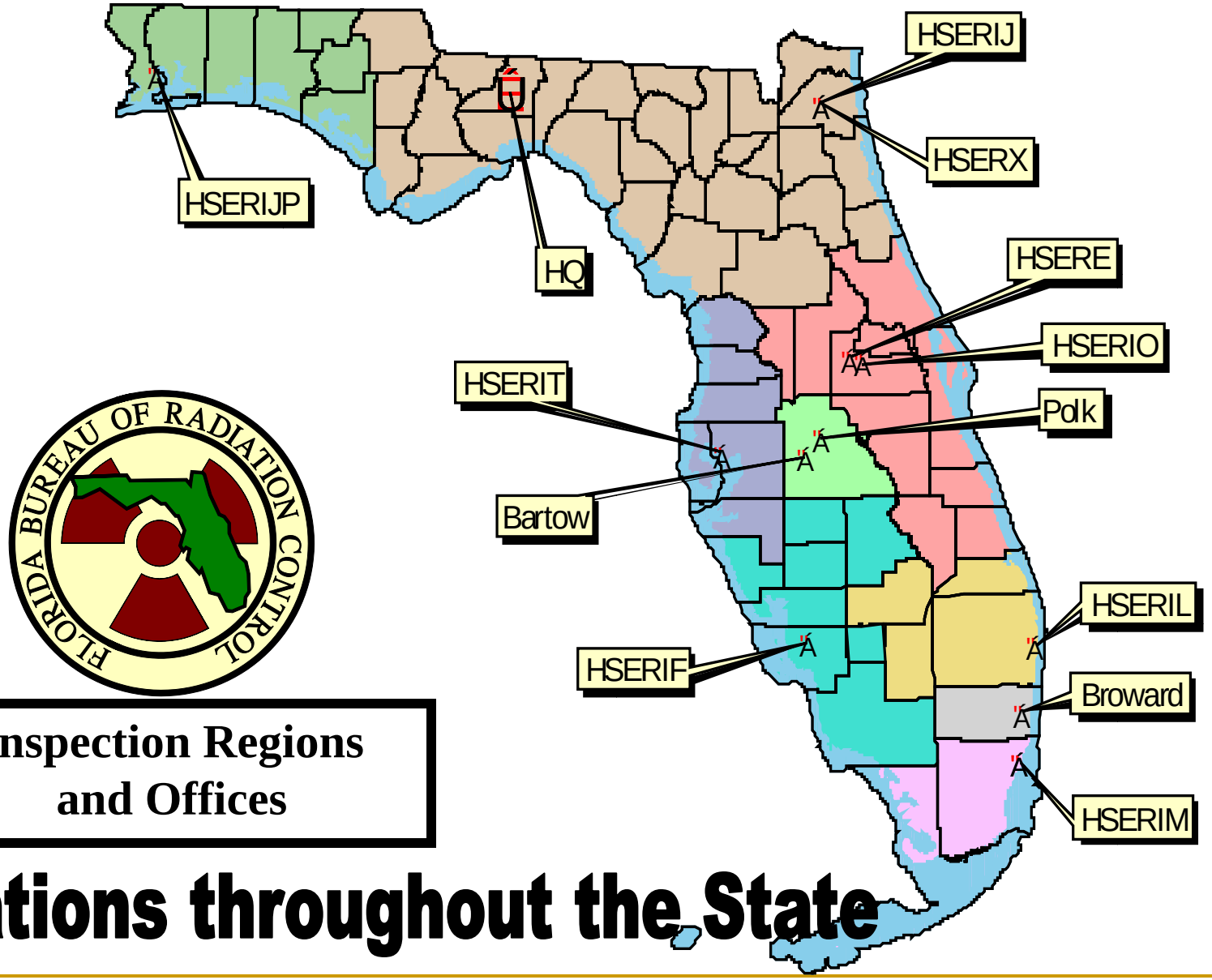
10/1997 “Cassini” : Titan rocket was sent to Saturn with the largest quantity of plutonium ever on a spacecraft.

Pluto New Horizons

Mars Science Lab

Preventative Radiological and Nuclear Detection (PRND) Activities

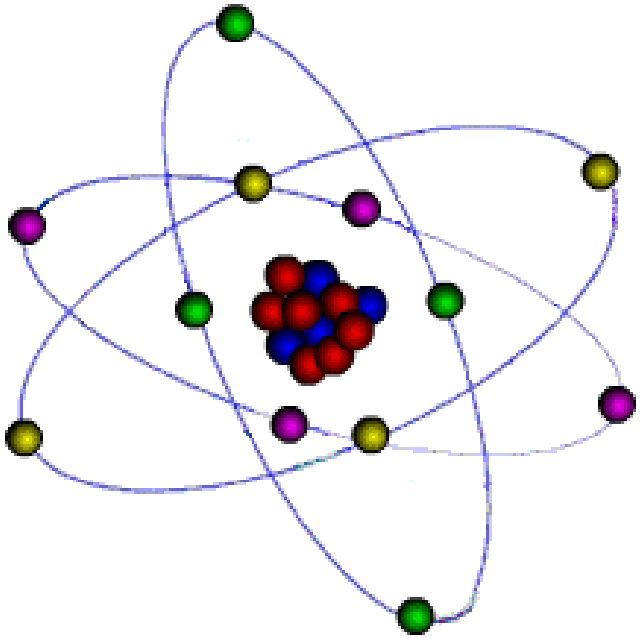
- 2009 & 2010 Superbowls
- Daytona 500 & Coke Zero 400 Races
- Republican National Convention
- Republican Debate
- Florida - Georgia College Football Game
- Governors Inauguration
- Blue Angels Air Show



Inspection Regions and Offices

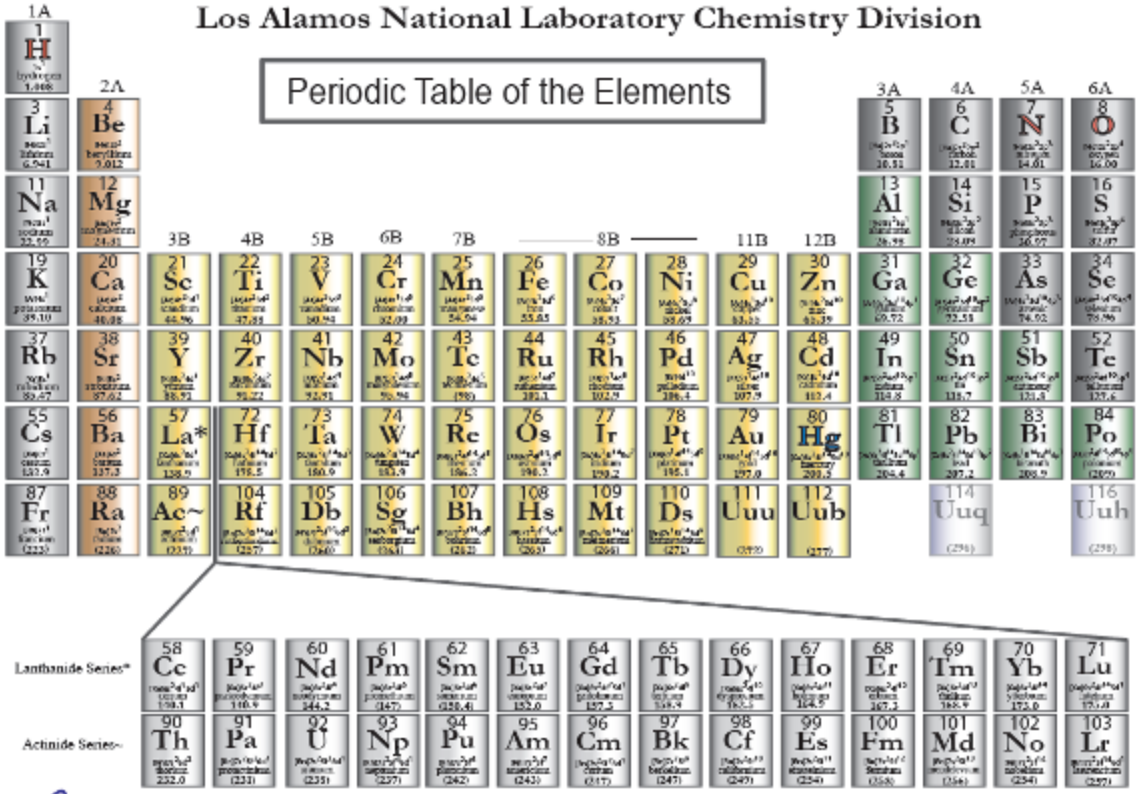
Locations throughout the State

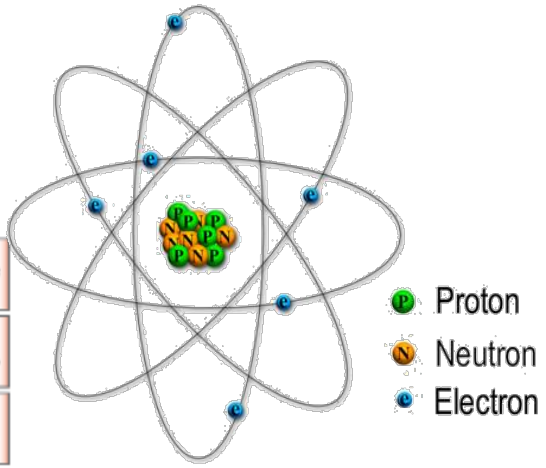
RADIATION FUNDAMENTS
ATOMIC AND NUCLEAR STRUCTURE



Atoms

- **The smallest part of an element that retains the properties of that element.**
- **Atoms are made up of protons, neutrons and electrons.**
- **Atoms make up elements.**
- **Elements make up Matter.**





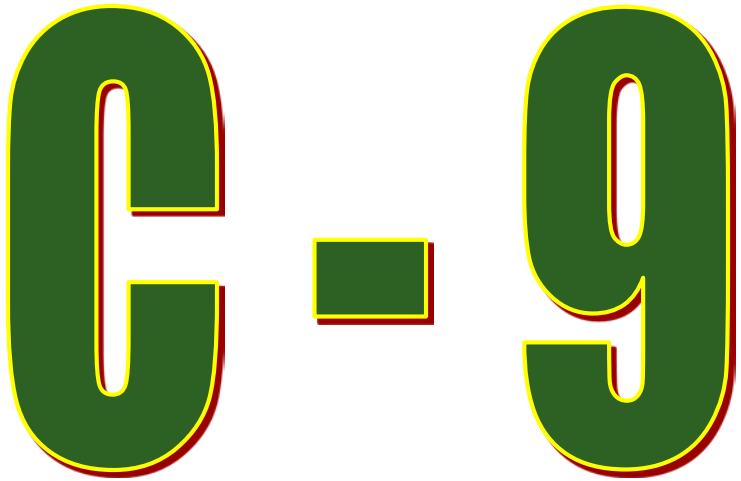
ISOTOPE

Isotopes – atoms of same element with **differing** #'s of neutrons

Example

C-9 C-10 C-11 C-12 C-13 C-14 C-15 C -16 are all "isotopes" of carbon and all exist on Earth !

Isotopic Designation



Symbol

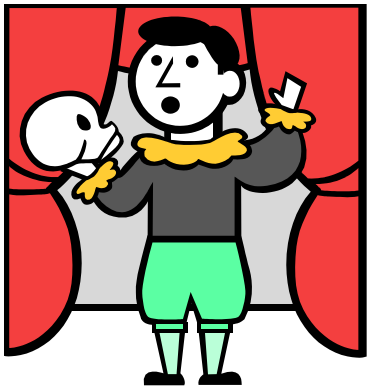
Atomic # + Neutrons

What Is Radiation?

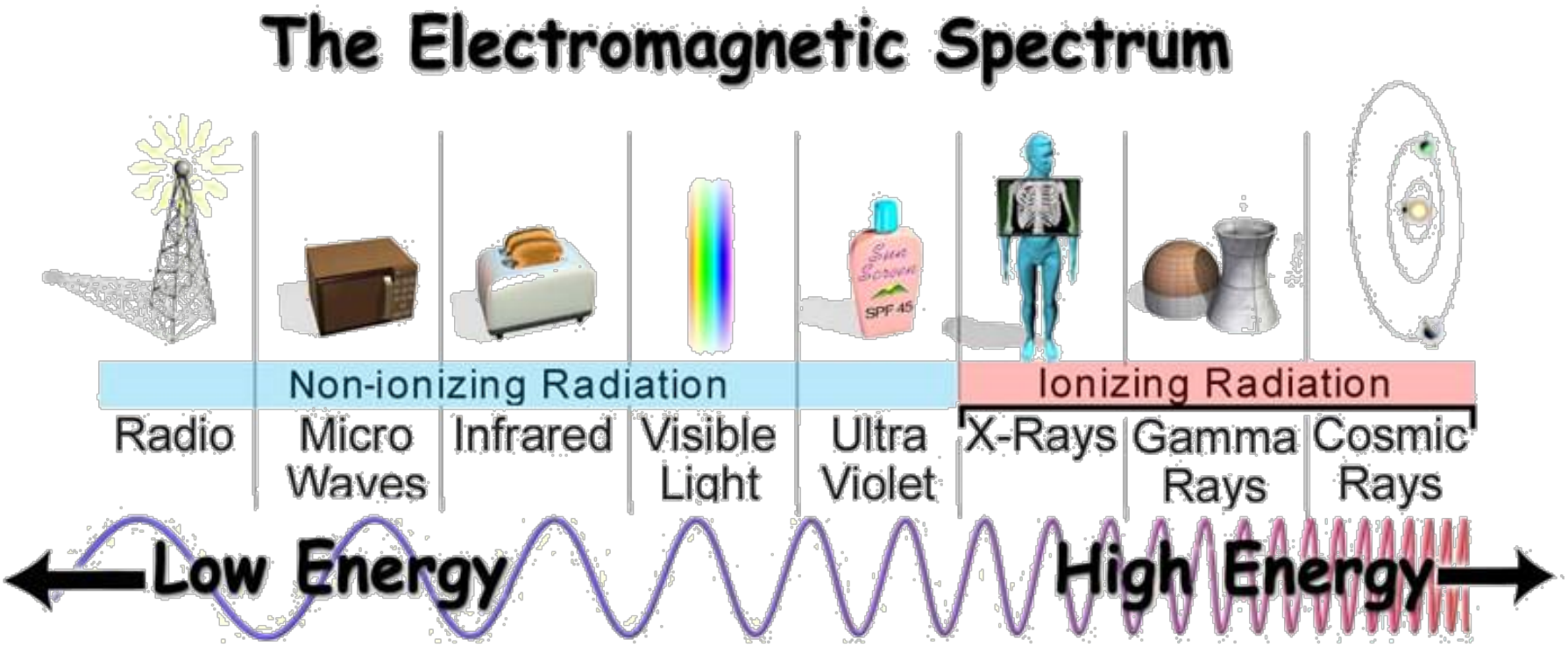
Energy in the form of subatomic particles ***or*** electromagnetic waves emitted from the nucleus of an *UNSTABLE* atom in an effort to reach STABILITY.

THIS ENERGY IS CALLED **RADIATION**

To ionize or not to ionize, that is the question…

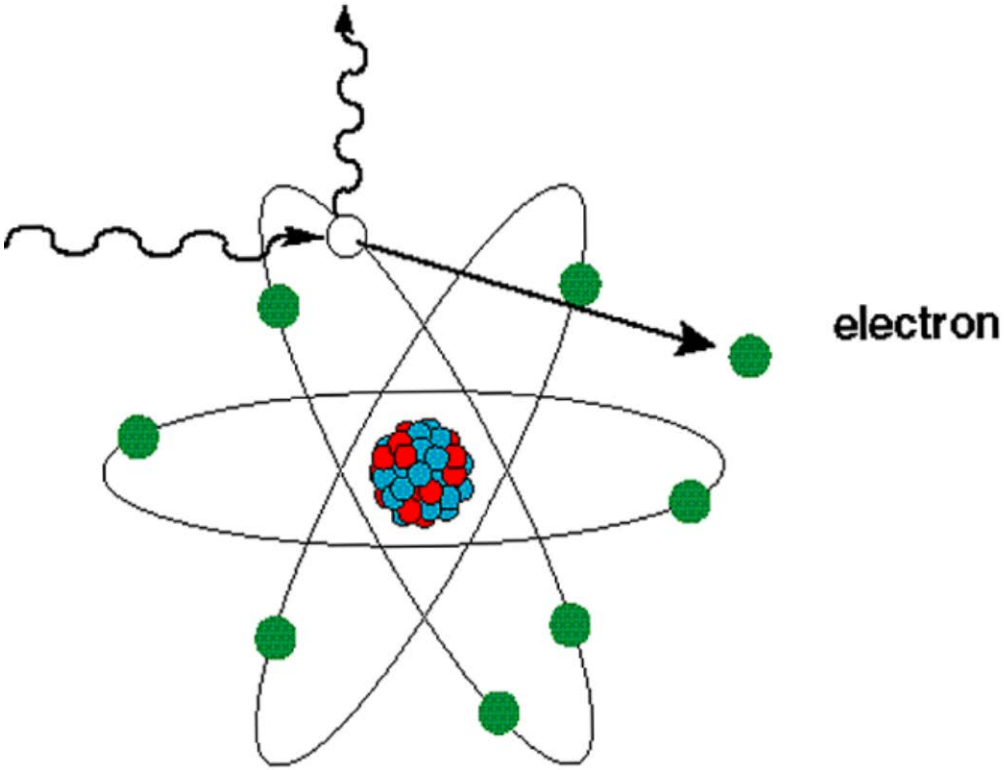


All radiation, natural or man-made, is either ionizing or non-ionizing.


