Council on
Ionizing Radiation
Measurements &
Standards

CIRMS Poster Blitz

Session 1

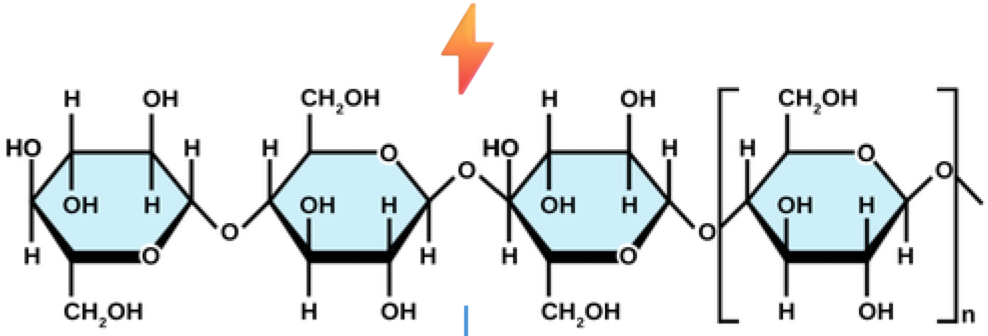
Monday April 13

Radiation-Induced Changes in Mechanical Properties of Cellulose-Based Materials for Grafted Polymer Applications

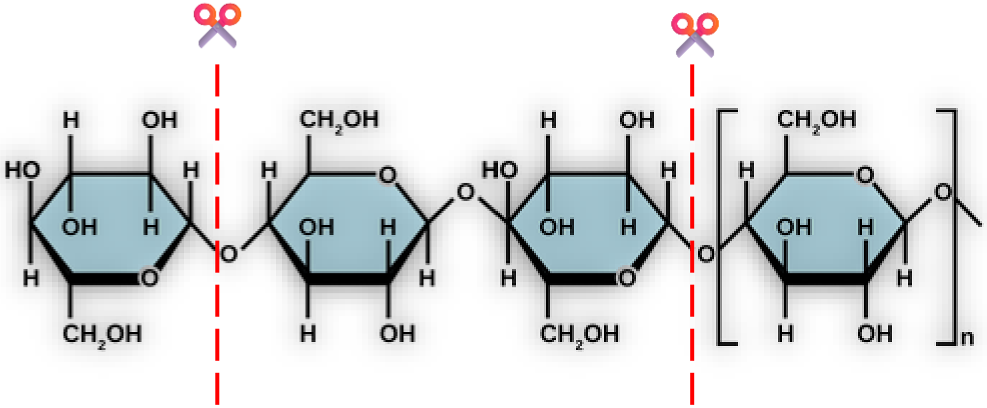
Dilara Turkel Agacik[1], Mark S. Driscoll [1]

[1]*Department of Chemistry, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210, USA*

