Radiation Injury Treatment Network®

<INSERT SPEAKER CONTACT INFO HERE>

Refer to notes for talking points and draft script.

As of July 2018
Why Everyone Should Care

• Government Is Not Taking the Threat Lightly
• FDA Approves for treatment of ARS
  • Filgrastim (March 2015)
  • Pegfilgrastim (Nov 2015)
  • Sargramostim (March 2018)
• These drugs being added to Strategic National Stockpile for a disaster
Agenda

• What is RITN?
• What is RITN preparing for?
• How RITN fits into the response
• Casualty Profile & Care
• Preparedness Initiatives
• Resources
What is RITN?
What is RITN? And why create it?

80 Cancer centers, blood donor centers and cord blood banks preparing to care for patients with ARS
Why Cancer Centers?

- Bone marrow is the most sensitive organ in the body to ionizing radiation.
- Doses >2 Gy** of ionizing radiation can cause Acute Radiation Syndrome (ARS).
- ARS mimics what BMT/hematology/oncology staff see daily while treating patients with blood cancers.
- Through cancer treatment process patients are irradiated or given chemotherapy to destroy their immune system (marrow).
- Failure to restore would result in death.


**Chest CT = 7 mSv : ~0.007 Gy == 2 Gy ~286 chest CTs
** PET/CT = 25 mSv : ~0.025 Gy == 2 Gy ~ 80 PET/CTs
# Radiation Injury Treatment Network

## Transplant Centers

<table>
<thead>
<tr>
<th>State</th>
<th>City</th>
<th>Facility Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Birmingham</td>
<td>Children's Hospital</td>
<td>Ped NDMS HPP</td>
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<tr>
<td>AL</td>
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<tr>
<td>ND</td>
<td>-</td>
<td>NMDP operated donor center</td>
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<tr>
<td>CO</td>
<td>-</td>
<td>Colorado Marrow Donor Program</td>
<td>CO</td>
</tr>
</tbody>
</table>

## Associate Donor Centers

- CA - City of Hope National Medical Center
- CO - Colorado Marrow Donor Program
- MD - C.W. Bill Young Marrow Donor Center
- TN - Blood Assurance

## Associate Cord Blood Banks

- CA - StemCyte International Cord Blood Center
- CO - University of Colorado
- IL - ITM Cord Blood Services
- MO - St. Louis Cord Blood Bank
- NC - Carolinas Cord Blood Bank
- TX - MD Anderson

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TC 69  
DC 5  
CRIS 6  
Total 80

Total NDMS Centers 57 83%  
Total MDP Centers 83 91%  
Total Pediatric or Ped/Adult 35 51%

As of January 2018

*please report any corrections to this document to RITN@nmdp.org
Federal Plans Involving the RITN

- White House: Planning Guidance for Response to a Nuclear Detonation
- FEMA: Nuclear/Radiological Incident Annex
- ASPR: Radiological Dispersal Device Playbook
- ASPR: Rad/Nuke Annex to All Hazards Plan
- ASPR: State & Local Planners Playbook for Medical Response to a Nuclear Detonation
- ASPR: Medical Planning and Response Manual for a Nuclear Detonation Incident
- NLM: REMM-RITN Prototype for Adult & Pediatric Medical Orders During a Radiation Incident
Concept of Operations.... ConOps
Damage will not be as Catastrophic as a Military Nuclear Weapon

Anticipated Damage Zones from a 10 kT IND

- Epicenter of detonation

Damage Zones
- Severe: complete devastation/buildings collapsed
- Moderate: buildings damaged and roads impassible
- Light: windows and doors blown out


Fallout May Cause the Most Radiation Injuries

- The dose in the Dangerous Fallout zone could cause marrow injury
- Sheltering-in-place is key to reducing dose, as the hazard dissipates relatively quickly

# ARS Casualties from 10kT IND

<table>
<thead>
<tr>
<th>Radiation Dose (Gy)</th>
<th>Care Requirement</th>
<th>Casualty Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild (0.75-1.5)</td>
<td>Self Recover and Monitoring</td>
<td>91,000</td>
</tr>
<tr>
<td>Moderate (1.5-5.3)</td>
<td>Outpatient Monitoring And Specialized Supportive Care</td>
<td>51,000</td>
</tr>
<tr>
<td>Severe (5.3-8.3)</td>
<td>Specialized Supportive Care and Possible Transplant</td>
<td>12,000</td>
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<tr>
<td>Expectant (&gt;8.3)</td>
<td>Comfort Care</td>
<td>47,000</td>
</tr>
<tr>
<td>Combined Injury and Radiation (&gt;1.5)</td>
<td>Stabilization and monitoring, pending resource availability</td>
<td>44,000</td>
</tr>
</tbody>
</table>

**Table adapted from:** Knebel AR, Coleman CN, Cliffer KD; et al. Allocation of scarce resources after a nuclear detonation: setting the context. Disaster Med Public Health Prep. 2011;5 (Suppl 1):S20-S31

Estimate of 63,000 casualties for RITN
It is not the Cold War..... Nor is it a futile effort
Movement of patients through NDMS

- **Incident Location:** Victims triaged, decontaminated, then moved to RITN or other care facility through collaboration with HHS-ASPR.

- **RITN Transplant Centers:**
  - Patients transported for intensive supportive care.
  - RITN Centers receive patients to allow hospitals in impacted area to focus on incident response.
ARS Patient Profile

Total IND Casualties

90% of casualties will have trauma or combined injuries and receive treatment elsewhere.