The Electromagnetic Spectrum
Non-ionizing Radiation
Ionizing Radiation
Radio
Micro Waves
Infrared
Visible Light
Ultra Violet
X-Rays
Gamma Rays
Cosmic Rays
Low Energy
High Energy

So what's "Ionization" ?

Simply the removal of an electron from an atom



So ? What's the big deal . . . . .

Here's one consequence – ionization of water causes hydrogen peroxide formation, DNA alteration, etc.

Ionizing Radiation

1) Particulate

2) Electromagnetic (wave)

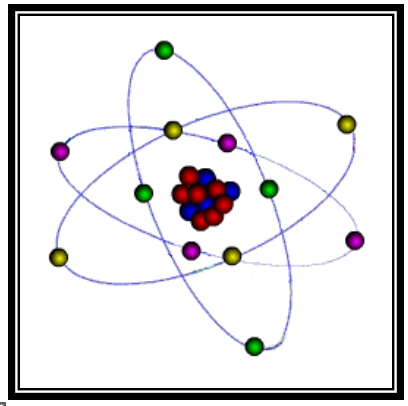
Ionizing Radiation (cont.)

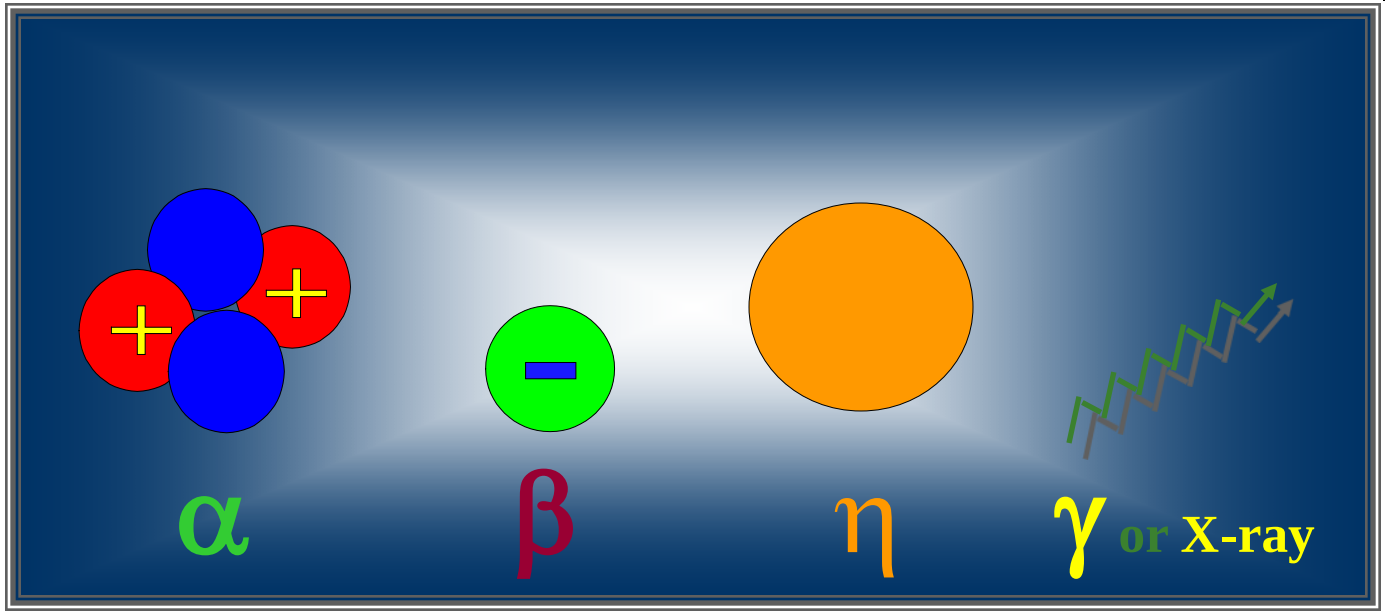
Alpha Particles

Beta Particles

Neutrons

Gamma Rays & X-rays



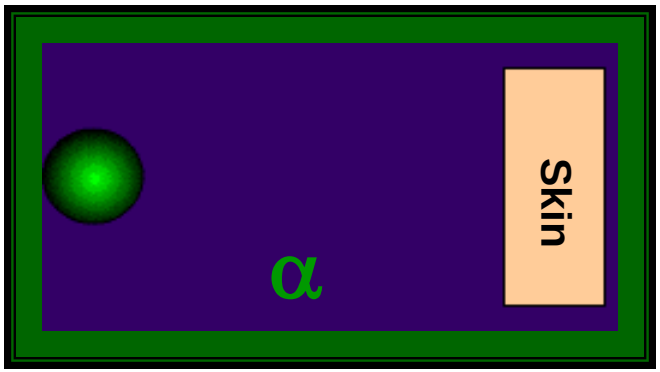


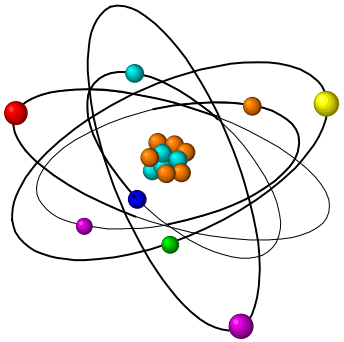
Alpha Particle

- **Internal** hazard only, harmful when inside the body

Former Russian spy Litvinenko fell ill on November 1 & died on November 23, 2006 after Po-210 poisoning.

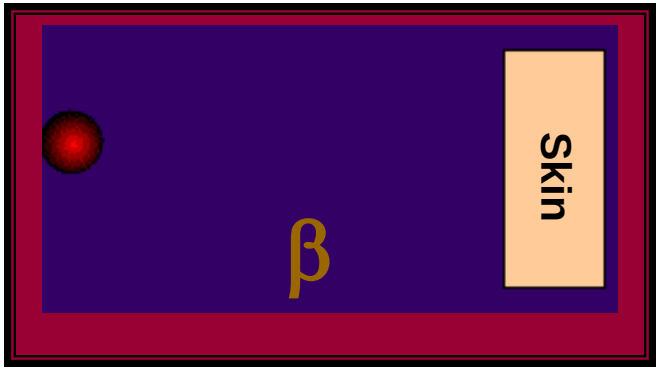
- Has large mass, can't penetrate skin
- Very short travel distance
- Shielded by paper

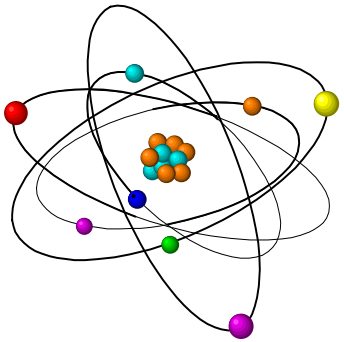




Beta Particle

- Internal and external hazard
- Can penetrate into skin but not to deep organs
- Short travel distance ~ 10 ft in air
- Shielded by ¼” plastic or thin metal



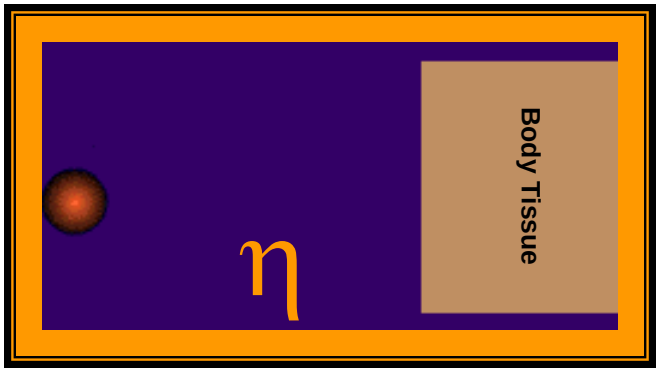


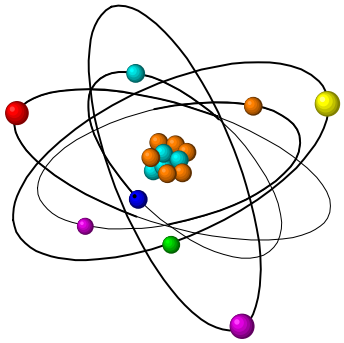
Neutrons

- Energetic and destructive to cells
- Rarely occurs from natural radioactive materials
- Can travel long distances
- Shielded with hydrogenous materials (water, poly, etc.)

10 Inches of Plastic **1 foot of Concrete** **3 feet of Dirt** **3 feet of Water**

- **Neutrons are needed for a chain reaction in nuclear reactors and nuclear bombs.**



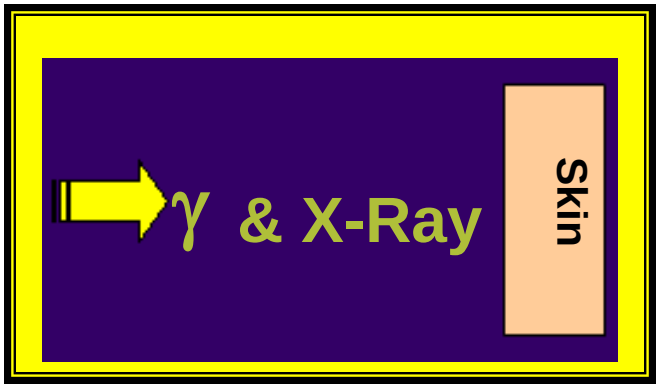


Gamma and/or X-Rays

- **<u>Biggest</u>** concern for public safety

- Both are penetrating radiation and travel long distances
- Can penetrate walls and entire body giving deep dose to organs
- Shielded by dense materials

12” Soil **6” Concrete** **3” Steel** **1” Lead**



Do unstable elements emit **just 1** type of radiation ?

Most elements typically emit several types of radiation to become stable.

Element	**Decay Mode**
Iodine-131	Beta, gamma
Co-60	Beta, gamma
Sr-90	Beta
Am-241	Alpha, weak gamma

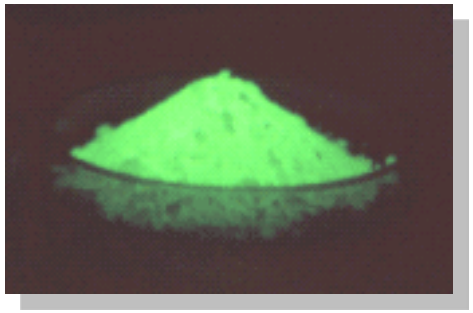
How much material is there?

- Radioactive material is measured in “activity.” Not by mass, weight, or volume.

1 Curie = 37 billion decays per second !

- 1 gram Pu-238 ~17 Curies
- 1 gram U-238 ~ 0.0000003 Curies
- 1 gram Cs-137 ~ 86 Curies
- 1 gram Ir-192 ~ 9,200 Curies

12 mg of Cs-137 = ~ 6,500 pounds of U-238



Common Prefixes

uCi : micro Curie 10^{-6}

mCi: milli Curie 10^{-3}

Ci: Curie

kCi: kiloCurie 10^{+3}

Examples of Rad Materials & Curie Amounts ----- A Broad Range !

Radionuclide	Activity	Use
Cobalt-60	**4,000,000 Ci**	Food Irradiator
Strontium-90	**100 mCi**	Eye Therapy Device
Iodine-131	**100 mCi**	Nuclear Med Therapy
Americium-241	**1 µCi**	Smoke Detectors

Radioactivity Half-life

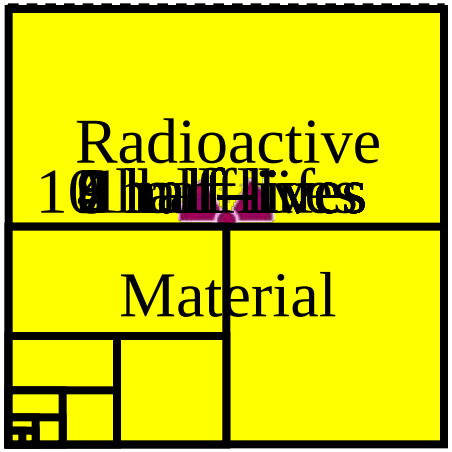
- Radioactive decay is measured in half-lives
- Half-life (T ½) is the time it takes for ½ of the radioactive atoms to decay to another form
- Half-life is unique to each radioactive isotope and can vary greatly

Some isotopes and their half-lives	
Isotope	**Half-Life**
Technetium-99m	6 hours
Thallium-201	73 hours
Cobalt-60	5 years
Cesium-137	30 years
Plutonium-238	87 years
Americium-241	432 years
Uranium-238	4.5 billion years

Radiation Measurement

How long will it be radioactive?

- The radioactivity level of any given amount of radioactive material is constantly decreasing.



Radiation Measurement

Terminology - Units

Roentgen = Rad = Rem (R)

SI unit Sieverts, Greys

Describes amount of energy absorbed per material weight

KEY CONCEPTS

Exposure or Dose Rate =

Amount of radiation received over a time period

(think speedometer)

Dose =

Total amount of radiation received

(think odometer)

Dose Rate Units

Write	Say	Conversion
1 μR/hr	One **micro** R per hour	
1 mR/hr	One **milli** R per hour	= 1000 μR/hr
1 R/hr	One R per hour	= 1000 mR/hr

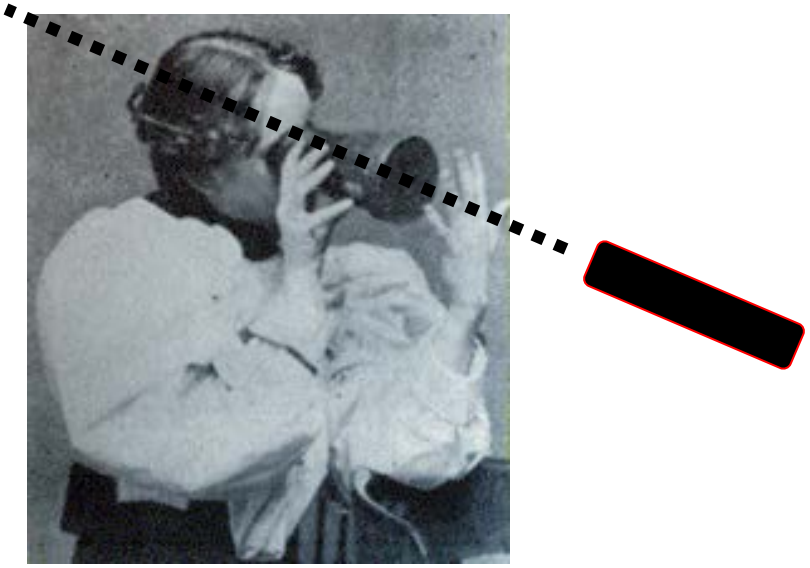
Dividing Cells are the Most Radiosensitive

- Rapidly dividing cells are more susceptible to radiation damage.
- Examples of radiosensitive cells are
  - Blood forming cells
  - The intestinal lining
  - Hair follicles
  - A fetus

This is why the fetus has a exposure limit (over gestation period) of 500 mrem (or 1/10th of the annual adult limit)

At HIGH Doses, We KNOW Radiation Causes Harm

- High Dose effects seen in:
  - Radium dial painters
  - Early radiologists
  - Atomic bomb survivors
  - Populations near Chernobyl



- In addition to radiation sickness, increased cancer rates were also evident from high level exposures.

Effects of ACUTE Exposures

Dose (Rads)	Effects
25 - 50	**First sign of physical effects (drop in white blood cell count)** **(NO detectable outward symptoms)**
100	**Threshold for vomiting, diarrhea, fatigue, fever** **(within a few hours of exposure)**
320 - 360	**~ 50% die within 60 days (with minimal supportive care)**
480 - 540	**~50 % die within 60 days (with supportive medical care)**
1,000	**~ 100% die within 30 days**
BODY PART 200	**Threshold for erythema (skin reddening)** **Ulceration (at higher doses)**

At LOW Doses (< 25 Rem), We PRESUME Radiation Causes Harm

- However, **no** physical effects have been observed

The Bad News: Radiation is a carcinogen and a mutagen.

The Good News: Radiation is a **very weak** carcinogen and mutagen!