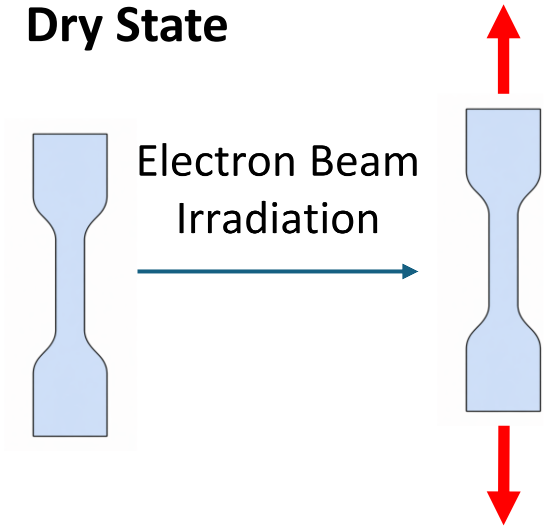
Electron Beam

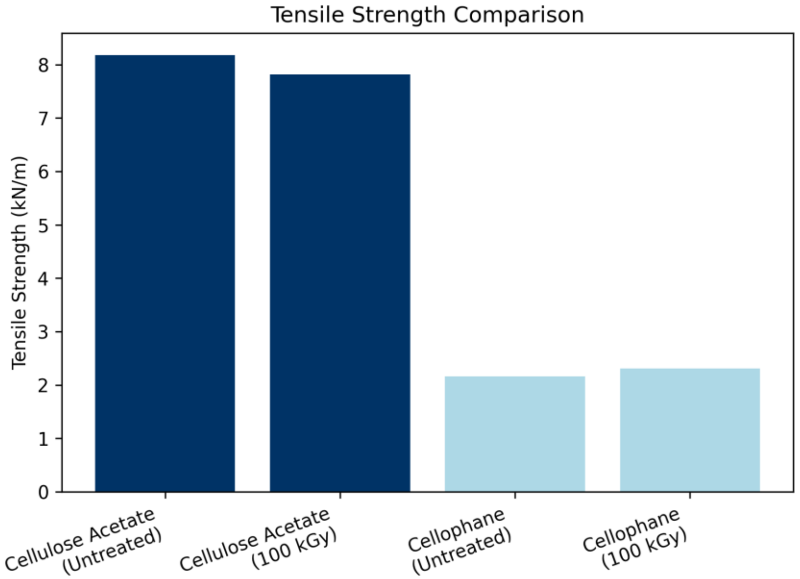


Grafting vs. Degradation

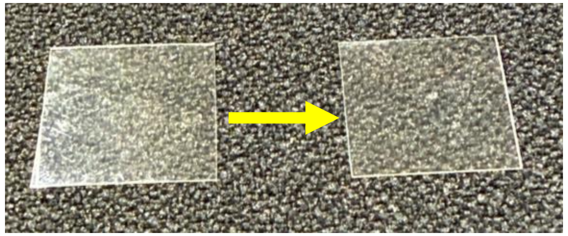


Dry State

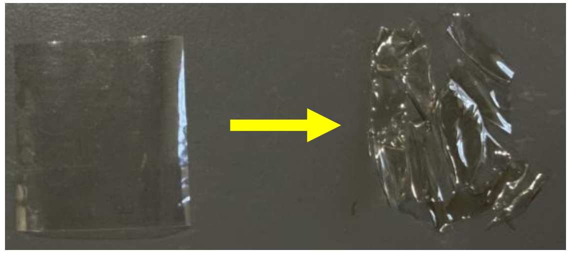




In Polymer Solution



Untreated and 200 kGy Gamma-Irradiated Cellulose Acetate in Polymer Solution

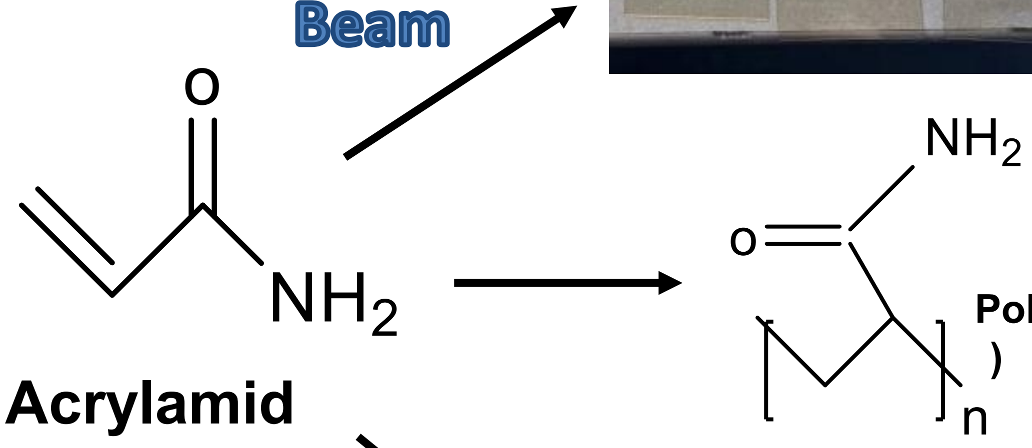


Untreated and 100 kGy Gamma-Irradiated Cellophane in Polymer Solution

Polyacrylamide Synthesis through UV and Electron Beam Radiation

Maci Dahlberg[1], Dilara Turkel Agacik[1], Mark Driscoll
[1]State University of New York, College of Environmental Science and Forestry

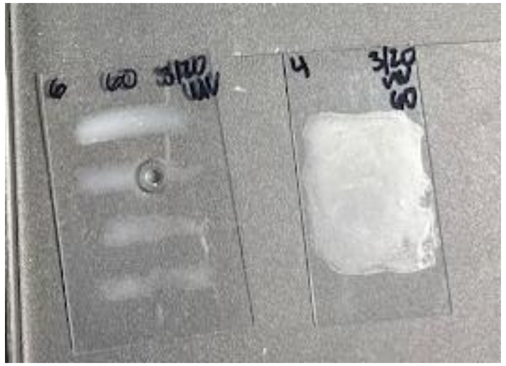
Electron Beam

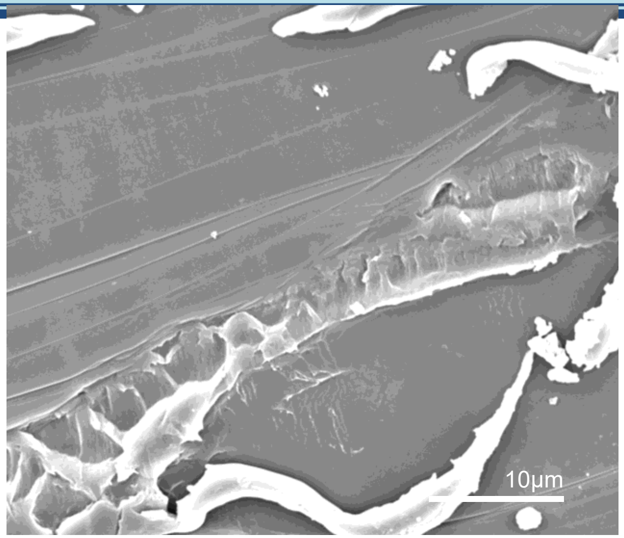


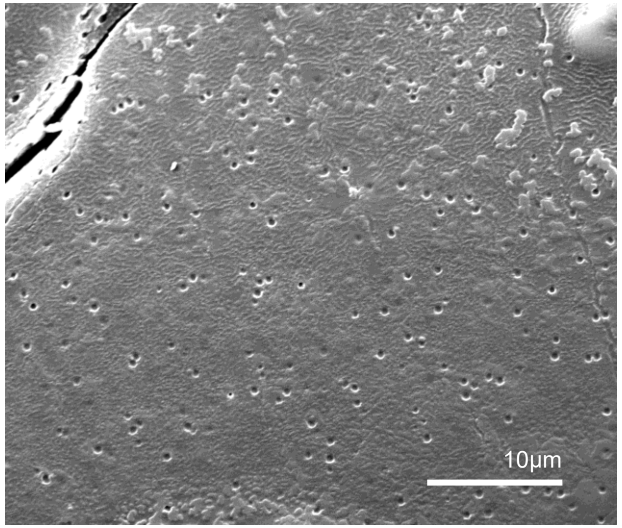
Acrylamid
e

Poly(acrylamide
)

UV







UNLV

A New Online Computer Program for Neutron Activation Analysis (NAA)

Rui Fang and Zaijing Sun
Department of Health Physics and Diagnostic Sciences, University of Nevada Las Vegas, Las Vegas, NV 89154

Motivation

- Neutr… …ive multielement analys…

Highligh…

- Deve… …culations.
- Integ… …evaluation, and activi…
- Redu…
- Usef…

Nuclear Activation Analysis System (NAAS) — Function Library Logout

Calculation Result (Direct Method)

Nuclide Co-60	**Activity (max)** 1.81069e-20 (Ci) = 6.69954e-10 (Bq)
Sample Concentration (ppm) 20.0013	**Uncertainty** 0.775823

Sample Information

Nuclide (Daughter)	Co-60
Half-life (s)	166194720.0
Mass (g)	0.10042
Energy (keV)	1173.56
Deviation of Energy	0.36
Peak Area	37350.0
Deviation of Peak Area	209.39
Production Mode	(n,g)
Nuclide (Parent)	Co-59

Reference Information

Nuclide (Daughter)	Co-60
Half-life (s)	166194720.0
Mass (g)	0.10107
Energy (keV)	1173.56
Deviation of Energy	0.36
Peak Area	33690.0
Deviation of Peak Area	198.74
Production Mode	(n,g)
Nuclide (Parent)	Co-59

Standard Reference Source

Nuclide	Co
Source	Particulate
Concentration (ppm)	17.93
Deviation	0.68

Time Parameters

	Sample	Reference
Decay Time (s)	2370394.0	2432929.0
Counting Time (s)	7200.0	7200.0

