

Treatment for Internal Contamination

**R. E. Toohey, Ph.D., CHP
REAC/TS**

Learning Objectives

- Identify element-specific treatments for intakes of radionuclides
- Describe methods for assessing the efficacy of treatment

Immediate Diagnosis

- Nasal swipes (~ 5% on inhalation intake)
- Nasal blows
- Sputum
- When all else fails - get a good history!

Clearance Time - Nasopharynx

Time in Minutes
to Swallowing

Anterior Nares	60
Nasopharynx	10 (10 mm/min)

Treatment Methods

- Block absorption
- Block deposition
- Dilute
- Displace
- Remove (chelate)

Absorption of Ingested Radionuclides

GROUP	ELEMENTS	%ABSORBED
Alkali Metals	^{24}Na , ^{42}K , ^{85}Rb , ^{137}Cs	High ~90
Group VIII Metals	^{59}Fe ^{60}Co ^{105}Ru	10 30-90 3

Absorption of Ingested Radionuclides

GROUP	ELEMENTS	%ABSORBED
Lanthanides	^{144}Ce , ^{147}Pm , ^{156}Eu , ^{160}Tb	<0.1
Actinides	^{228}Th , ^{235}U	<0.1
Transuranics	^{237}Np , ^{239}Pu , ^{241}Am	<0.001

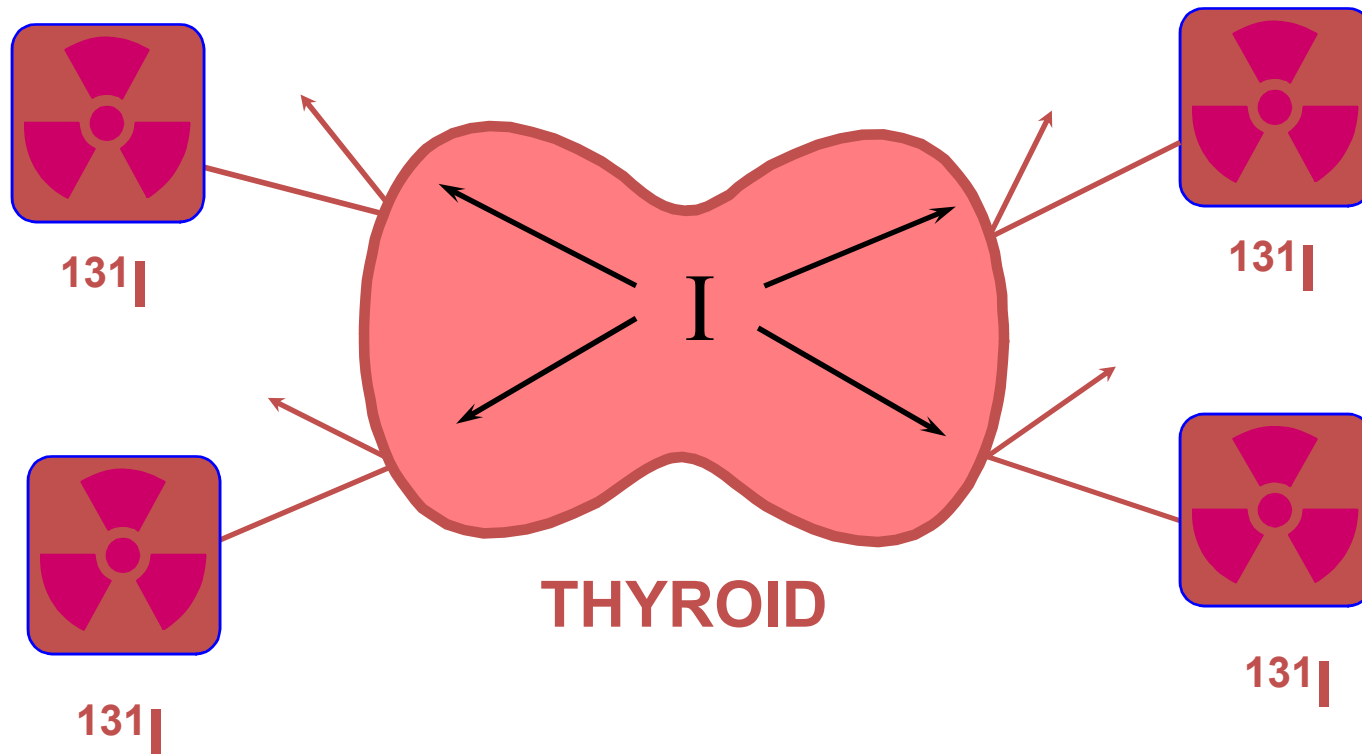
Reduction of Absorption From Gastrointestinal Tract