There's been **NO proven** cases of genetic damage passed to future children from RAD exposure, <u>including</u> Hiroshima & Nagasaki

Mutation levels are **<u>no</u>** higher than general population

Typical Doses

Source	DOSE
Chest or Dental X-ray	10 mrem
Coal Burning Power Plant	0.2 mrem / yr
Nuclear Power Plant	0.1 mrem / yr
Coast to coast Airplane roundtrip	5 mrem / trip
Smoking	3 mrem / pack

Average occupational annual doses

- Airline flight crewmember - 400 mR/yr
- Nuclear power plant worker - 160 mR/yr
- Grand Central Station worker - 120 mR/yr
- Medical personnel - 70 mR/yr
- Average DOE worker - 44 mR/yr

Some Limits

- **2 mR/hr** Dose rate to public / Federal

- 500 mR Emergency responder limit - State BRC
- 5 R/hr Turn back value / State/BRC

- **5 R/yr** Occupational /Federal/ State

- 10 R Property / Federal (No detectable biological effect)
- **25 R** Life saving / Federal (slight decrease in white blood count)
- >25R Volunteers only / Federal

Ref- 10CFR PART 20, EPA 400, 64E-5 FAC // FL-SOP

Types of Radiation

1) Naturally Occurring Radioactive Material (NORM)

2) Man-made

Radiation Sources

Natural Occurring (NORM)

Soil & Building Materials

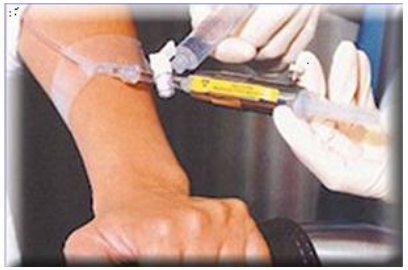
Air

Food & Drink

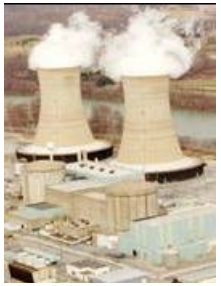
Cosmic Radiation

Man-Made or -Enhanced

Nuclear Medicine



Nuclear Power & Weapons



Consumer Products

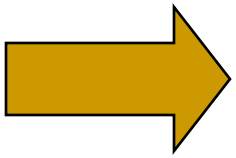
Industrial Devices

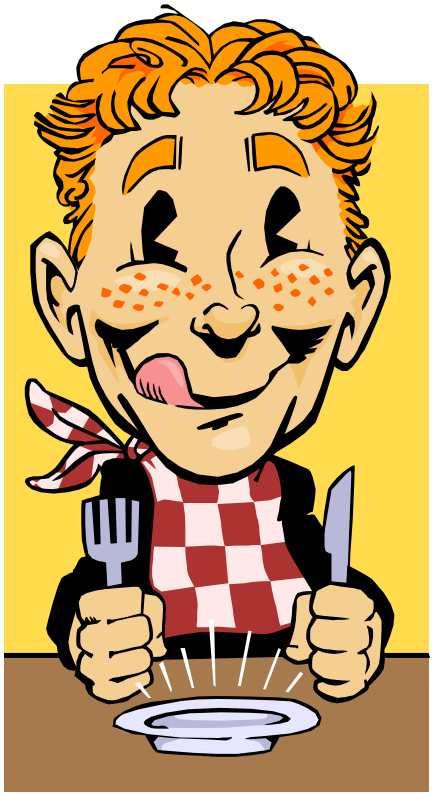
Naturally Occurring Radioactive Material

Three Components

- **Cosmic Rays** – Streams of radioactive particles, coming from space which sometimes reach Earth's surface.
- **Primordial Radiation** – Given off by the breakdown of rare radioactive rocks and soils (like Uranium -- Radon is made by this breakdown.)
- **Cosmogenic Radionuclides** – Particles made when cosmic rays hit the gases in our atmosphere such as Carbon 14, Tritium, Sodium 22, etc.

The “Food Chain”





Yikes, you're irradiating me !!

Natural Radioactivity in your Body

Nuclide	Total Activity of Nuclide Found in the Body
Uranium	30 pCi
Thorium	3 pCi
Potassium 40	120,000 pCi
Radium	30 pCi
Carbon 14	400,000 pCi
Tritium	600 pCi
Polonium	1,000 pCi

Estimated concentrations of radionuclides calculated for a 70 kilogram adult based ICRP 30 data:

Man-made Radiation

- **Nuclear medicine - diagnostic & therapeutic**
- **Consumer products**
- **Industrial processes**
- **Nuclear power**

Estimated Exposure To The National Population

- 620 mR/yr (322 NORM / 298 medical)
  (equates to about 62 chest x-rays)

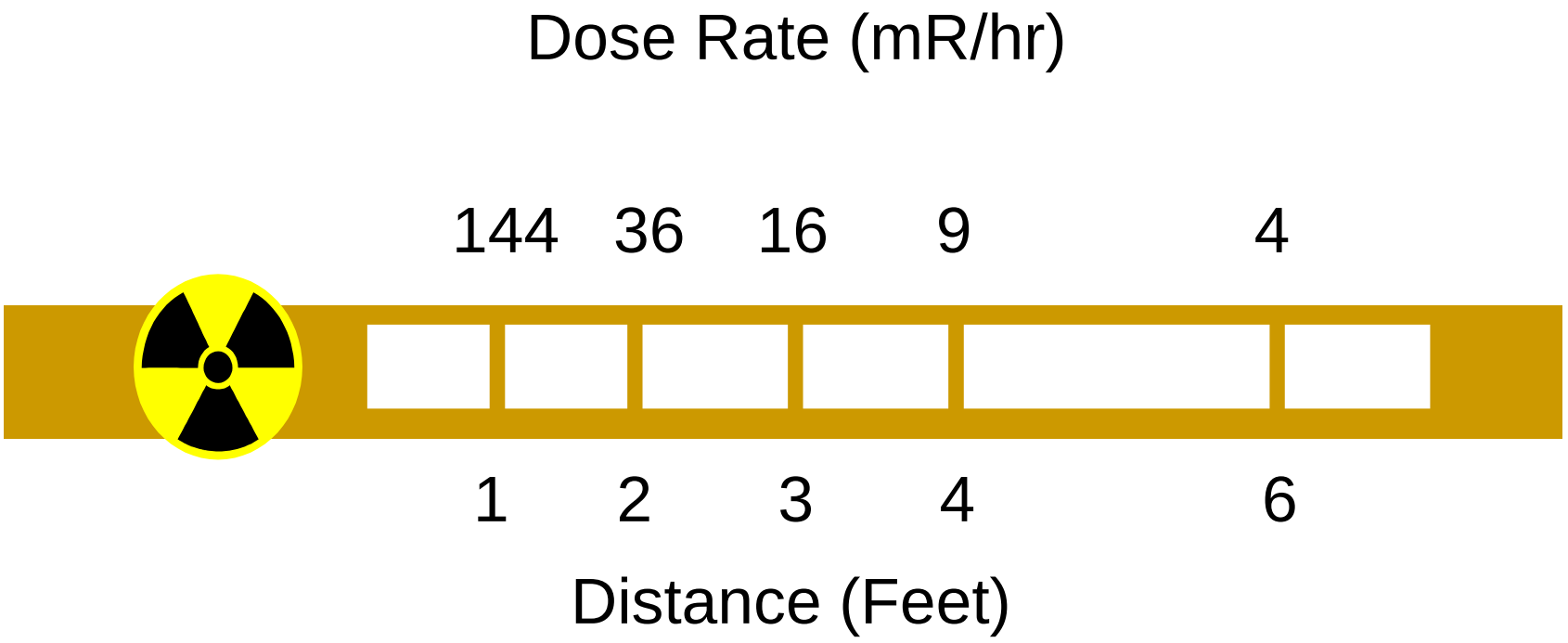
- Average for smokers (1 pack/day)
  1300 mR/yr

Source: NCRP 160

- http://www.epa.gov/radiation/students/calculate.html

Controlling Exposure (ALARA) ??

“Inverse Square” Law



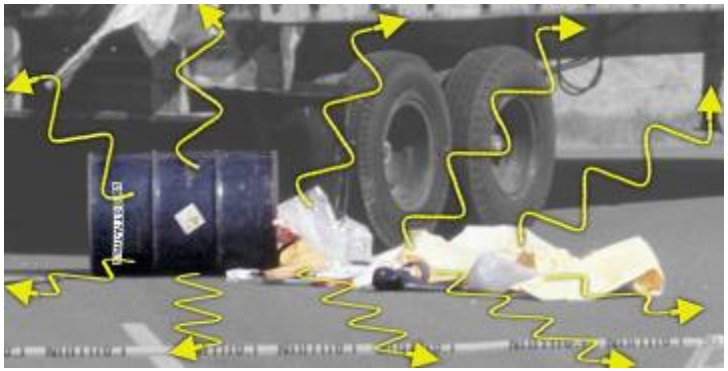
Double the distance, decrease by factor of 4

Halve the distance, increase by factor of 4

Contamination ??

- Contamination is radioactive material in an undesirable location.

Radiation is a type of energy; Contamination is the material.



Questions

?

‘Radiological Attack’

RDD’s

Nuclear Power Plants

Atomic Weapons

Radiation Dispersal Device (RDD)
Two Types

1. Dispersal with Explosives (Dirty Bomb)
2. Dispersal without Explosives (aerial spray)

Probability of RDD

Much higher probability than the use of a nuclear device:

- Simple to build
- Widely available materials

RDD Configurations

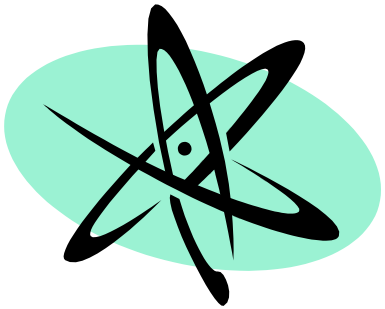
- **HE Mixtures**
- **Pyrotechnic Devices**
- **Mortar Configurations . . . .**
- **Dispersal Machines**

(crop-dusters, wind machines…)

Is a Dirty Bomb a nuclear weapon?

NO !!

- **NO** nuclear/fission chain reaction
- Dirty bombs use nuclear waste or radioactive sources
- Nuclear weapons need **weapons grade** (highly enriched) material
- Nuclear weapons are **thousands** of times more devastating



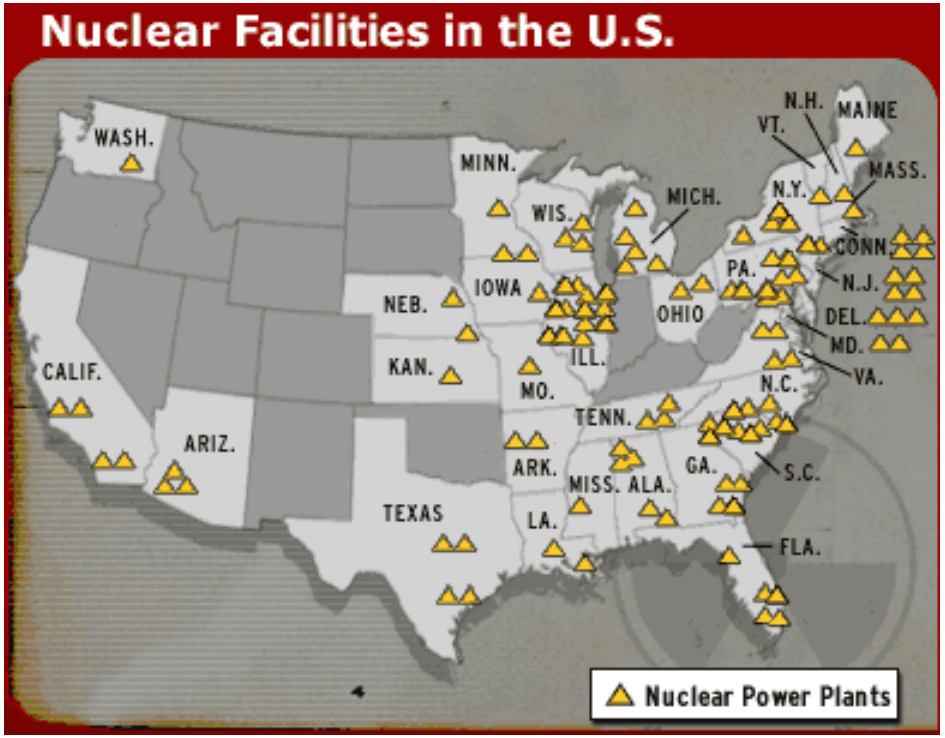
Radiation Exposure Device
RED

- Easily hidden, shoe box, back pack, under bench, etc
- Purpose – psychological, cause panic
- Health effects – low, possibly moderate in long term

Radiological/Nuclear WMD

- Radiation Exposure Device (RED)
  - Device that emits dangerous levels of radiation that pose a threat to the public health and safety

Another Possible Target: Nuclear Facilities

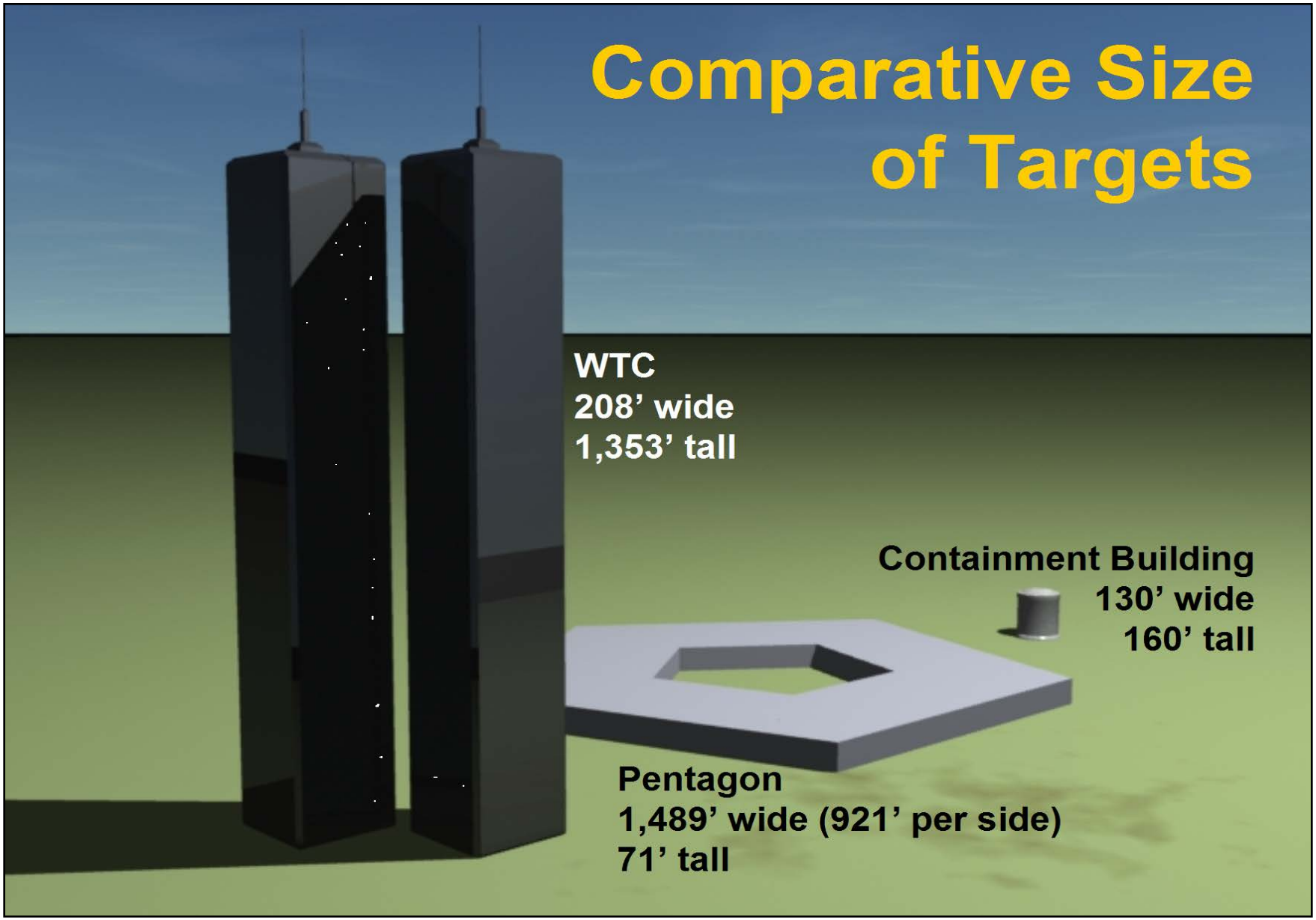


- There are 100 operating nuclear power reactors across the United States
- Total power production is about 20 % of consumption

Threats to Nuclear Power Plants

- Airliners hitting containment
- Cutting off electrical power to plant
- Armed assault

Comparative Size of Targets

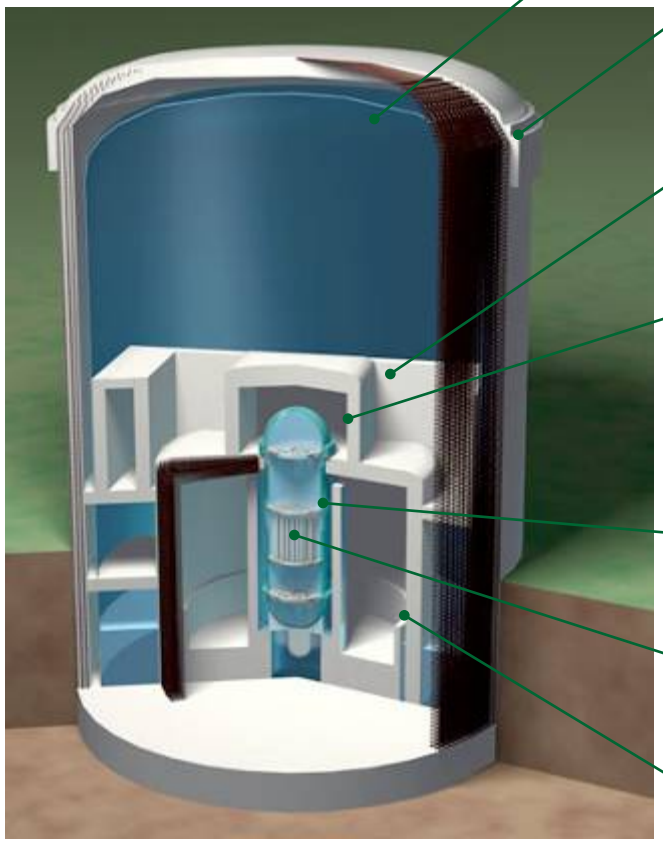



Big-boys.com
Hur hållbara är kraftstationerna, då?
Här är ett nytt test med ett F4 plan.