Back | Export to Excel

Function Library Logout

±5%

…utron Number	Abundance	Relative Atomic Mass
	1.0	22.98976928

…tion	Gamma Emission Probability	Nuclide (Parent)
…ator …ed	0.999	None
	1.0	Al-27
	1.0	Na-23
	1.0	Mg-24

Deviation	Source
…500.0	fly ash
…50.0	Particulate
…240000.0	water

Intensity	Uncertainty_I	Decay	Branch ratio (%)	Rad Type	Nuclide (Daughter)
31.8	2.1	B+P	55.0	g	Na-21

Visit NAAS website:

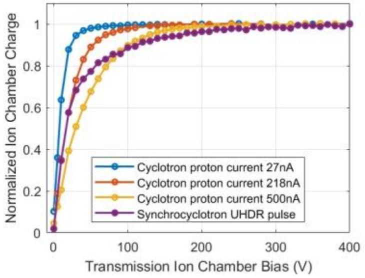
Capturing Space-Charge Dynamics in UHDR Ionization Chambers

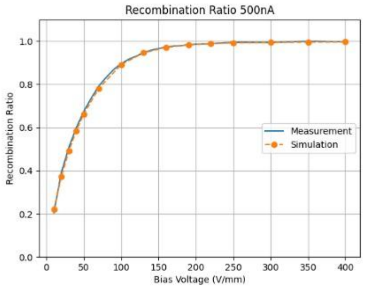
1. UHDR beams spare normal tissue while maintaining tumor control
2. High ionization rates require new validation frameworks
3. Measured 230MeV UHDR recombination via transmission IC and Faraday Cup
4. Modeled charge liberation, drift, and recombination using PDEs:

$$\frac{\partial \rho_+}{\partial t} = R(t) - \frac{\alpha}{e}\rho_+\rho_- - \nabla \cdot (v_+\rho_+)$$

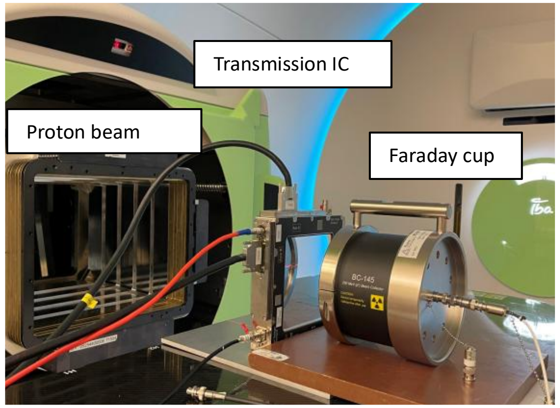
$$\frac{\partial \rho_-}{\partial t} = +\gamma\rho_e - \frac{\alpha}{e}\rho_+\rho_- - \nabla \cdot (v_-\rho_-)$$

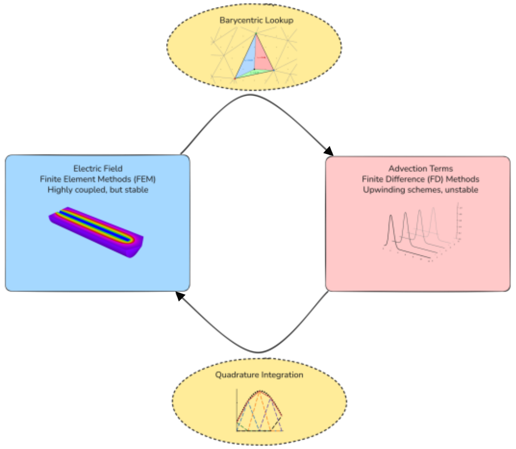
$$\frac{\partial \rho_e}{\partial t} = R(t) - \gamma\rho_e - \nabla \cdot (v_e\rho_e)$$