1. Antacid
2. Precipitation into insoluble salt
3. Catharsis

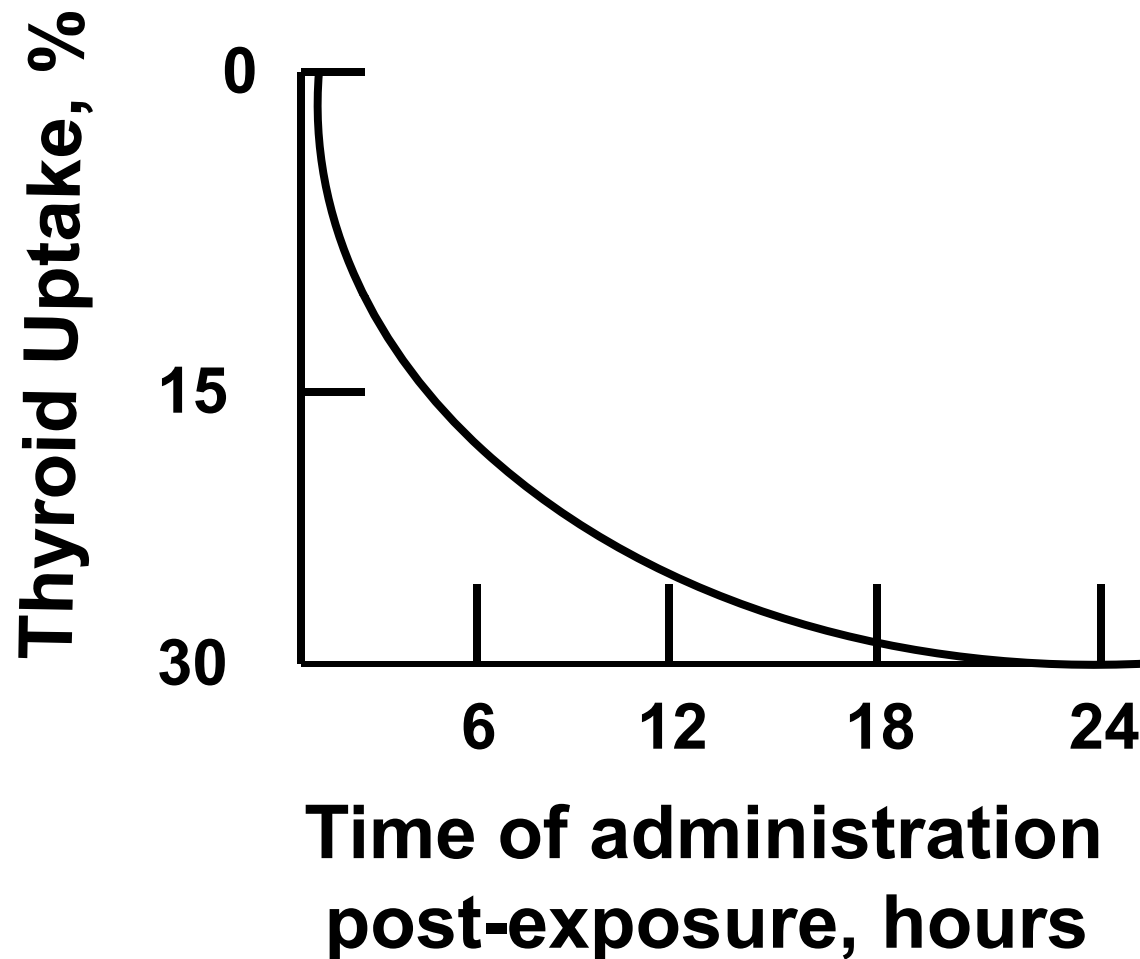
Prussian Blue is Highly Effective in Treatment of ^{137}Cs Uptake