The Electric Power Research Institute (EPRI), has concluded commercial airliner impact does NOT pose a threat to NPP's.

Firing missile or trying to bomb containment ?

Safety has been **OVER** engineered into reactor designs.



Containment Vessel
1.5 – 4 inch thick steel

Shield Building Wall
3 foot thick reinforced concrete

Dry Well Wall
5 foot thick reinforced concrete

Bio Shield
4 foot thick leaded concrete with 1.5-inch thick steel lining inside and out

Reactor Vessel
4 to 8 inches thick steel

Reactor Fuel

Weir Wall
1.5 foot thick concrete

Trying to cut off electrical power to the plant?

Nuclear plants have, by license, large diesel generators to supply power in the event of losing offsite power. These generators have enough fuel to run for weeks if needed.

Armed assault of plant?

- **Post 9/11 -- security has been increased tenfold.**
- **Plants maintain commando and SWAT type training for their security personnel.**

Nuclear Devices

Who has Nuclear Weapons ?

Russia	US	Pakistan
Israel	North Korea	China
U.K.	France	India

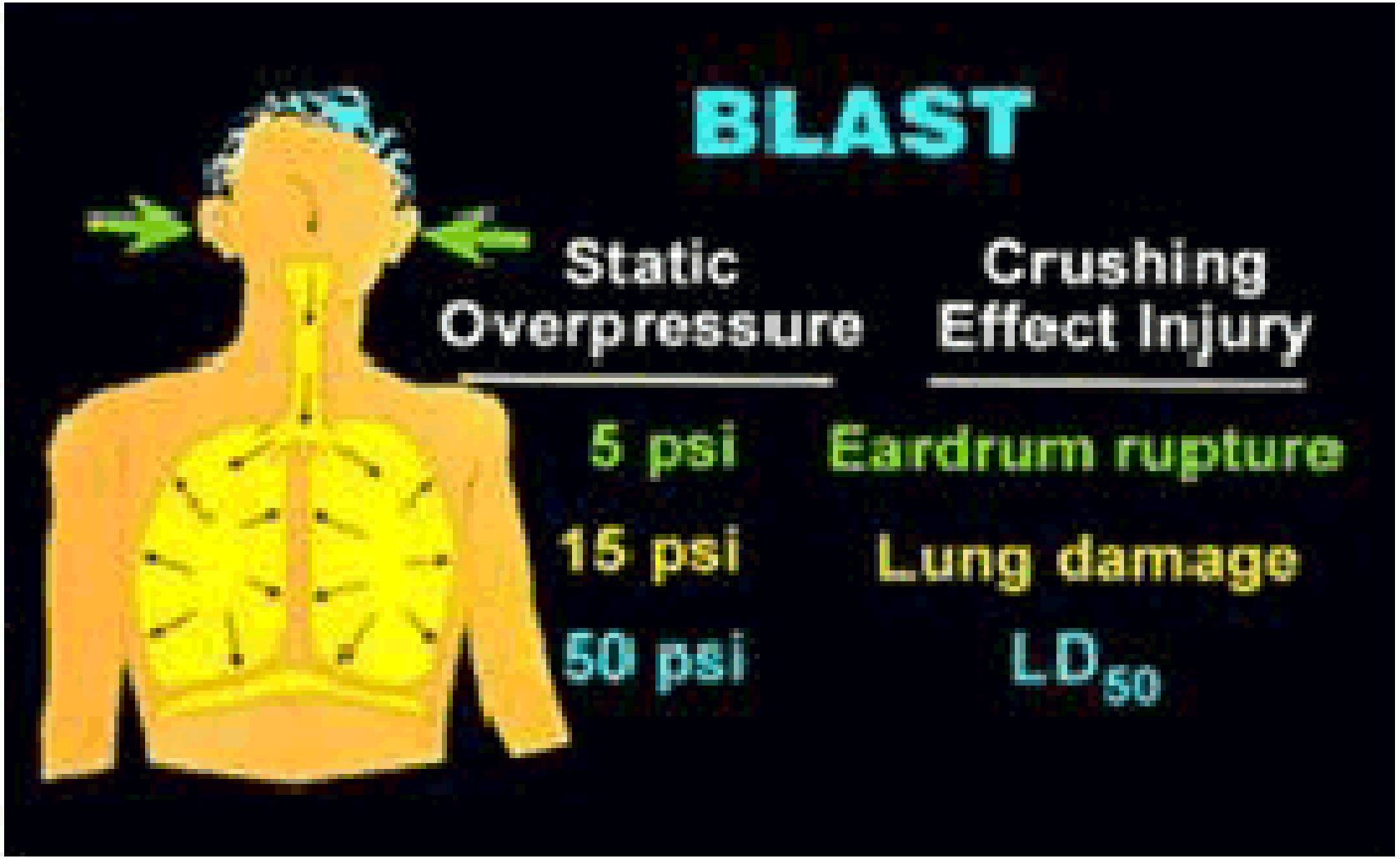
Energy Distribution

Low altitude detonation, moderate sized weapon

- 50% as blast
- 35% as thermal radiation
- 15% as nuclear radiation; (5% initial & 10% residual)

Shock wave & heat account for 85% of energy released

Source:http://www.fas.org/nuke/intro/nuke/effects.htm


BLAST
Static Overpressure
Crushing Effect Injury
5 psi
Eardrum rupture
15 psi
Lung damage
50 psi
LD50

- **WASHINGTON (CNN) Sept 5, 2007**

-- Six nuclear warheads on air-launched cruise missiles were mistakenly carried on a flight from North Dakota to Louisiana last week.

The crew was **unaware** that the plane was carrying nuclear weapons.

Follow up: 65 US Airmen were decertified from handling nuclear weapons due to gross disregard for handling procedures.

Associated Press October 20, 2007

If this can happen here, can it happen over there ?

Russia ??	**US**	**Pakistan ??**
Israel	**N. Korea ??**	**China ??**
U.K.	**France**	**India ??**

Questions ?

Radiological Survey Instruments and Dosimetry Devices

Radiological Surveys

- Two main categories of instruments available:
  - Exposure meters or “dose rate meters”
  - Contamination meters or “friskers”

Some meters can do both!

Exposure/Dose rate meters uR/hr, mR/hr, R/hr

UltraRadiac

Contamination meters "Friskers" CPM

Ludlum 2401-P

- Before using any meter, what are two things you should do?

Canberra UltraRadiac

- Measures dose 1 μR - 999 R
- Measures dose rate 1 μR - 500 R/Hr
- Uses 4 AAA batteries/150 hrs
- 4 alarm settings
- "b" flashing 10 hours left
- Gamma only
- Mil-Spec Design

Establish area "Background"

Radiation exposure BACKGROUND

Normally between 2 and 20 µR/hr
(.002 to .02 mR/hr) Florida

Canberra UltraRadiac

Reset the total accumulated dose to zero

...press and hold DOSE button first and then CLR/TEST button together for about 5 seconds

Canberra UltraRadiac

AUDIO or the SOURCE FINDER MODE

…to turn on press the rate button until you see the “1” flashing; to turn off press the rate button again until you see the “0” flashing.

Canberra UltraRadiac

STAY TIME FUNCTION

…press alarm button until you see 999; the # of mins you can safely stay in the area at the current dose rate before you will reach the stored dose alarm.

Canberra UltraRadiac

Alerts and Alarms

Dose Rate Alert set @ 2 mR/hr

Dose Rate Alarm set @ 100 mR/hr

Dose Alert set @ 100 mR

Dose Alarm set @ 500 mR

Application of Radiation Dose Rate Survey Instruments

- Locating sources of radiation
- Establishing control zone boundaries

Procedure for Radiation Exposure Survey

- Monitor with detector in front of you at waist level
- Move detector slowly side to side
- Periodically monitor above and below this level and in a 360º circle

If the instrument reads

TWICE over background…..

<u>Consider taking further action</u>

Contamination Survey Instruments

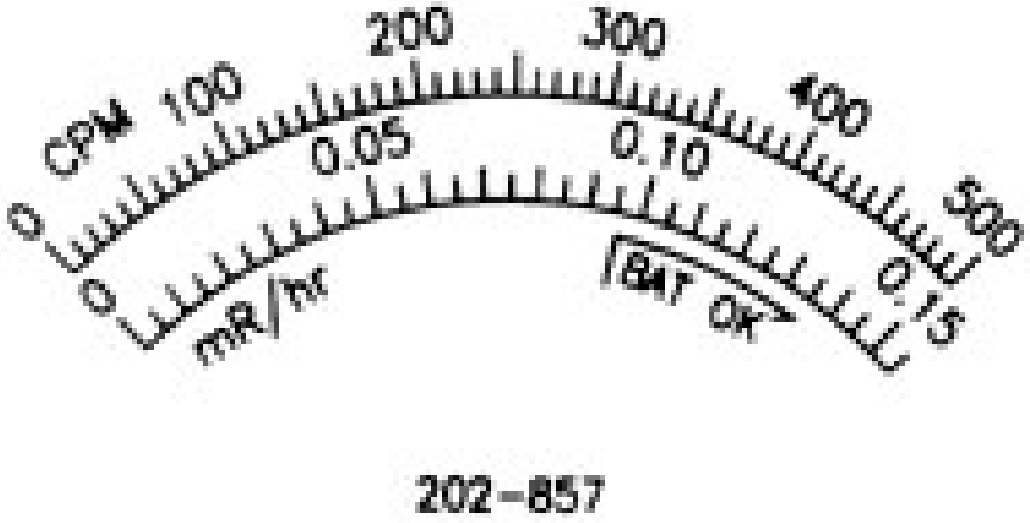
- Typically read in counts per minute (CPM)
- Usually use a pancake probe

Ludlum 2401-P

Ludlum 14-C

The Ludlum 2401-P

MODEL 2401-P Pocket Meter



202-857

Range: 0 -50 KCPM
0 -15mR/hr

Detects:
Alpha/Beta/Gamma

MULTIPLIERS: X1, X10, X100

9-volt battery /250 hrs operation

Application of Contamination Survey Instruments

- Locating contamination on personnel and equipment
- Determining the boundaries and magnitude of a contaminated area
- Determining the effectiveness of decontamination

Establish area "Background"

Contamination instrument BACKGROUND

Normally between 50-100 CPM

Procedure for Contamination Survey

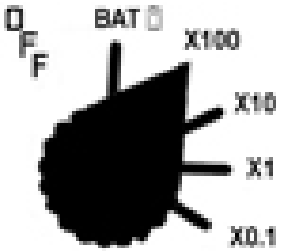
- Hold probe 1/2 inch from surface
- Move probe slowly, 1-2 inches per second
- Pause if count rate increases

When is something “contaminated” ?

Meter reads over 2X background

Reading the Ludlum meter

- Analog instruments can be more difficult to read than newer digital instruments
- Often require that user multiply displayed reading by a multiplier, based on which scale instrument is set to



200 CPM X 100

= 20,000 CPM

Dosimetry

DRD/SRD

TLD

EPD

Dosimeters

- Electronic Personal Dosimeter:

  (EPD)

  - Measures accumulated dose
  - Highly accurate dose
  - No user changeable settings
  - EPD software

  Slow response as a dose rate meter.

Thermo MK2

Personal Dosimeter

Specifications:	
Detects: Gamma-Beta X-rays	
Dose Range :	0.1 mrem to 1600 rem
Units :	mrem to rem auto-ranging
Dose Alarms :	100 mR and 500mR HP10 1000 mR HP07
Battery :	1AA 1.5VAlkaline/3.6VLithi 30 weeks/10 months *Will also measure dose rate up to 400 R/hr

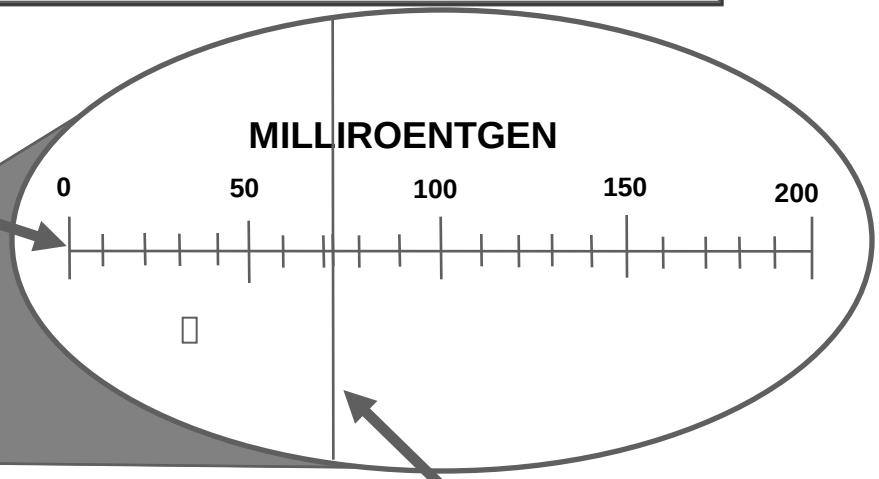
DRD's/SRD's and Chargers

Common DRD/SRD Equipment:

- CD V-742 0-200 Roentgens
- CD V-138 0-200 MilliRoentgens
- CD V-750 Model 5 Charger
- CD V-750 Model 6 Charger

Direct Reading Dosimetry Indication

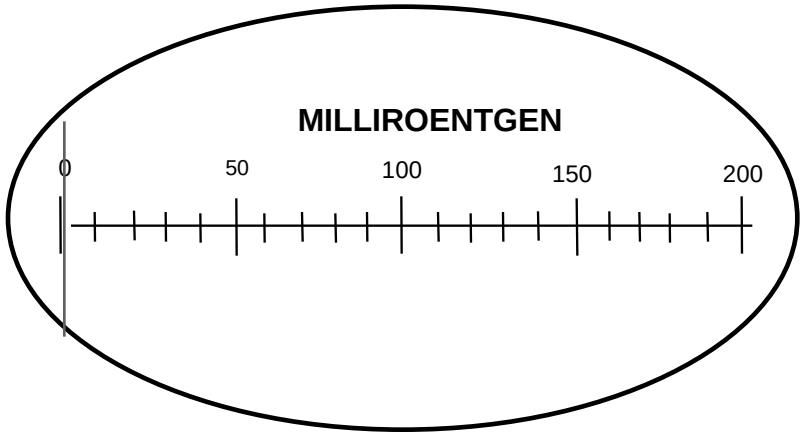
SCALE

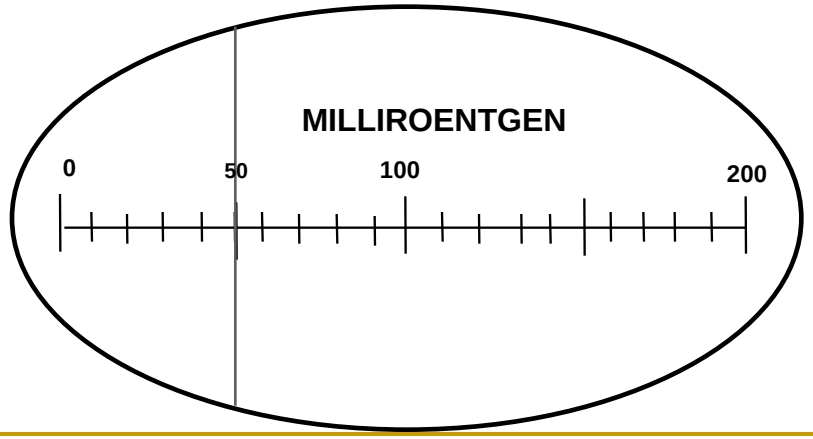


Low Range DRD

HAIRLINE
Indicating total external exposure

Reading the Direct Reading Dosimeter





Instrument: Low Range
Model: CDV-138

Scale: 0-200 mR

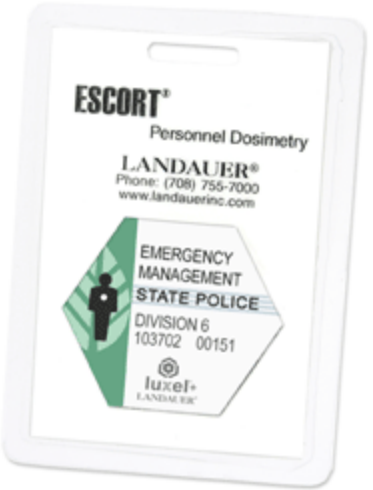
Initial Reading: 0 mR

Final Reading: 50 mR

Total Dose: 50 mR

Dosimetry Devices

- Thermoluminescent dosimeter (TLD) or Optically stimulated luminescent dosimeter (OSLD):
  - Measures accumulated dose
  - Does **not** provide on-the-spot dose measurement
  - Specialized equipment required to “read” TLD
  - Serves as a legal dose of record



Some Exposure Limits

2 mr/hr	Dose rate to public / Federal
500 mr	Emergency responder limit / State/BRC
500 mr	Fetus / Federal
5 R/yr	Occupational /Federal
5 R/hr	Turn back value / State / BRC
10 R	Property / Federal
25 R	Life saving / Federal
> 25 R	Volunteers only / Federal

Ref - 10CFR PART 20, EPA 400, FL-SOP

Model AM-801 Transportable Radiation Portal Monitor

Manufactured by William B. Johnson & Associates, Inc.