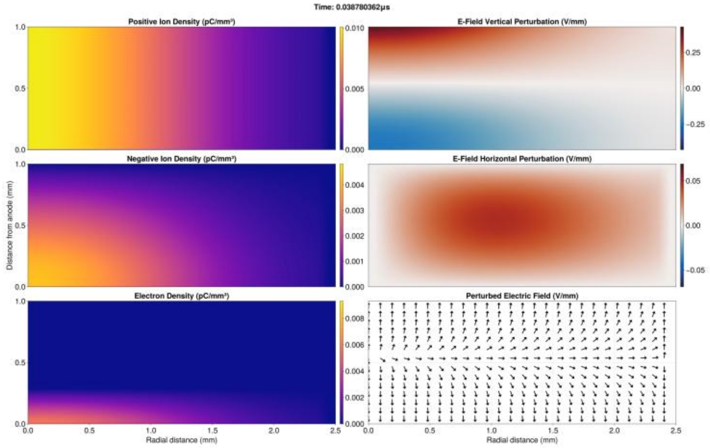




5. Developed and validated a high-performance, complex-geometry simulation engine







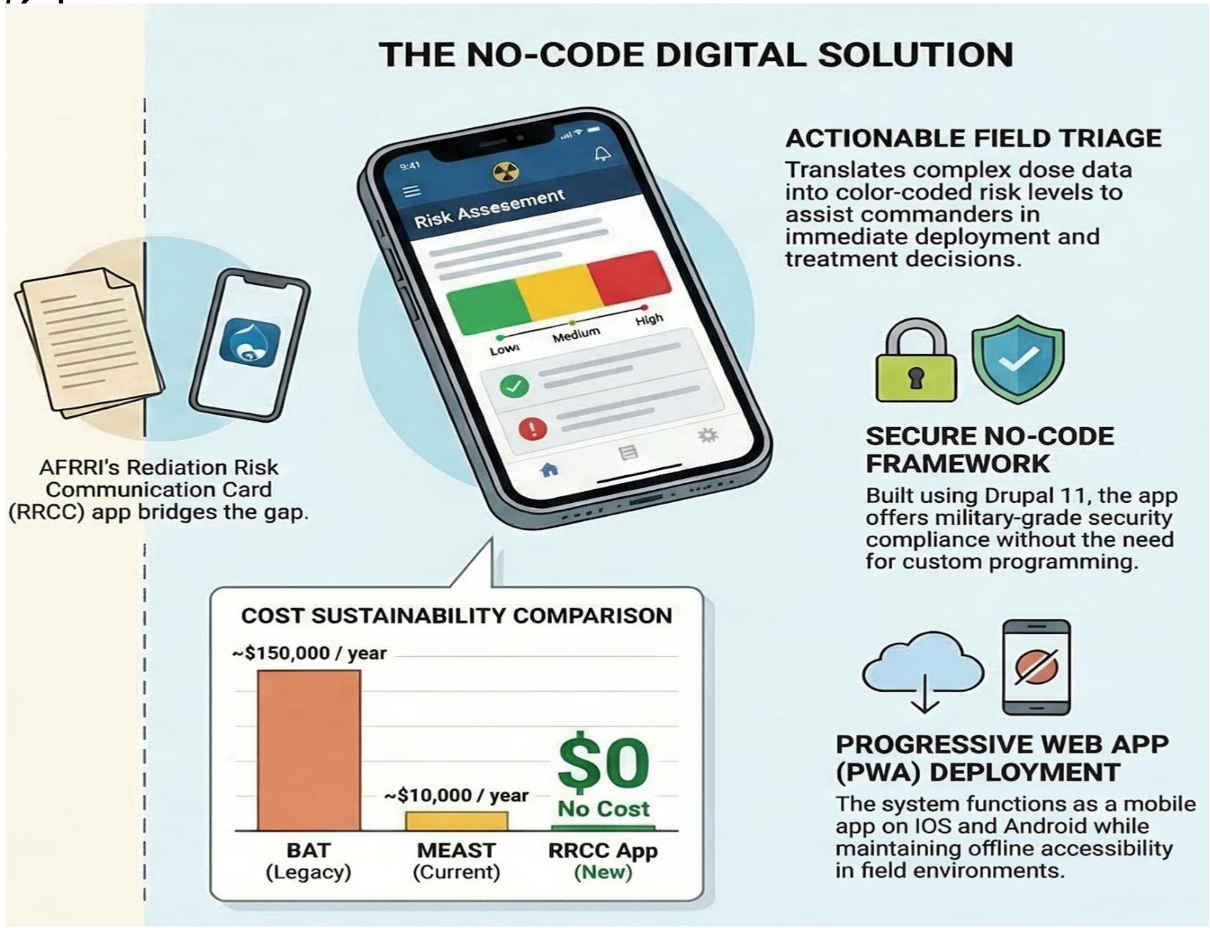
Radiation Risk Communication Using an In-house Non-code App Solution

Lalitha Kurada, Ph.D.[1], William F. Blakely, Ph.D.[2], Brandon M. Wiggins[3], David L. Bolduc, Ph.D[2]
[1]Henry M. Jackson Foundation, Rockville, MD; [2]Armed Forces Radiobiology Research Institute, Uniformed Services University of the Health Sciences, Bethesda, MD; [3]Naval Research Enterprise Internship Program, Washington, DC

Poster #21

AFRRI Radiation Risk Communication Card

RES category level	Absorbed Dose, mGy	Mortality within 30d, %	Effective Dose, mSv	Lifetime radiation-induced increased fatal adult cancer risk, %	Life activity risk, Number of adult chest x-rays (PA)
0	<0.5	0	<0.5	U.S. baseline 20% lifetime risk	25
1A	0.5-5	<0.01	0.5-5	<0.04	25 - 250
1B	5 - 50	0.01 - 0.02	5 - 50	0.04 - 0.4	250 - 2 500
1C	50 - 100	0.02 - 0.04	50 - 100	0.4 - 0.8	2 500 - 5 000
1D	100 - 250	0.04 - 0.05	100 - 250	0.8 - 2.0	5 000 - 12 500
1E	250 - 700	0.05 - 2.00	250 - 700	2 - 6	12 500 - 35 000
2	700 - 1500	2 - 10	700 - 1500	6 - 12	35 000 - 75 000
3	1500 - 4000	10 - 50	1500 - 4000	12 - 22.8	75 000 - 200 000
4	>4000	≥50	>4000	> 22.8	> 200 000



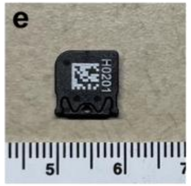
Clinical Implementation of Optically-Stimulated Luminescent Dosimeters (OSLDs) toward Dose Verification of Rotational Total Skin Electron Treatment (TSET)

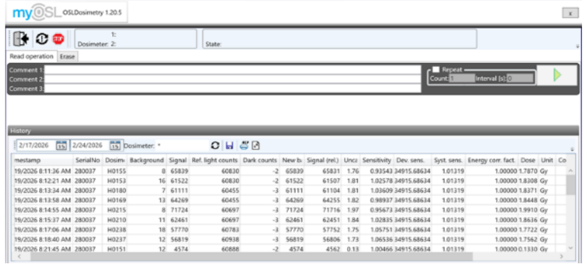
Motive:

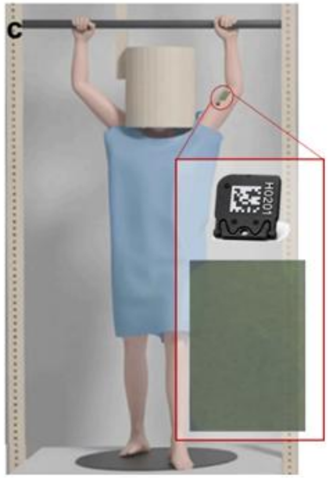
- Total skin electron therapy is a treatment for malignancies such as mycosis fungodies
- Verification of uniform prescription dose can be challenging due to setup, limited *in-vivo* dosimetry options
- Optically-stimulated luminescent dosimeters (OSLDs) can be utilized to confirm dosing constraints

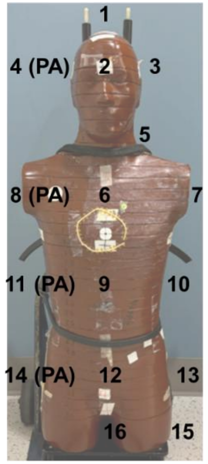
Validation Method:

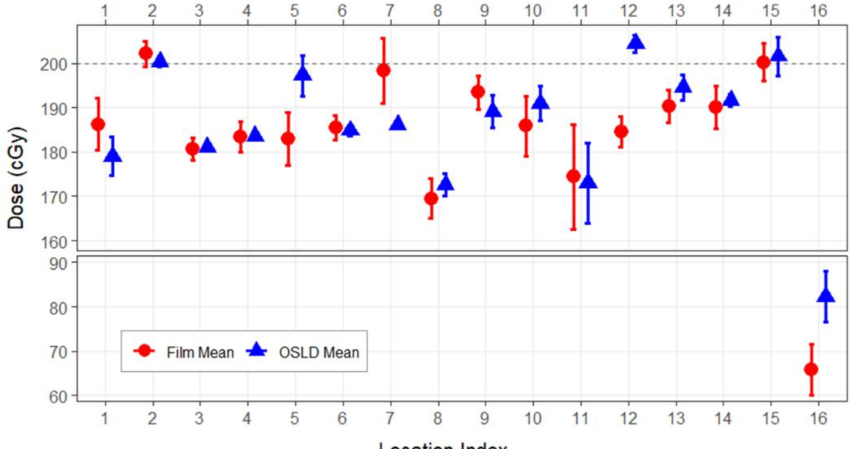
- Validate OSLDs to GafChromic film dosimetry measurements
- 180-220 cGy secondary calibration
- 200 cGy TSET treatment comparison on phantom
- 200 cGy TSET treatment comparison on clinical patient