- Binds ions in gut
- Reduces biological half life to one third of untreated value
- Not absorbed
- Reduces recycling

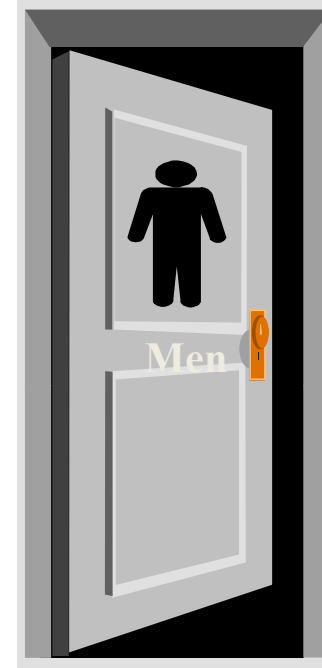
Saturate the Critical Organ with the Stable Isotope



Prompt KI Treatment for ^{131}I Intake is Highly Effective



Isotopically Dilute



TRITIUM

Displace

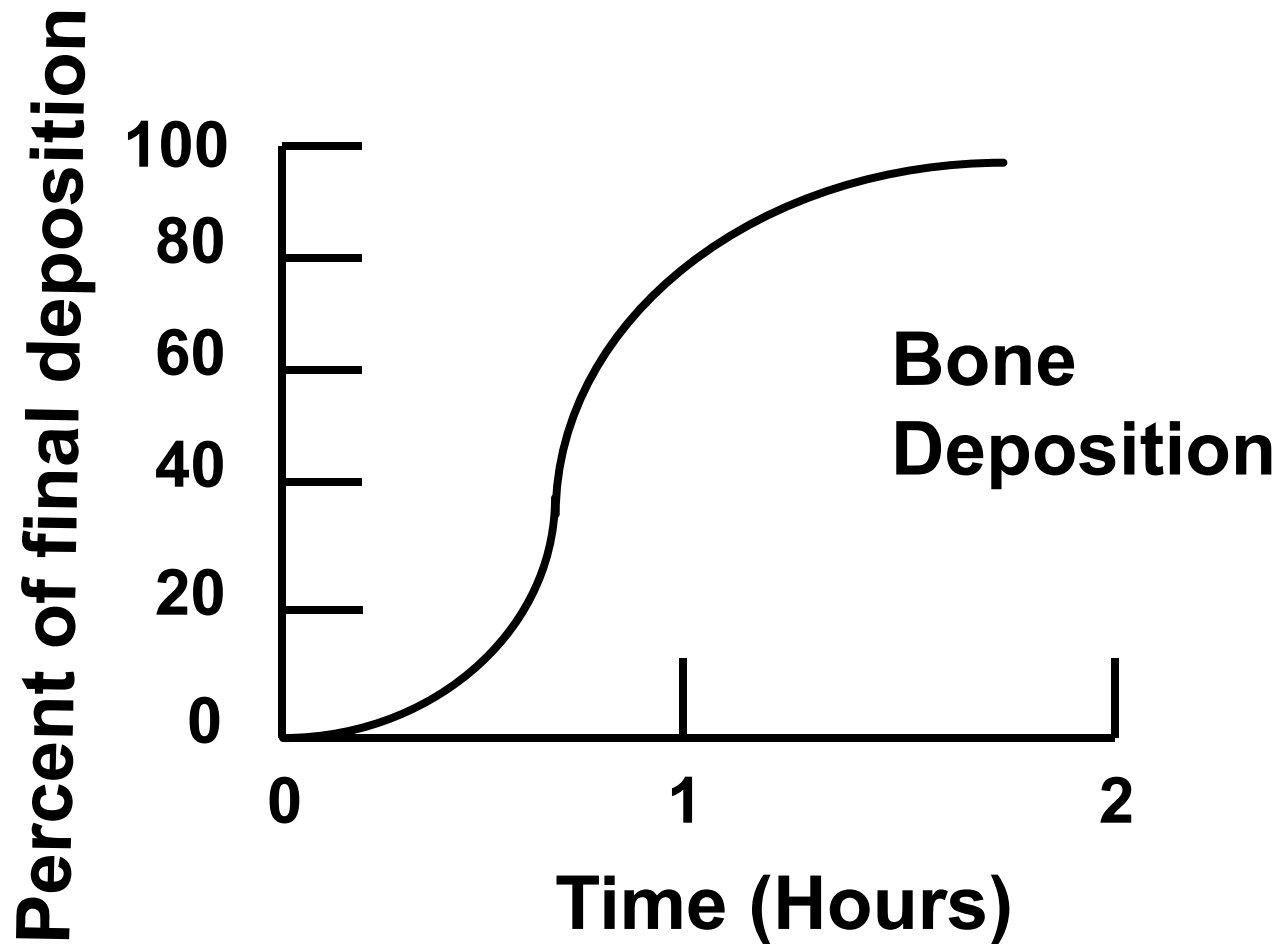
USE CALCIUM TO COMPETE WITH
RADIOSTRONTIUM

USE STABLE IODIDE TO COMPETE WITH
RADIOTECHNETIUM

Chelate

- DTPA - Diethylenetriaminepentaacetic Acid
- EDTA - Versene
- BAL - Dimercaprol
- DFOA - Deferoxamine
- PCA - Penicillamine

Uptake of Actinides Is Remarkably Rapid



Prompt DTPA Treatment of ^{239}Pu Intake is Highly Effective

Retention (% of Uptake)

	Control	DTPA Treated
Liver	14.0	0.47
Skeleton	57.0	5.9

How to Administer DTPA

- Direct IV injection of undiluted DTPA over 5-10 minutes.
- Aerosol: 1 gram undiluted in Bird respirator; inhalation takes 10-15 minutes.

Common Medications that have Chelating Effects

- Anti-Inflammatory Drugs
 - Salicylates
 - Indocin
 - Aminopyrine
 - Tylenol
 - Butazolidin Group
- Steroids