3 ft
7 ft


BOTTOM WHEELS
TOP HANDLE

Unit basic description

- Screen for gamma/beta radiation
- Weather resistant
- Assembly w/o tools
- 68 lbs. w/carrying case: 100 lbs.
- Inside Dimensions (3’ W x 7’ H)
- Costs $10,000!

OPERATING MODES

- Walk thru
- Timed count
- Vehicle Drive Thru (separate kit)

Operating Spec's

- Audio (digitally recorded verbal commands)
- Power (120 VAC or 9 "D" cell batteries)
- Temperature Range (-4° thru 140° F)
- Display (VGA Touch Sensitive Screen)
- Operator Input (Screen)


CAUTION
RADIOACTIVE MATERIALS
3
1
1
PORTAL MONITOR
DANGER
NO SMOKING
DANGER
CHEMICAL STORAGE
DANGER
FLAMMABLE LIQUIDS
F1
F2
F3
F4
F5
Show Menus
Help
Home
Setup
Style
Diag.
Ready
46450
42600
3:23:50 pm
11 Jan 2007
40905
38600
71
Persons
Batt: 14.6V

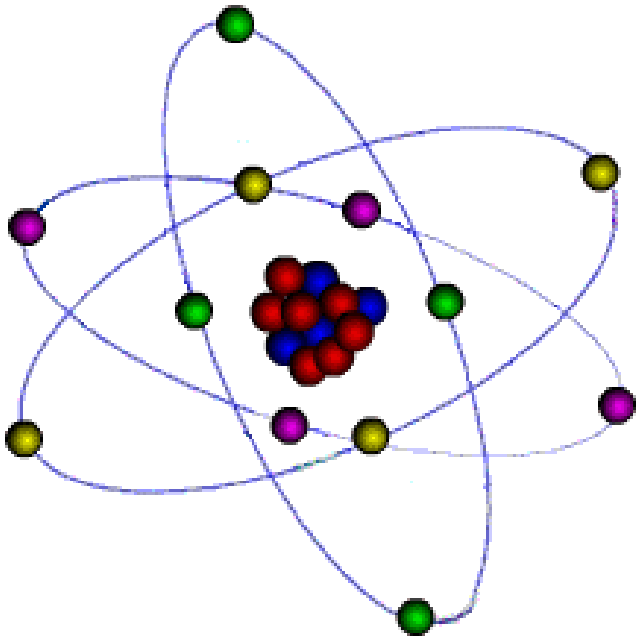
QUESTIONS ?


RATE
ALARM
AUD
VIS
10.0 μR/hr
RATE
ALARM
DOSE
LIGHT
CLR/TEST
ON/OFF
CALIBRATION


CPM 100
200
300
400
500
0.05
0.10
0.15
mR/hr
BAT OK
LUDLUM MEASUREMENTS, INC.
SWEETWATER, TEXAS
MODEL 2401-P SURVEY METER
QUIET
NORMAL
BAT CHECK
OFF
X1
X10
X100
CAL


Thermo
SCIENTIFIC
EPD-G

RADIOLOGICAL EVENT
FEDERAL AND STATE COMMAND STRUCTURE



Federal Command Structure

- Follows the Incident Command and National Incident Management System
- DHS (DOE) may be the Federal coordinating agency
- FBI will be lead **federal** **investigative** agency for WMD events

State Command Structure

Follows the Incident Command and National Incident Management System

County Structure

- **Florida County Commissioners Responsible for Citizen Safety** (home rule)– normally delegated through County Emergency Operations Center.

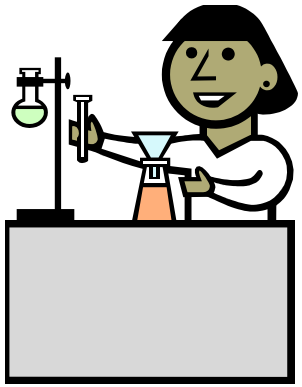
Florida DOH Responsibilities

- **Florida Statute 404 designates DOH as the state agency to administer a statewide radiation protection program**

BRC Responsibilities

- **Provide radiation expertise**

- **Collect and analyze samples**



BRC Responsibilities

- **Take radiation measurements**

- **Furnish dosimetry/KI to emergency workers in the radiation area as needed**

- **Keep emergency worker dose records**
- **Determine doses to the public**
- **Provide documentation for measurements.**

BRC Responsibilities, Cont'd

- **Determine needs for mutual aid and federal assistance with regard to radiation monitoring.**

For any Radiation event, BRC has representatives at SEOC and County EOCs, as needed.

Early Phase Issues

- **Options: Evacuate or Shelter in Place - 1 REM projected dose (plume & ground) is the trigger**

- **BRC advises what to do – County decides**

General County Responsibilities

- Open and staff Reception Centers -- where citizens can get assistance or have radiation levels monitored
- Location for federal assistance if requested

PAGs for the Early Phase of a Nuclear Incident

Protective Action	Projected dose	**Comments**
Evacuating or sheltering	**1-5 rem TEDE**	Protective action: normally initiated at 1 rem
Administration of iodine stable (KI*)	**5 rem CEDE**	Requires approval of DOH Operations Officer

* Only if Radioactive Iodine is suspected of being released.

Each Specialty has some special considerations….

- **County Emergency Management**
- **Law Enforcement**
- **Fire and Hazmat**
- **Hospitals/EMS**
- **County Health Department**

Special Considerations: Emergency Management

- **Provide resources to the Incident Commander**
- **Coordinate execution of mutual aid agreements**
- **Establish Joint Information Center**
- **Establish Rumor Control Hotline**
- **Establish Unified Command for Multiple Counties**

Special Considerations: Law Enforcement

- **Provide security and traffic control**
- **Assist with evacuation notification**
- **Assist with evidence protection and criminal investigation**

Special Considerations: Fire and Hazmat

- **Control fire at the scene**
- **Assess safety of unexploded devices**

- **Assist with evacuation notification**
- **Establish decontamination points**

Special Considerations: EMS

Assess and triage casualties at the scene

Stabilize and transport casualties to hospitals

Special Considerations: Hospitals

- **Establish casualty collection point**
- **Receive and treat casualties**
- **Establish decontamination at/near casualty collection point**

Special Considerations: Hospitals

- **Entire State Will See “Worried Well”**
- **Request perimeter security from Law Enforcement**
- **In coordination with American Red Cross, establish family reunification and worried well/behavioral health assessment**
- **Contact REAC/TS for radiological casualty treatment advice at 865-576-1005**

County Health Departments Preparedness Phase

- **Set locations and procedures for: Casualty Collection Points and Reception Centers**
- **Establish location for federal assistance facility per FRMAC requirements**
- **Drill**

County Health Departments

- **Staff County EOC ESF-8 and assist with identification and deployment of health and medical resources**

- **Release public health information in conjunction with the Joint Information Center**

Population Monitoring: County Health Department

- Create & track a public exposure registry complete with names, addresses, location and times in the exposure area – **in coordination** with the BRC, CDC, DOE, DHS, DHHS, NRC, DOD and others

- Will be a long-term issue for CHDs (~70 years)

Recovery Phase:
Months to *Years*

- **Feds: DOE transfers lead to EPA**
- **Economic & social factors will be taken into account when keeping radiation levels low.**
- **All stakeholders will participate in deciding actual recovery standards.**

Assistance

- BRC 24/7 at 407-297-2095
- Multiple Federal Resources (DOE, REAC/TS, etc.)

Questions

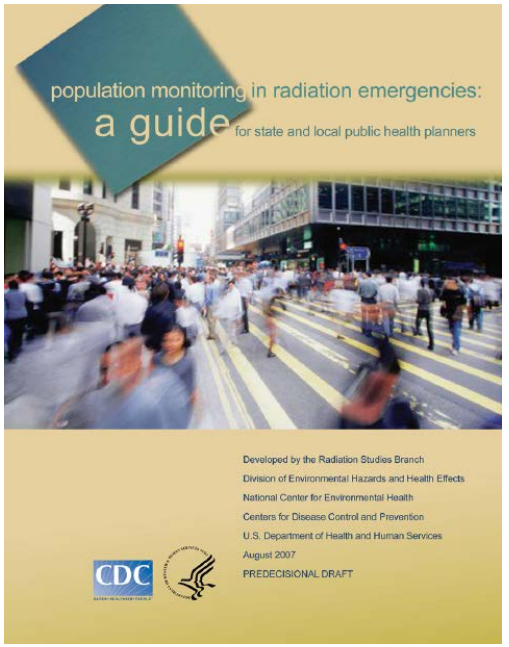
?

Population/PET Monitoring In Radiation Emergencies

Population Monitoring

Process begins soon after a radiation incident is reported and continues until all potentially affected people/pets have been monitored and evaluated for:

- **Medical treatment**
- **Contamination with RAM**
- **Decontamination**
- **Dose assessment and health risks.**
- **Long term health effects**



Population Monitoring

SCOPE includes two assumptions:

- **Incident does not involve chemical and/or biological agents**
- **The local response infrastructure is relatively intact**

Population Monitoring

Chernobyl-1986

- 134 cases of ARS; 28 deaths within 4 months
- 116,000 initially evacuated
- 210,000 additional relocated

Goiania, Brazil Cs-137 exposure 1987

- 249 contaminated
- 54 hospitalized
- 8 cases of ARS
- 4 deaths
- 112,000 people monitored

Tokyo, Japan-Sarin Gas attack in subway 1995

> *5500* reported to hospitals, ~1000 mild injury, 37 severe and 17 critical.

Fukushima, Japan 2011

170,000 evacuated from the 20-km radius
450,000 people in 2600 evacuation centers

Florida HEALTH

BUREAU OF RADIATION CONTROL

Fukushima Japan-2011






Florida HEALTH

BUREAU OF RADIATION CONTROL

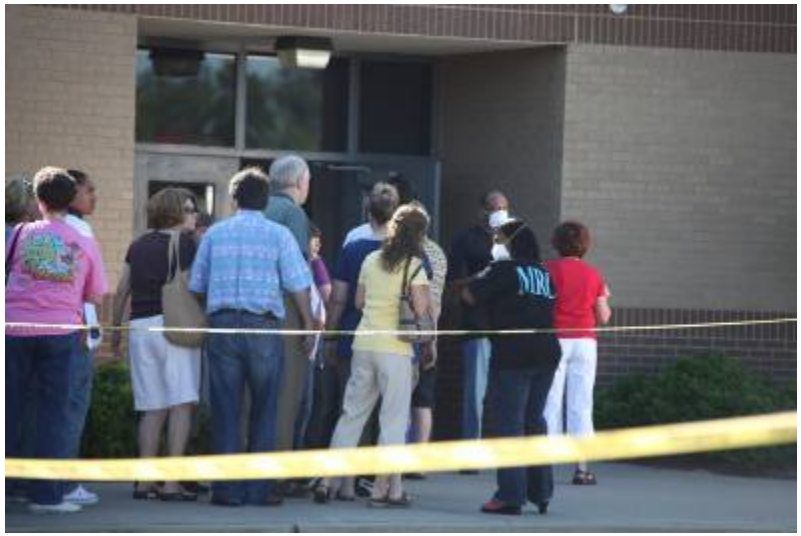
Community Reception Center Operations for Radiation Emergency Response

Kevin Caspary, MPH

Oak Ridge Institute for Science and Education

Objectives

- **Describe the process flow in a CRC**
- **Identify the key stations in a CRC**



Community Reception Centers

Local response strategy for conducting population/pet monitoring

- Multi-agency effort, public health lead
- Staffed by government officials and organized volunteers
- Opened 6-24 hours post event
- Located outside of hot zone
- Comparable to PODs, NEHCs

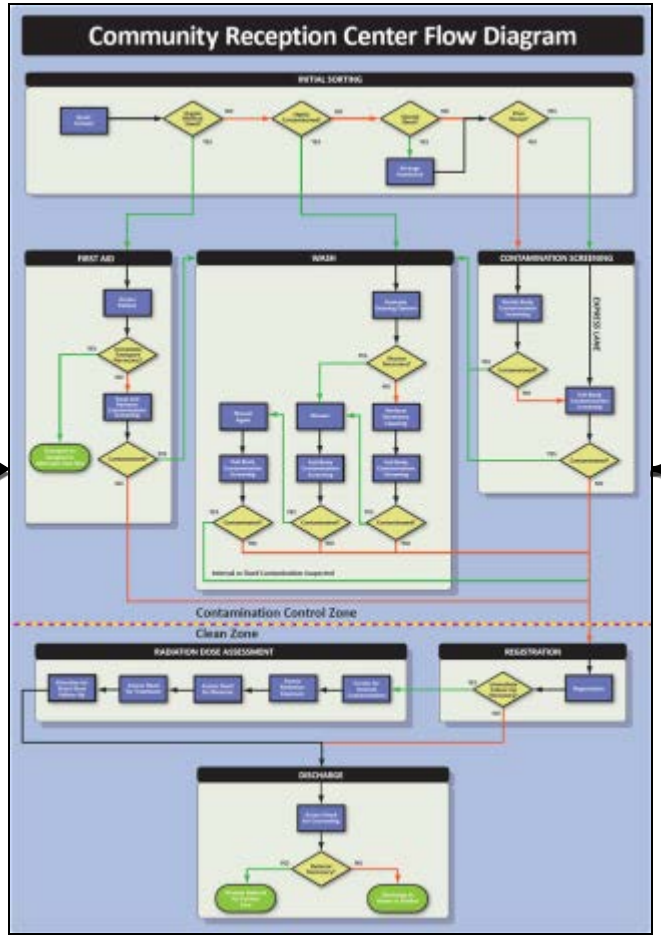
Community Reception Centers

- **Services include:**
  - External contamination screening
  - External decontamination
  - Limited medical care
- **Services may include:**
  - Assessment of internal contamination
  - Assessment of need for bioassay
  - Collection of bioassay
- **Main purpose is to prioritize people for further care**
  - Ease burden on hospitals
  - Manage scarce medical resources