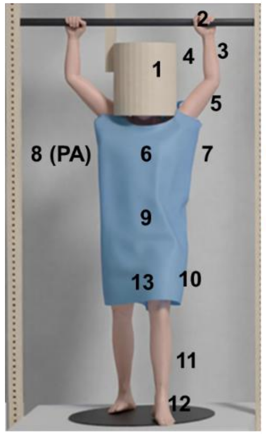


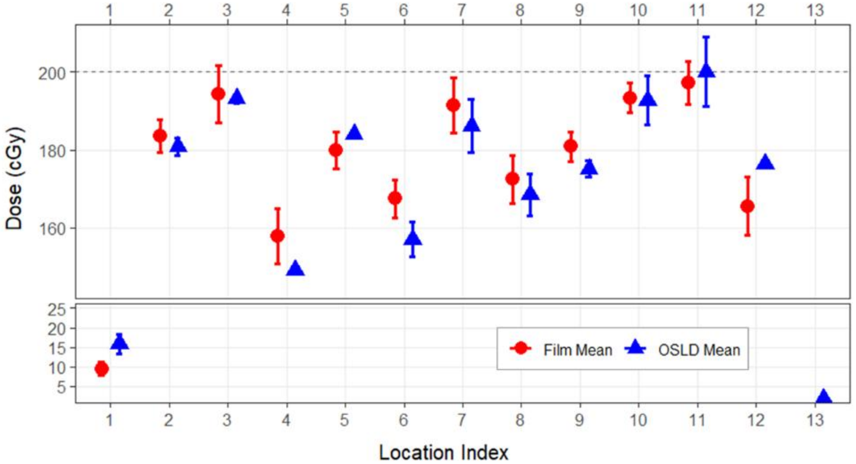












Results:

- Largest deviation on secondary calibration was -4.0%
- Phantom measurements (r^2 = 0.932) resulted in 3 regions > 5% deviance, anterior abdomen (10.7%), neck (7.8%), and shoulder (6.2%)
- In-vivo measurements (r^2 = 0.985) resulted in 2 regions > 5% deviance, lateral foot (6.6%) and upper extremity (5.5%)

Conclusion:

- OSLDs serve as an appropriate *in-vivo* dosimetry method for TSET dose verification

Devon Karl Overson
CIRMS Conference 2026

April 13-16 2026

Non-destructive Volume Determination of Commercial Ionization Chamber using Various micro-CTs

UNIVERSITY OF WISCONSIN

OBJECTIVE: Compare three micro-CTs to determine geometric volume of an Exradin® A3 commercial ionization chamber, with applications of electric field corrections to yield the charge collecting volume.

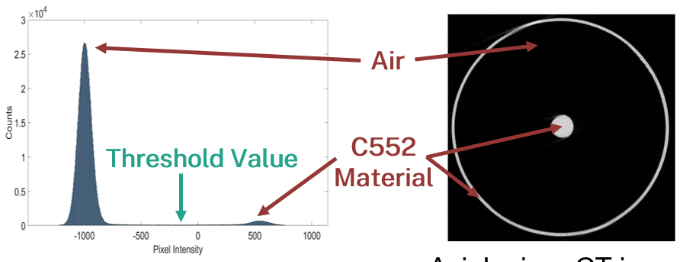
METHODS

1 OPTIMIZED MICRO-CT SCANS

Exradin® A3 (3.6cc)