 - Cortisone, Hydrocortisone, etc.
- Psychotropic Drugs
 - Chlorpromazine
 - Dilantin

Common Medications that have Chelating Effects (cont.)

- Antimicrobial Drugs that Chelate
 - p-Aminosalicylic Acid Fe, Cu
 - Bacitracin Zn
 - Isoniazid Fe, Cu, Mn, Co
 - Kanamycin Ca
 - Neomycin Fe, Al
 - Novobiocin Mg
 - Penicillin Co
 - Polymyxin Mg, Mn, Ca, Fe
 - Streptomycin Mn
 - Tetracycline Fe, Mg, Mn, Mo, Al, Ca

Uranium

PROBLEM: Chemical toxicity to kidney

TREATMENT:

- Sodium bicarbonate to alkalinize urine
- May need renal dialysis until renal recovery from injury.

Keep the Patient Busy!

- Cabbage for ^{131}I , ^{99}Mo , ^{75}Se
- Eggs for ^{59}Fe
- Soybean flour for ^{65}Zn , ^{59}Fe
- Stop Vitamin C for ^{59}Fe

Common Drugs Useful

- Hygroton ^{86}Ru
- Phosphagel $^{85}\text{Sr}, ^{90}\text{Sr}$
- Gaviscon $^{85}\text{Sr}, ^{90}\text{Sr}$
- Neutraphos ^{32}P

REMINDER

- Any decorporation therapy is a medical treatment, and so must be prescribed and administered by a qualified and licensed medical practitioner
- But don't be surprised if the practitioner asks you what to do