Origin → **CRC** → **Endpoint**

Affected Area

Surrounding Community

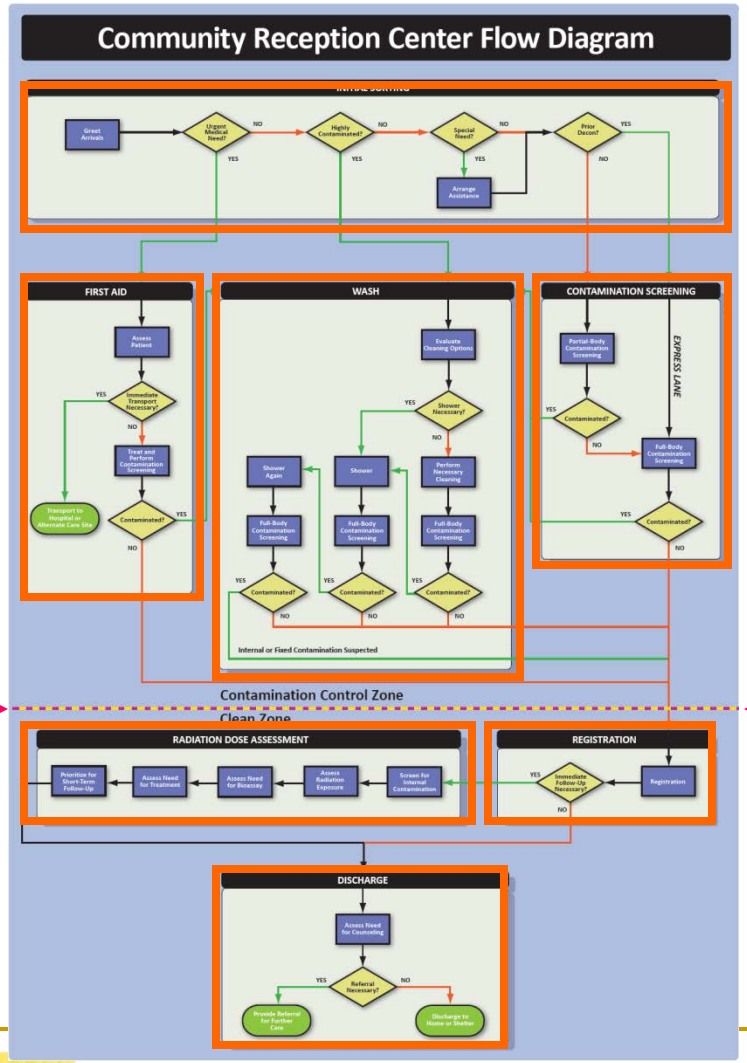


Home

Public Shelter

Hospital or Alternate Care Site

Community Reception Center Process Flow



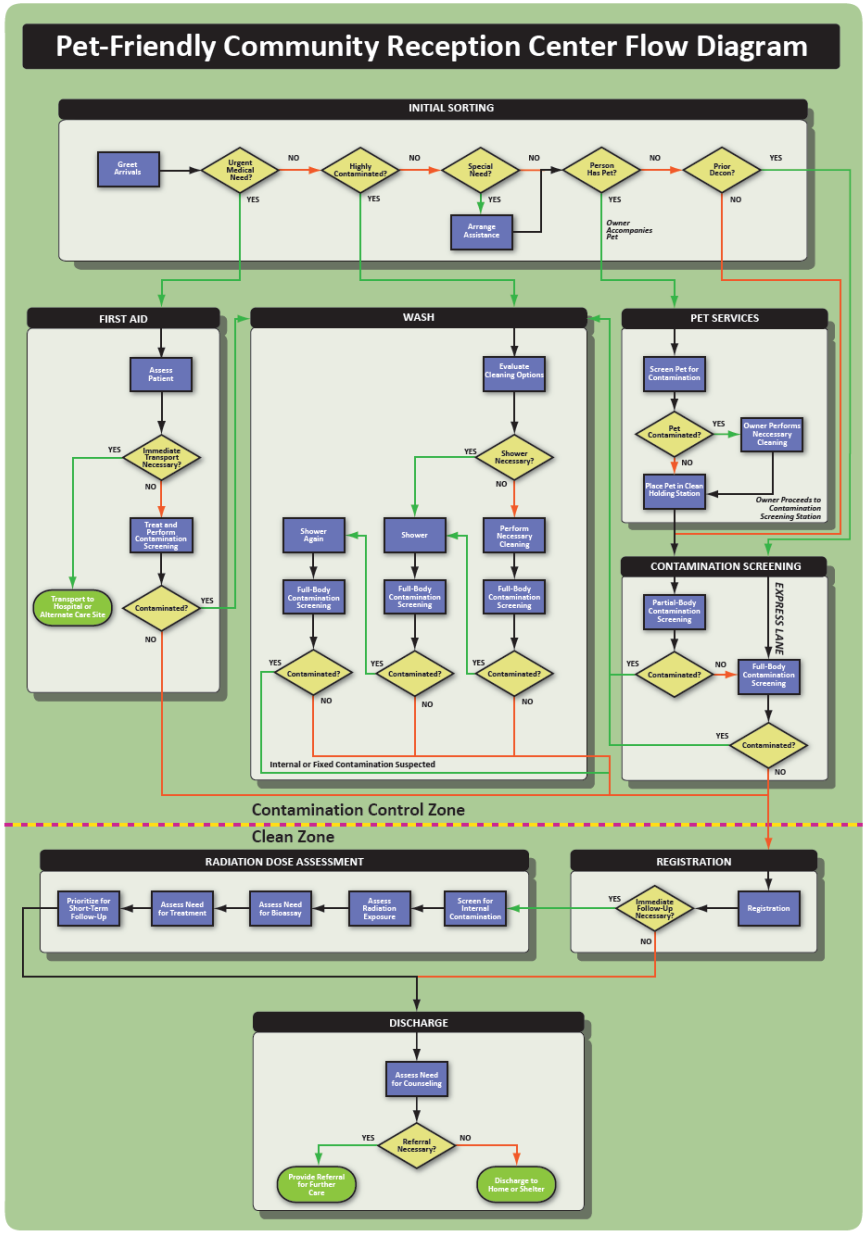
7 Stations:

- Initial Sorting
- First Aid
- Contamination Screening
- Wash

Contamination Control Zone

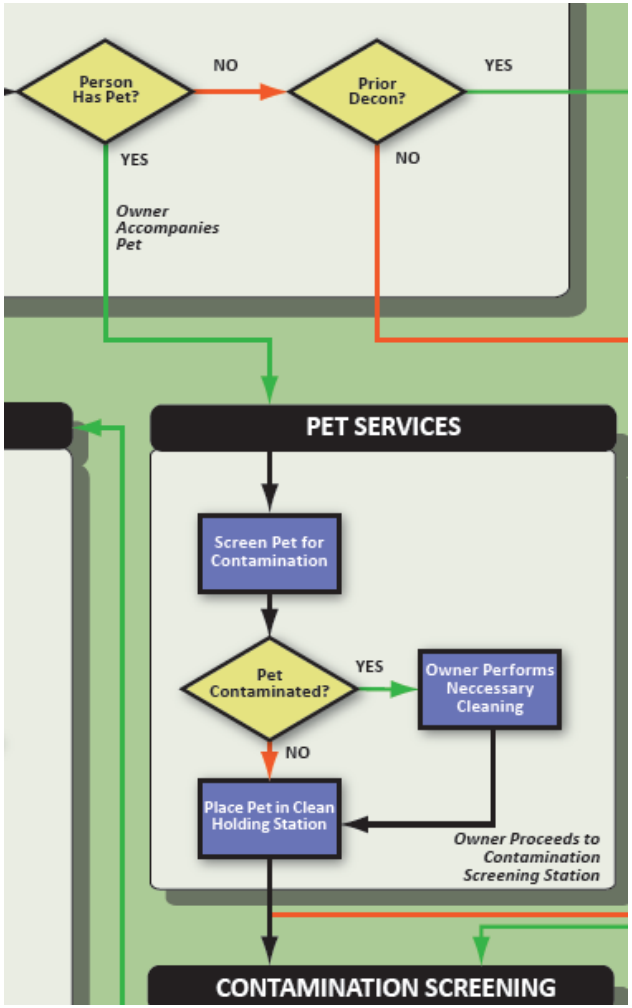
Clean Zone

- Registration
- Radiation Dose Assessment
- Discharge



For updates and additional resources, visit:
http://emergency.cdc.gov/radiation

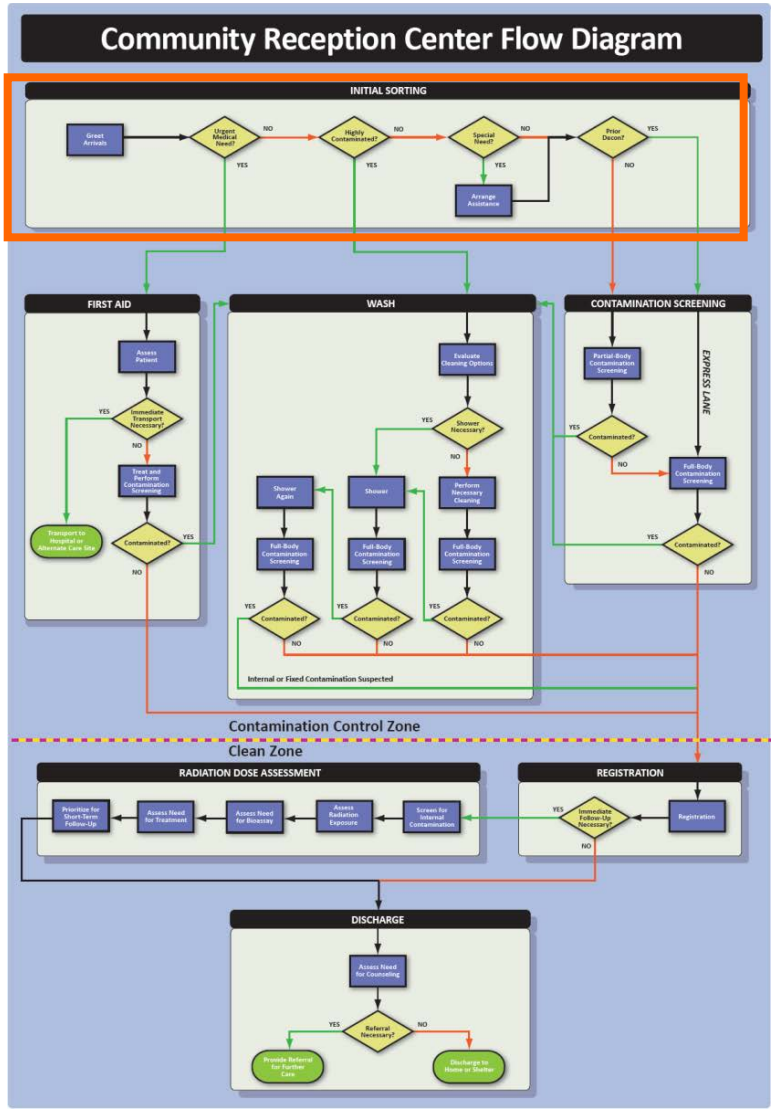
PET SERVICES
" ADD – IN" TO BASIC MODEL



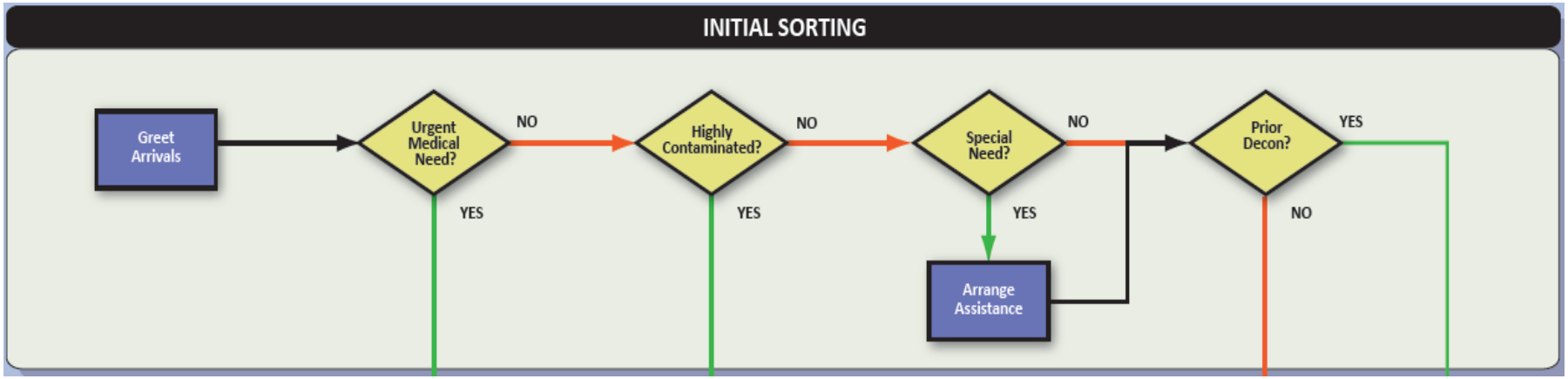
Florida HEALTH

BUREAU OF RADIATION CONTROL

Initial Sorting



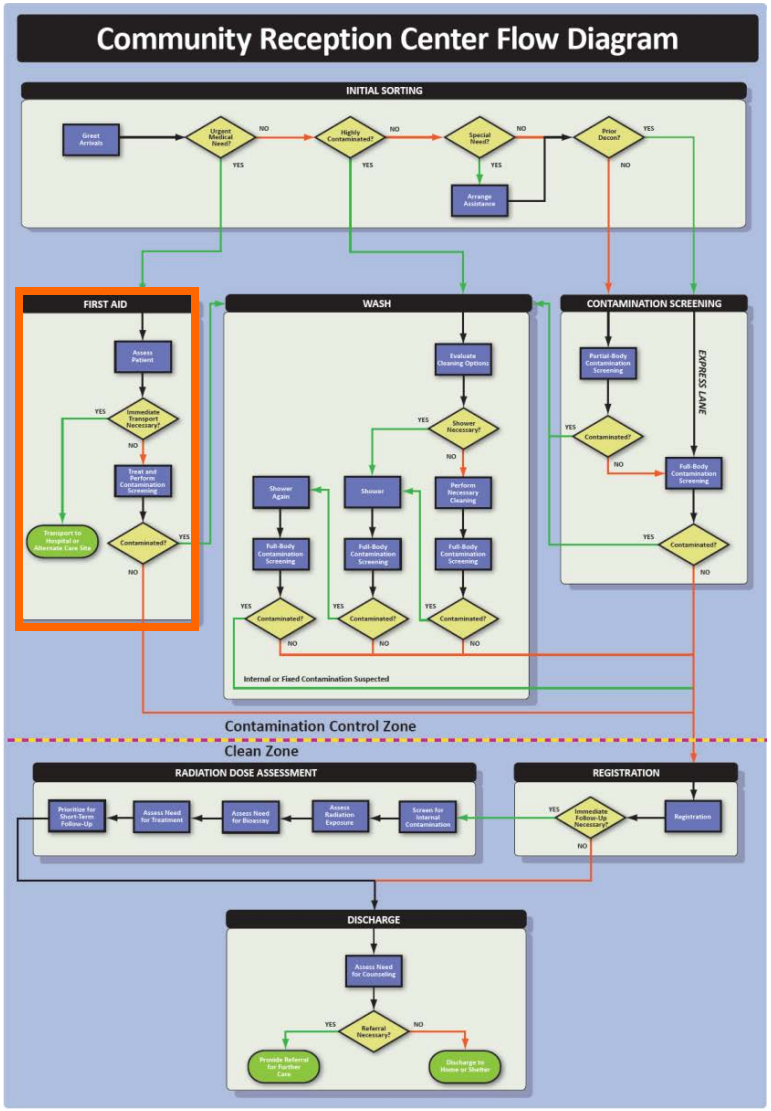
Initial Sorting



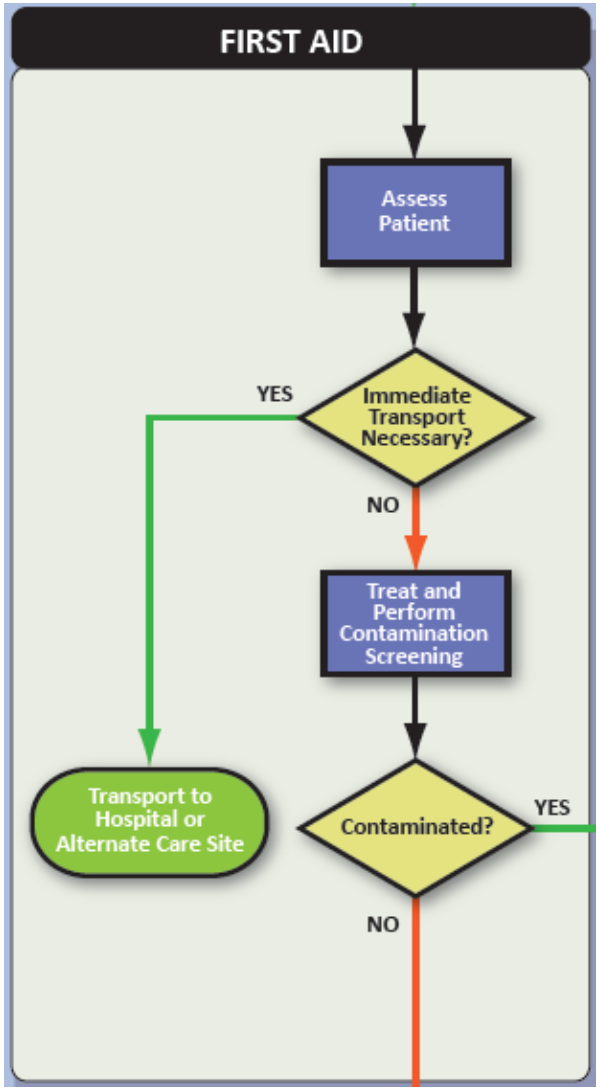
Staff identify people who have:

- Urgent medical needs
- High levels of contamination
- Special needs
- Decontaminated before coming to the CRC

First Aid

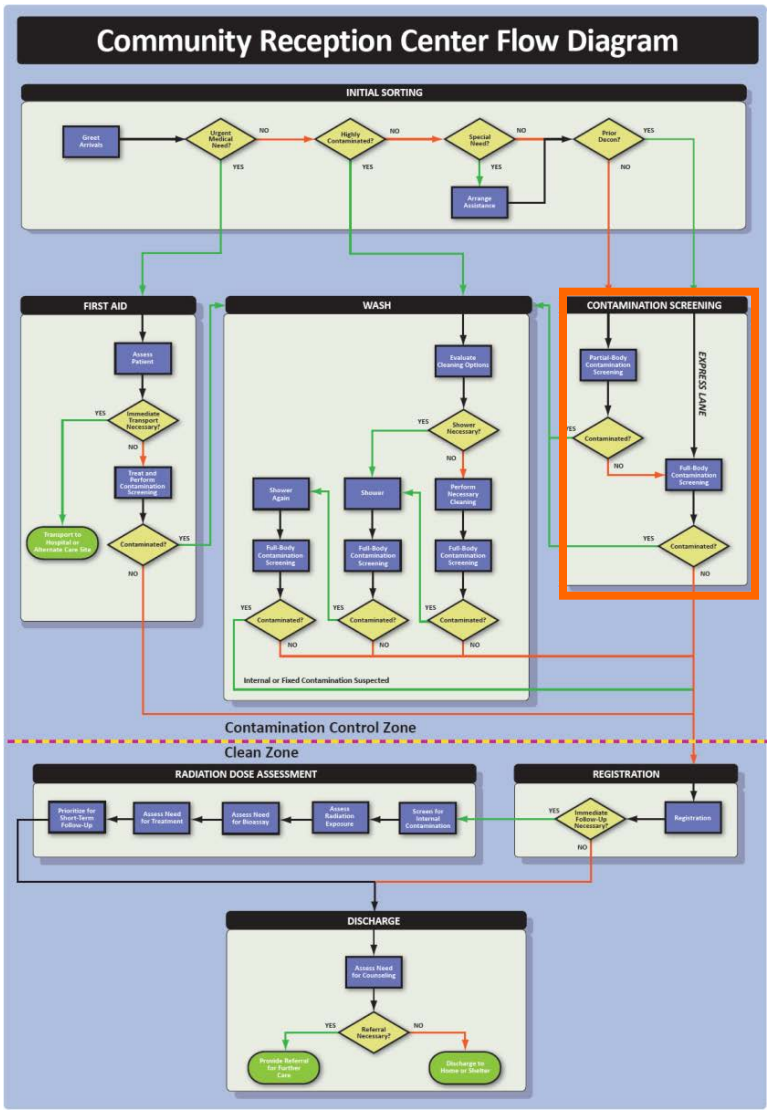

Community Reception Center Flow Diagram
INITIAL SORTING
Great Arrivals
Urgent Medical Need?
NO
YES
Highly Contaminated?
NO
YES
Special Need?
NO
YES
Arrange Assistance
Prior Decon?
YES
NO
FIRST AID
Assess Patient
Immediate Transport Necessary?
YES
NO
Transport to Hospital or Alternate Care Site
Treat and Perform Contamination Screening
Contaminated?
YES
NO
WASH
Evaluate Cleaning Options
Shower Necessary?
YES
NO
Shower Again
Shower
Perform Necessary Cleaning
Full-Body Contamination Screening
Contaminated?
YES
NO
Internal or Fixed Contamination Suspected
CONTAMINATION SCREENING
Partial-Body Contamination Screening
Contaminated?
YES
NO
EXPRESS LANE
Full-Body Contamination Screening
Contaminated?
YES
NO
Contamination Control Zone
Clean Zone
RADIATION DOSE ASSESSMENT
Screen for Internal Contamination
Assess Radiation Exposure
Assess Need for Bioassay
Assess Need for Treatment
Prioritize for Short-Term Follow-Up
REGISTRATION
Registration
Immediate Follow-Up Necessary?
YES
NO
DISCHARGE
Assess Need for Counseling
Referral Necessary?
YES
NO
Provide Referral for Further Care
Discharge to Home or Shelter

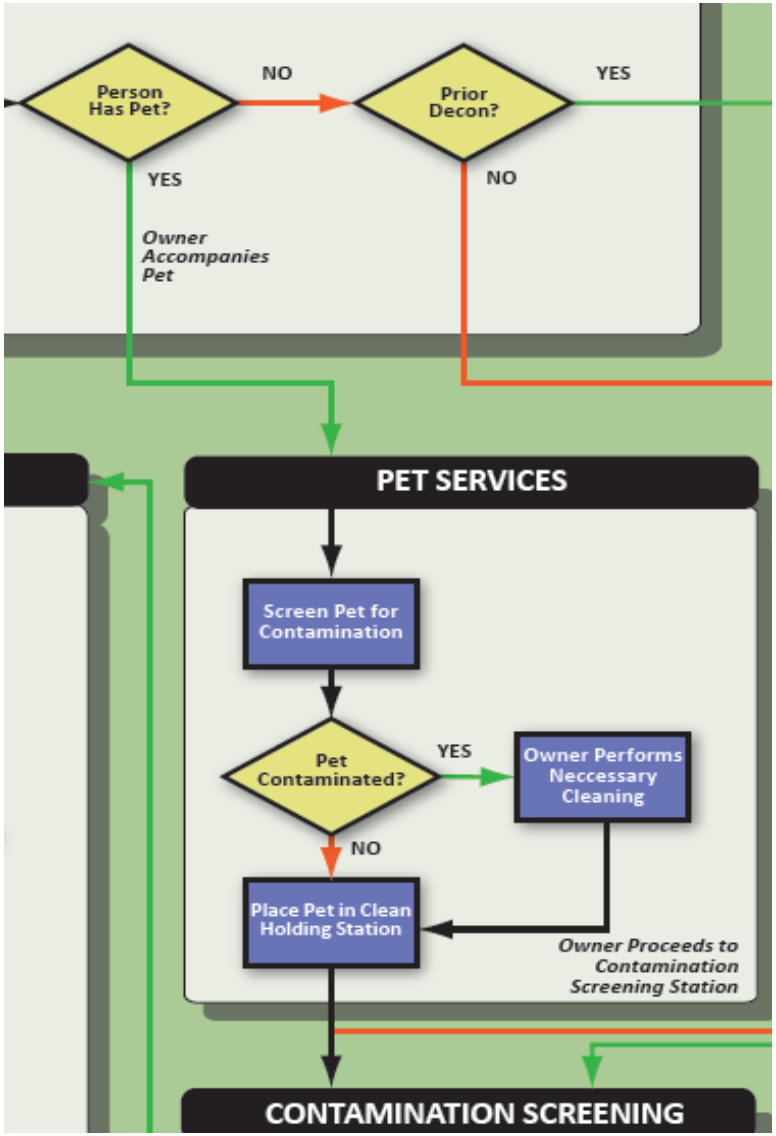
First Aid



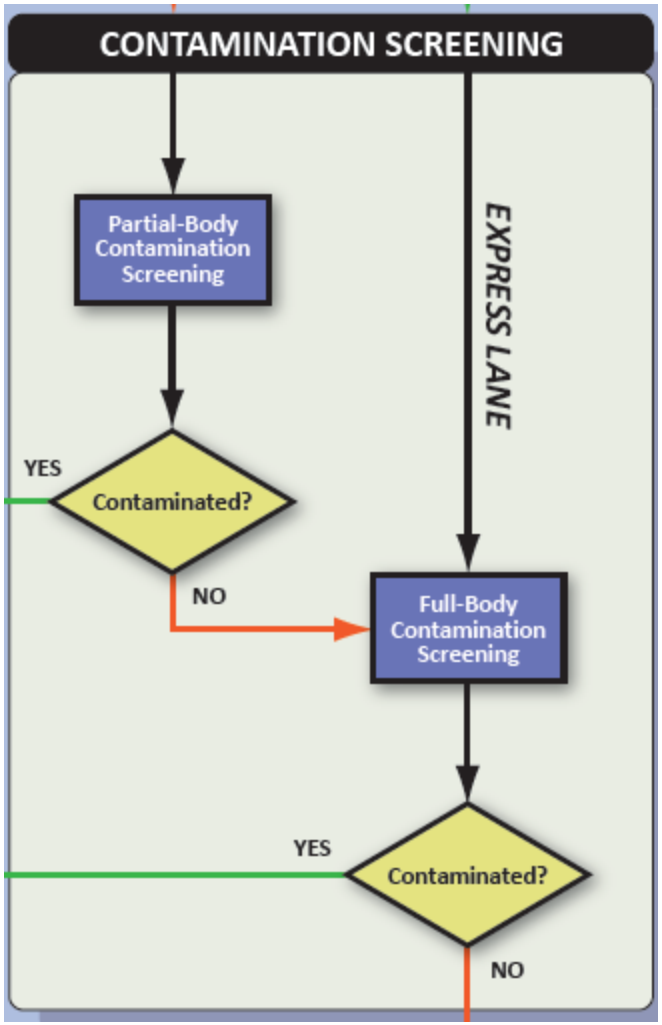
- **Medical staff care for and/or transport patients with urgent medical needs**
- **Life saving care takes priority!**
  - Do not delay transport for decontamination!

Contamination Screening



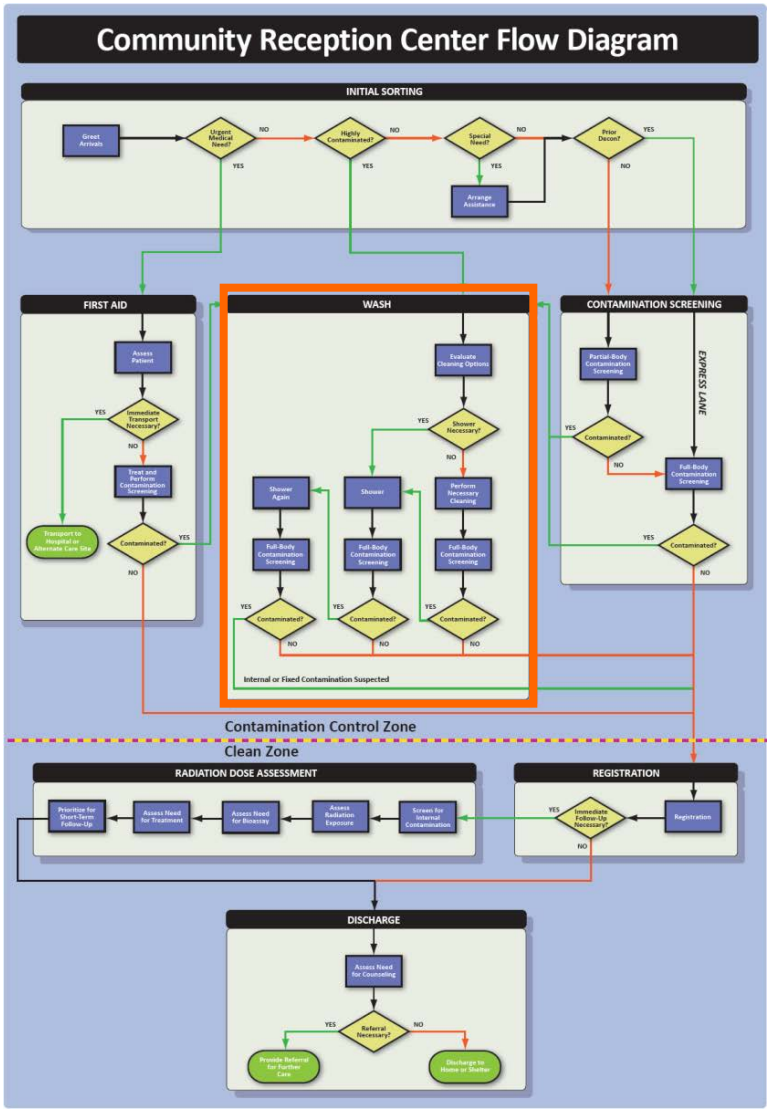


Contamination Screening



- Staff screen people/pets for external contamination
- Radiation detection equipment

Person Wash


Community Reception Center Flow Diagram
INITIAL SORTING
Greet Arrivals
Urgent Medical Need?
Highly Contaminated?
Special Need?
Prior Decon?
Arrange Assistance
FIRST AID
Assess Patient
Immediate Transport Necessary?
Treat and Perform Contamination Screening
Transport to Hospital or Alternate Care Site
Contaminated?
WASH
Evaluate Cleaning Options
Shower Necessary?
Shower Again
Shower
Perform Necessary Cleaning
Full-Body Contamination Screening
Contaminated?
Internal or Fixed Contamination Suspected
CONTAMINATION SCREENING
Partial-Body Contamination Screening
EXPRESS LANE
Contaminated?
Full-Body Contamination Screening
Contaminated?
Contamination Control Zone
Clean Zone
RADIATION DOSE ASSESSMENT
Prioritize for Short-Term Follow-Up
Assess Need for Treatment
Assess Need for Bioassay
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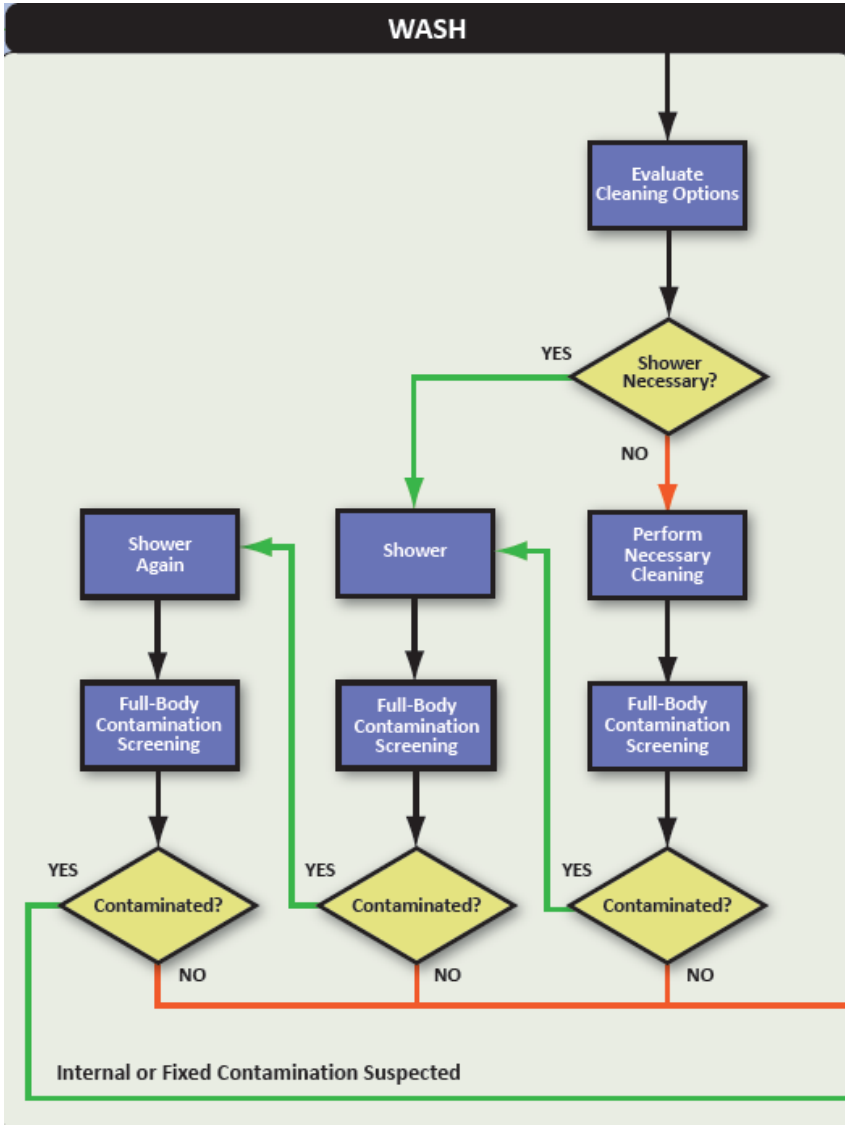
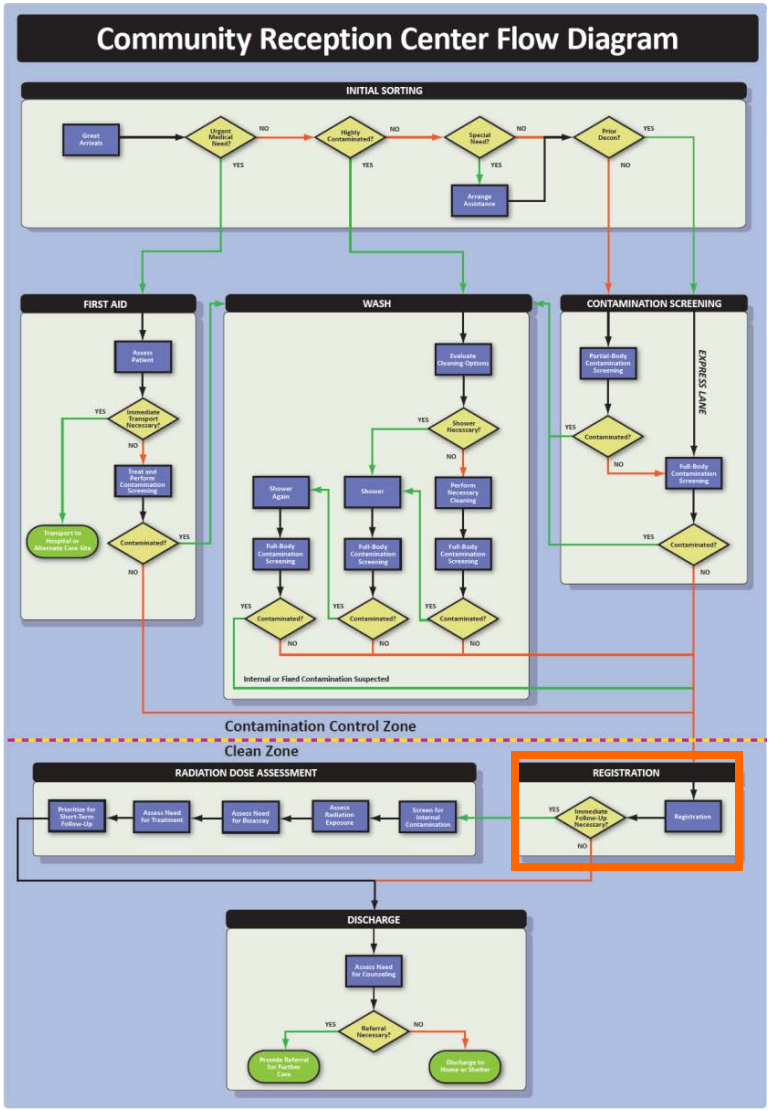
Screen for Internal Contamination
REGISTRATION
Immediate Follow-Up Necessary?
Registration
DISCHARGE
Assess Need for Counseling
Referral Necessary?
Provide Referral for Further Care
Discharge to Home or Shelter