Three micro-CT systems

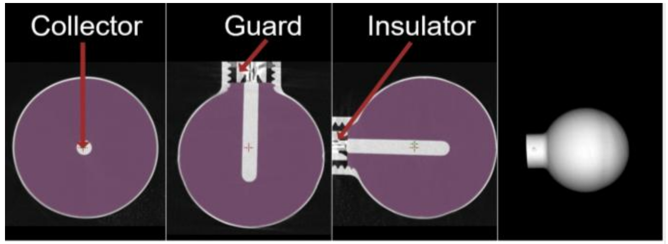
2 SEGMENTATION THRESHOLD



Histogram of pixel intensities

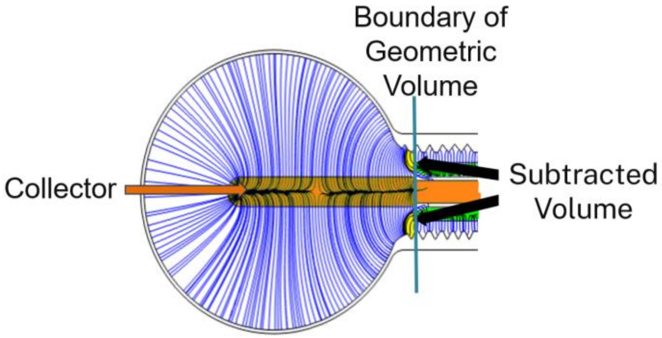
Axial micro-CT image of Exradin® A3

3 & 4 GEOMETRIC VOLUME

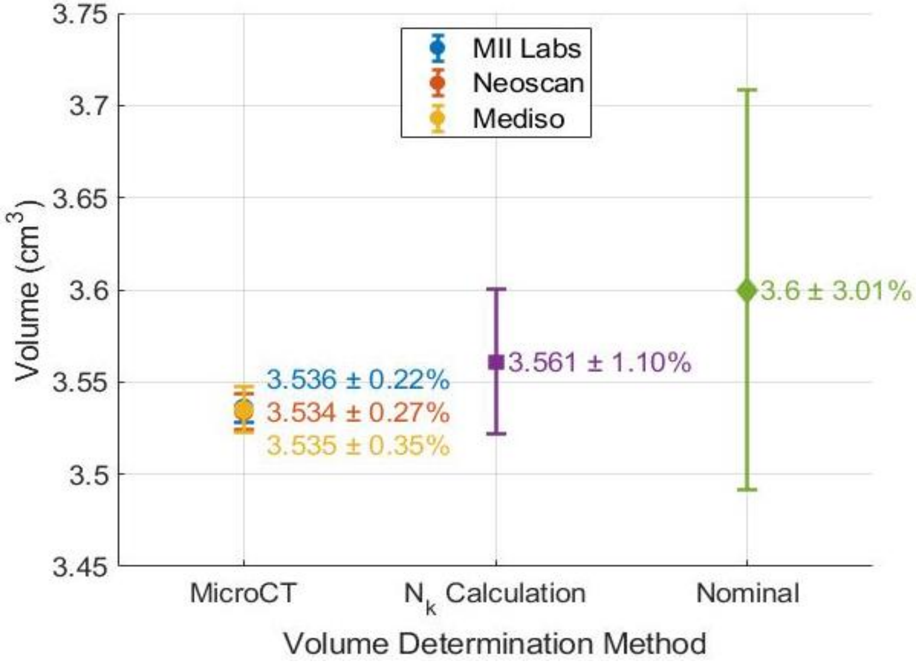


Axial Coronal Sagittal 3D Rendering

5 ELECTRIC FIELD CORRECTION



RESULTS



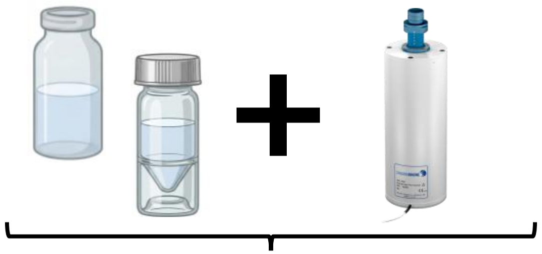
- All agree within k=1 uncertainty
- Voxel size limitations are major differentiator of micro-CT uncertainty

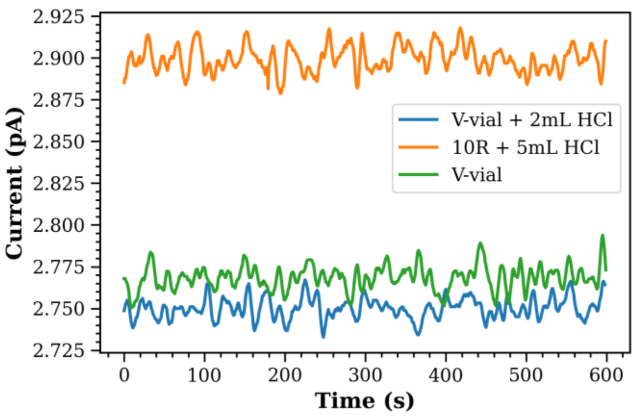
CONCLUSION: Micro-CT provides a reliable, non-destructive approach to determine the geometric volume of ionization chambers, with some scanners offering advantages in image quality over others.

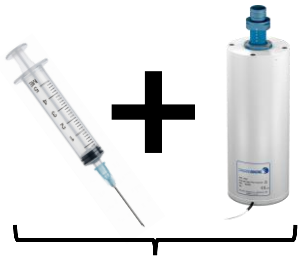
rexpiusvince@wisc.edu

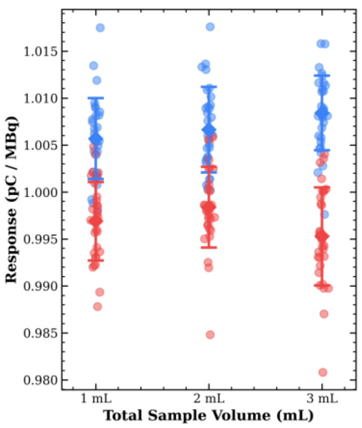
Evaluating Source Geometry Dependencies with ^{177}Lu in Air Communicating Well-Type Ionization Chambers

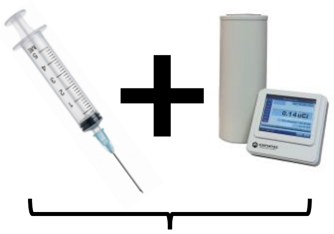
Objective: Utilize air-communicating well-type ionization chambers as an alternative to radionuclide calibrators

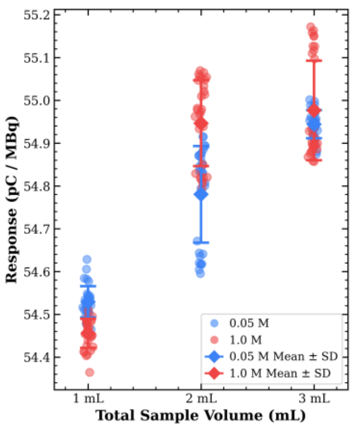












Geometry	Molarity (mol/L)	SI HDR 1000+ (pA/MBq)	SI IVB 1000 (pA/MBq)	Capintec 12-atm (pA/MBq)
10R	0.05	0.0150(5)	0.0165(6)	0.885(13)
10R	1	—	0.0170(3)	0.885(12)
Syringe 1 mL	0.05	—	0.0150(12)	0.908(25)
Syringe 2 mL	0.05	—	0.0160(14)	0.924(25)
Syringe 3 mL	0.05	—	0.0160(9)	0.914(25)

- Derived precise ^{177}Lu calibration coefficients (pA/MBq) for air-communicating and pressurized well chambers
- Solvent molarity had a negligible impact on detector response
- Volumetric expansion inside syringe geometries revealed stability in the SI IVB 1000, while the Capintec 12-atm exhibited a slight geometry dependence
- The SI IVB 1000 has shown to be a robust alternative for RPT measurements

Likhitha Polepalli (polepalli@wisc.edu)

Development of a Murine Irradiation Platform for Screening of Medical Countermeasures against Multi-organ Injuries

Alia Weaver, Alena Tsioplaya, Kefale Wuddie, Gregory Holmes-Hampton, Sanchita Ghosh and Vidya P. Kumar

Radiation Science Department, Armed Forces Radiobiology Research Institute, Uniformed Services University of the Health Sciences, Bethesda, MD, 20889

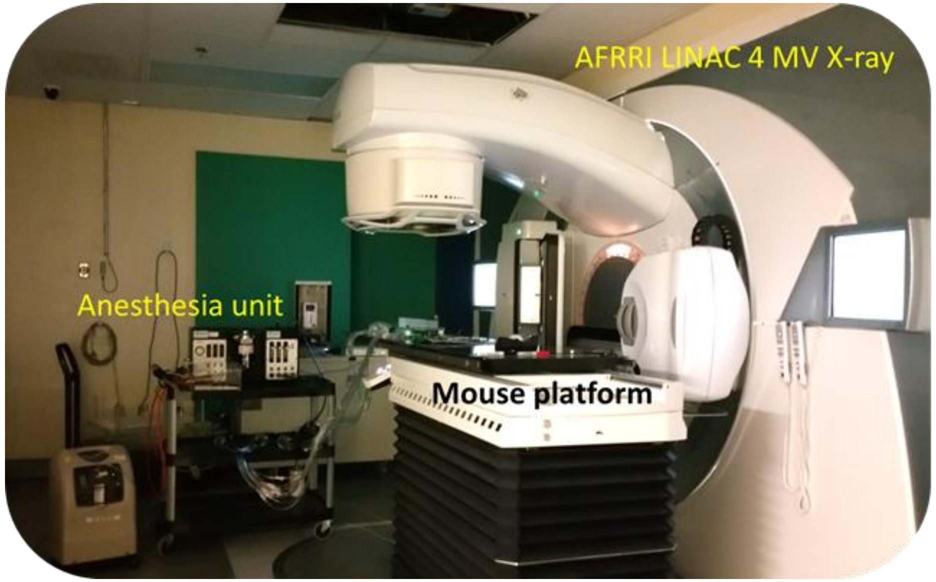
How to mitigate the biological effects of exposure to acute, high doses of radiation? (hematopoietic, gastrointestinal, lung)

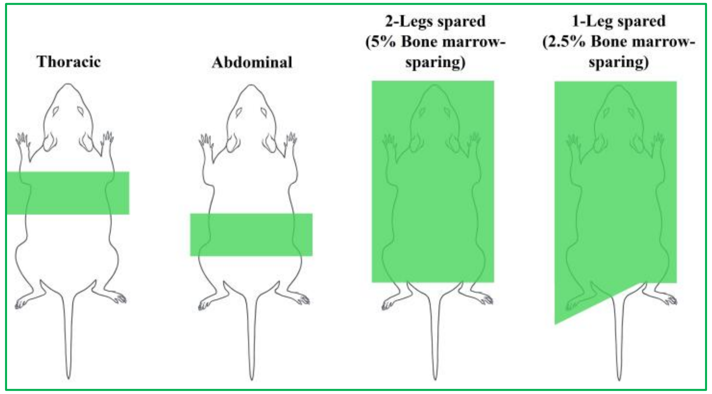
Radiation medical countermeasures

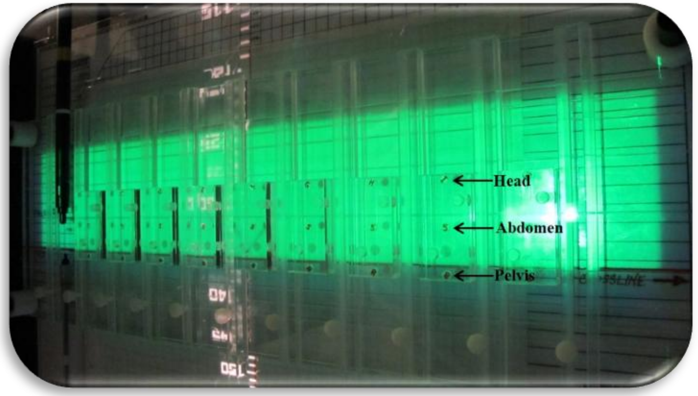
Objective: develop irradiation platform for screening of countermeasures to gastrointestinal-acute radiation syndrome

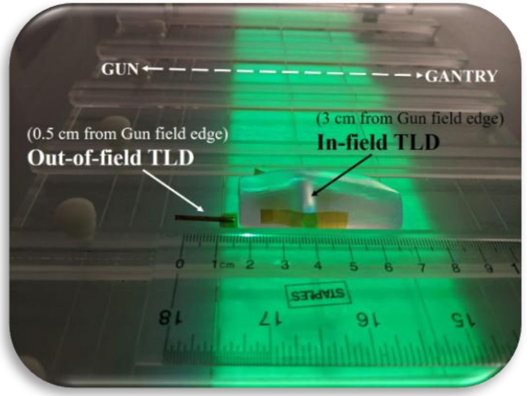
Method: partial-body irradiation (PBI) of mouse model under 4 MV photon beam (clinical accelerator)

Conclusion: attenuation of hematopoietic injury through PBI with precise dosimetry delivered by a clinical accelerator enables investigation countermeasures for gastrointestinal and late stages of radiation-induced damage