Wash

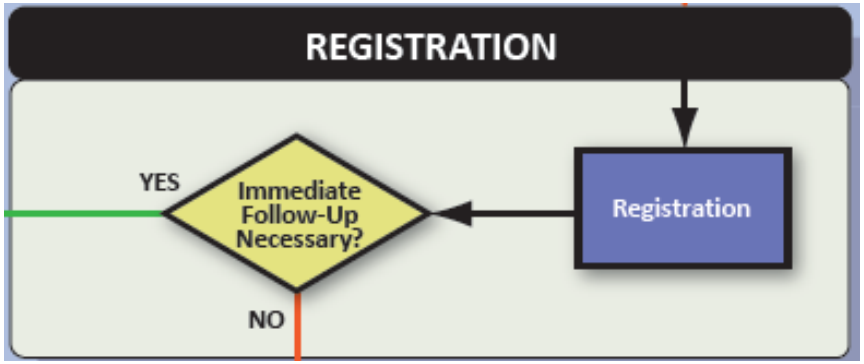


- **Staff monitor and facilitate showering**
- **People wash themselves**
  - People with special needs may require additional assistance

Registration



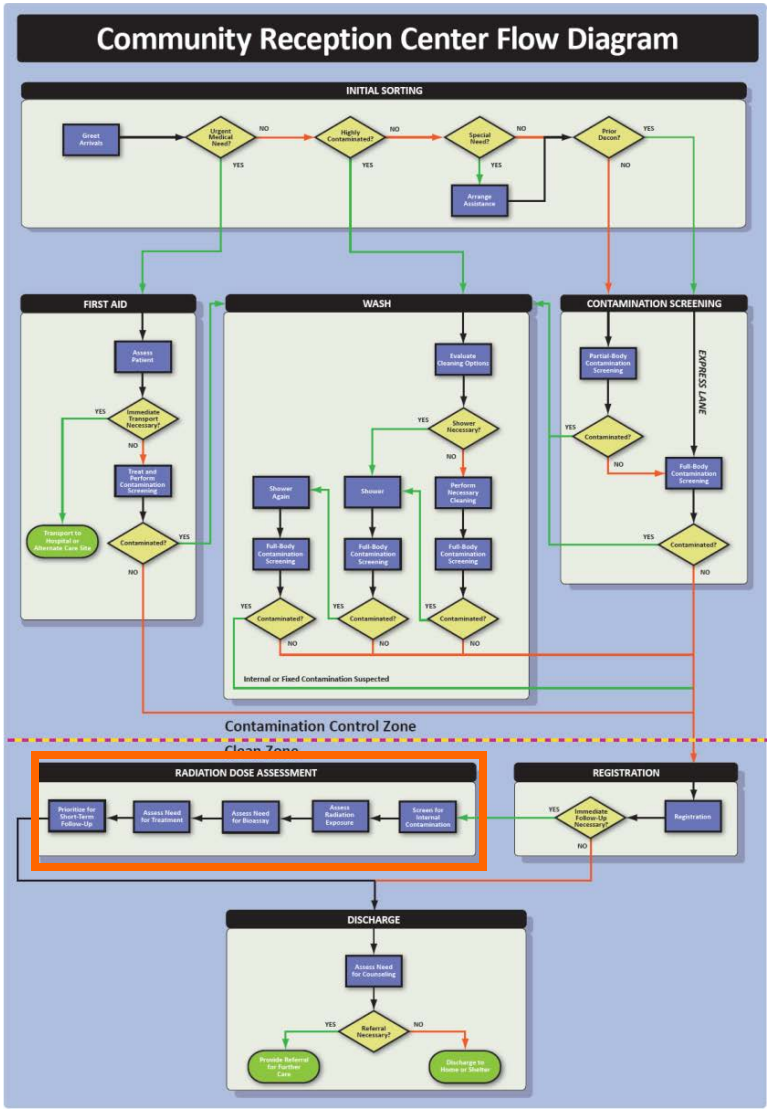
Registration



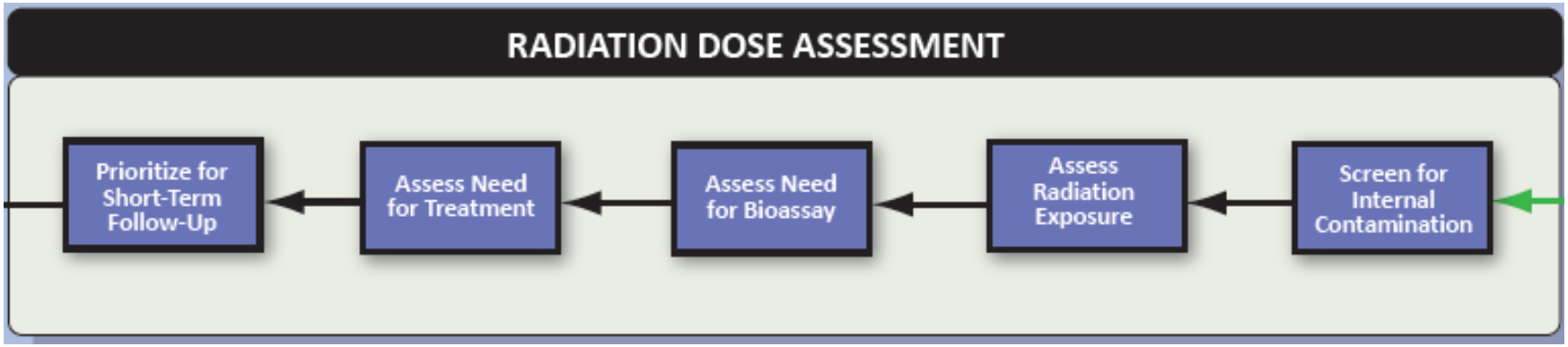
Staff collect information for registry and long-term follow-up:

- Patient name
- Contact information
- Destination
- Proximity to event
- Time in affected area

Radiation Dose Assessment



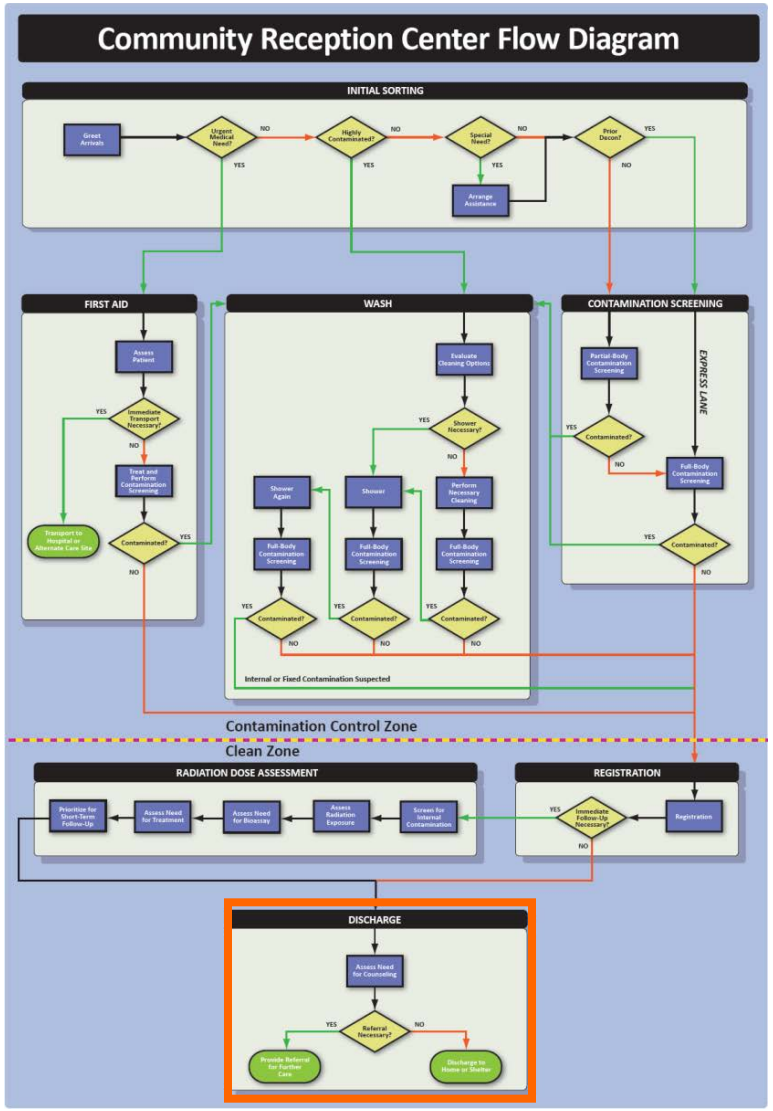
Radiation Dose Assessment



Clinical and health physics staff:

- Screen for internal contamination
- Assess radiation exposure
- Assess need for bioassay
- Assess need for treatment
- Prioritize for short-term follow-up

Discharge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Assess Need for Treatment
Assess Need for Biodosimetry
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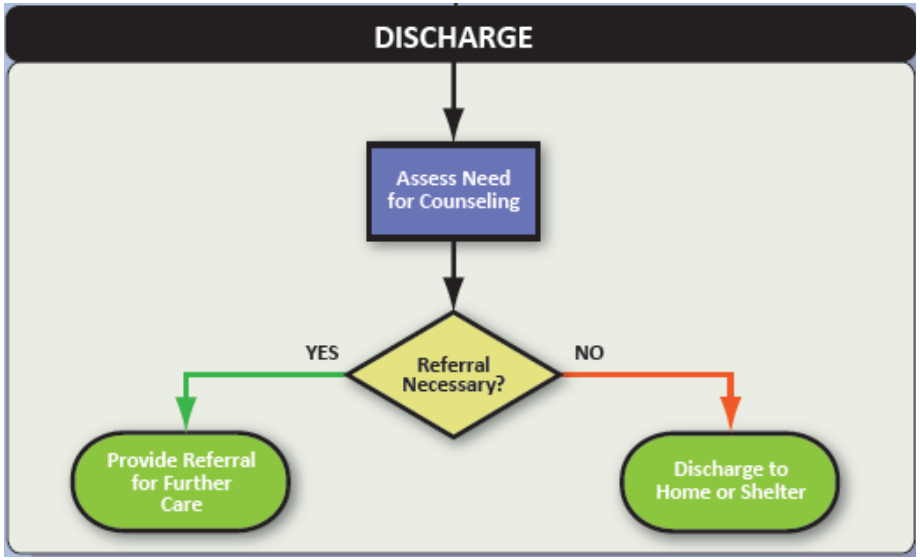
Screen for Internal Contamination
REGISTRATION
Immediate Follow-Up Necessary?
Registration
DISCHARGE
Assess Need for Counseling
Referral Necessary?
Provide Referral for Further Care
Discharge to Home or Shelter

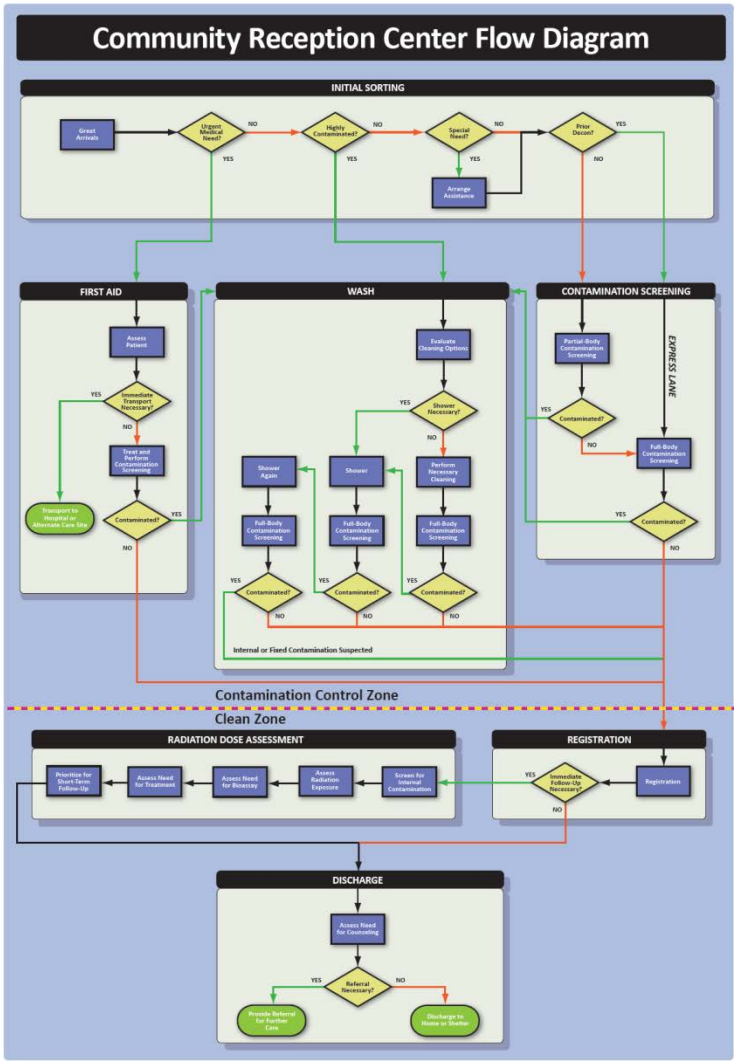
Discharge



Staff provide information for people discharged:

- Assess need for counseling
- Discharge to home or shelter
- Provide referral for further care

Community Reception Center Process Flow



- **Process can be adjusted to meet capabilities**
  - Instrumentation
  - Personnel
- **Additional processes can be added as needed or as possible**
  - Pets
  - Relocation services

vCRC available online:

www.emergency.cdc.gov/radiation/crc/vcrc.asp

www.orau.gov/rsb/vcrc/

Or to request a complimentary copy:

cdcinfo@cdc.gov or 800-CDC-INFO

The End

Thanks for your attention

The Bureau of Radiation Control
407 - 297 – 2095

24 / 7 !!