Neutron Activation Analysis: Quantifying Arsenic in Rice

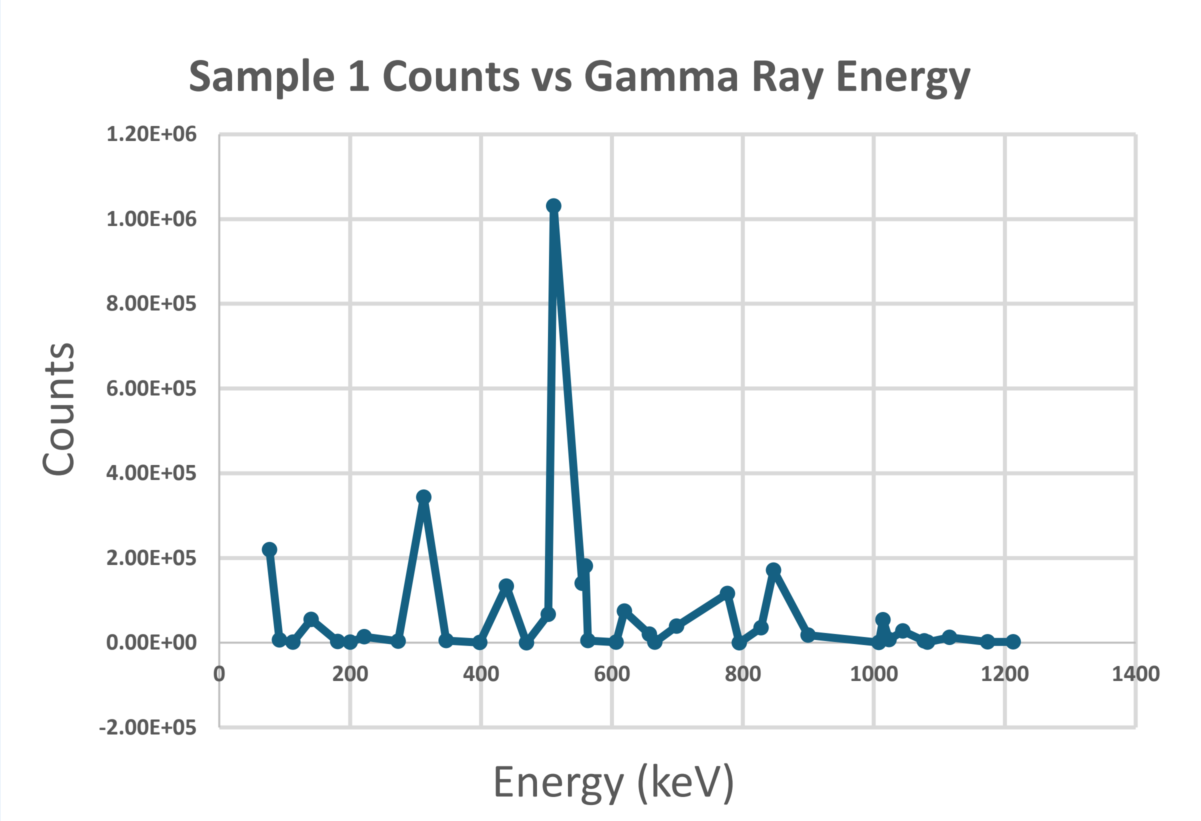
Lindsey Wright

Motivation

Arsenic concentrations in rice are on the parts-per-billion (ppb) level and are increasing worldwide, leading to significant health complications.

Experiment

2 Arkansas rice samples were activated in the University of Maryland Training Reactor to determine neutron activation analysis's (NAA) ability to monitor environmental contamination.

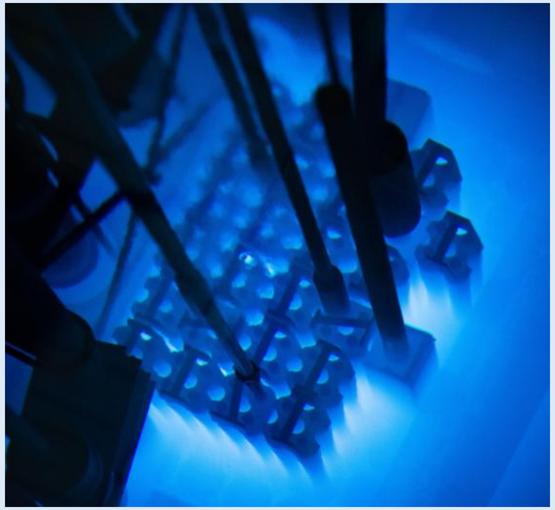


Conclusion

This experiment indicates NAA is an accurate technique to identify contaminated soil and influence remediation efforts to increase public health safety.

Results

Using gamma spectroscopy analysis and a certified rice standard, arsenic levels of 143 and 134 ppb were measured, consistent with known values.

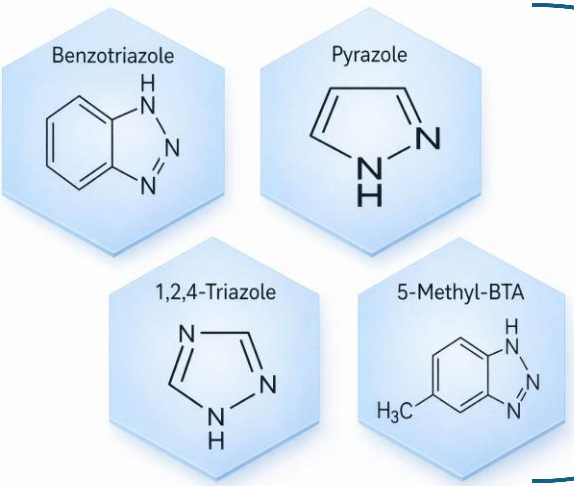


UMD Reactor Core

Dose-Driven Degradation of Azole Emerging Contaminants in Water by Electron Beam Irradiation

Haulison Yayoh, Mark Driscoll, Richard List
Department of Chemistry, State University of New York College of Environmental Science and Forestry

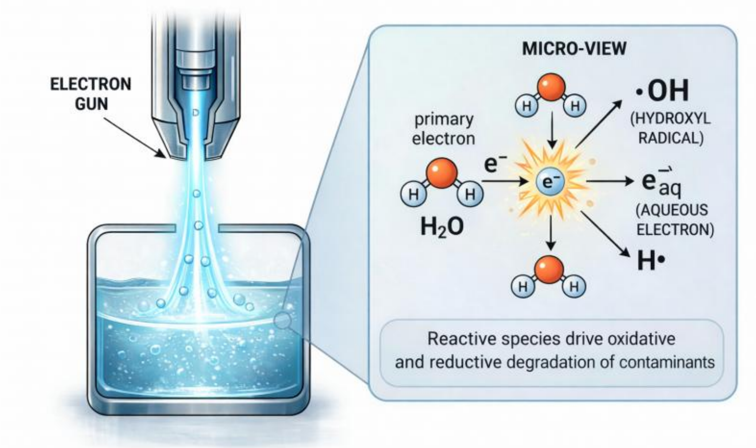
Azole Contaminants of Emerging Concern

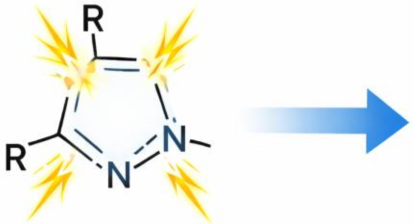


- Persistent
- Potential Toxicity
- Bioaccumulation

RESISTANT TO CONVENTIONAL TREATMENT METHODS

Electron Beam Irradiation

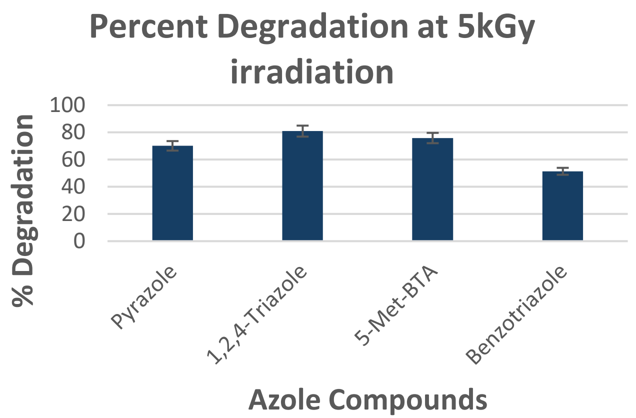




Transformation products

UHPLC-MS/MS

Result



Up to 80% degradation with low energy electron beam