Approximately 10% will have radiation only (ARS) injuries and be sent to RITN centers for definitive medical care.

• Follow standard approaches for patients with bone marrow toxicity from chemotherapy

• Based on severity of cytopenias and presence of complications (e.g. neutropenic fever)
  – Irradiated, leukoreduced transfusions
  – Antibiotics
  – IV fluid and other support
  – G-CSF
  – Hospitalization when indicated

• Daily CBCs to determine clinical need for treatment

• Biodosimetry
  – Using online algorithms (REMM & BAT)
  – Blood counts (before and after arrival at RITN centers)
  – Geographic dosimetry
  – Opportunity to apply new biodosimetry approaches
Only a small percentage would benefit from a transplant
Accomplishments & Resources
RITN Preparedness Efforts.... Exercises, Training and More....

Since 2006

650+ exercises
***All exercise materials available on RITN.net/exercises

15,000+ medical staff trained
***Free web-based courses available on RITN.net

16,900+ G-CSF doses on-hand inventory
***Fluctuates throughout year, is sum of inventory at each RITN hospital

+ 2,400 Adult & 1,600 ped ARS beds w/in 72 hrs *** as of May2016

80 cancer centers, blood donor centers, cord blood banks
Accomplishments

• Medical Guidance [www.RITN.net/treatment]
  – ARS Treatment Guidelines
  – Referral Guidelines
  – Adult and Pediatric Medical Orders in collaboration with REMM

• Training [www.RITN.net/training]
  – Mobile REAC/TS course
  – ARS Medical Grandrounds training
  – Web based training courses (basic radiation, ConOps, etc...)
  – Non-medical Radiation Awareness Course Adopted by NNSA for USAID staff

• Operations
  – Exercises
  – Web based data collection for ARS patients
  – RITN hospital “bed report +” integrated into GEO Health
Prototype for Adult Medical Orders During a Radiation Incident

Version: April 17, 2017

Cautions

• Authored by REMM and RITN physicians, this set of orders is a prototype only.
• Orders must be customized for each patient and incident.
• Specific drugs are suggested for function only. Patients may not need any/vary category of drug listed.
• No HHS, CDC, FDA, or other US government entity endorsement of specific drugs or drug doses is intended or implied by inclusion in this order set.
• Consult the notes at the end of this document for additional, key information.

Internal contamination (decontamination treatments)

- This Adult Orders Prototype lists only FDA-approved medications as radiotrace countermeasures.
- Some, but not all of these drugs are currently in the Strategic National Stockpile.
- Prescribers should consult the FDA drug label for complete prescribing information.
- Decoaration drugs should be used in children with great caution.
- The online version of REMM has additional recommendations about additional countermeasure drugs that may be considered.
- This prototype does not address threshold levels of internal contamination that would trigger initiation, continuation, or discontinuation of decontamination treatment. See REMM Countermeasures Caution and Comment, which discusses this issue.

Drug dosages

- All adult drug doses in this prototype are based on a 70 kg adult with normal renal and hepatic function.
- Appropriate dose adjustments should be made based on age, weight, drug-drug interactions, nutritional status, renal, and hepatic function.

- After a mass casualty incident, practitioners may encounter counterfeit drugs. This

Prototype for Pediatric Medical Orders During a Radiation Incident

Version: April 17, 2017

Cautions

• Authored by REMM and RITN physicians, this set of orders is a prototype only.
• Orders must be customized for each patient and incident.
• Specific drugs are suggested for function only. Patients may not need any/every category of drug listed.
• No HHS, CDC, FDA, or other US government entity endorsement of specific drugs or drug doses is intended or implied by inclusion in this order set.
• Consult the notes at the end of this document for additional, key information.

Internal contamination (decontamination treatments)

- This Pediatric Orders Prototype lists only FDA-approved medications as radiotrace countermeasures.
- Some, but not all of these drugs are currently in the Strategic National Stockpile.
- Prescribers should consult the FDA drug label for complete prescribing information.
- Decoaration drugs should be used in children with great caution.
- The online version of REMM has additional recommendations about additional countermeasure drugs that may be considered.
- This prototype does not address threshold levels of internal contamination that would trigger initiation, continuation, or discontinuation of decontamination treatment. See REMM Countermeasures Caution and Comment, which discusses this issue.
Please choose a section from the list below:

- Principles of ARS management at RITN centers
- Altered standards after a nuclear detonation
- Acute Radiation Syndrome
- Casualty triage after a nuclear detonation
- ARS management
- Stem cell support: when to HLA type casualties
- Additional Resources

Decision to perform HLA typing

Factors favoring HLA typing*

- Estimated whole body dose > 3 Gy
- Neutrophil count < 100/µl by day 6 (see slide 26)
- Rapid drop of platelets (see slide 27)
- Expected to survive other injuries

Expedited HLA typing will be available using buccal swab, with high resolution DNA typing of HLA-A, -B, -C, -DRB1, and -DQB1

*Guidance for obtaining HLA typing can be obtained by contacting the NMDP or the closest RITN center:
  - NMDP HLA typing guidance: 1 (800) MARROW2 or (612) 627-5800
  - For an updated map and list of RITN centers: http://www.ritn.net/about/
  - RITN Participating Centers General Contact Directory: http://www.ritn.net/Contact/

Decision to recruit a donor for evaluation

Factors favoring recruitment of a donor

- Bone marrow is aplastic at 2 sites >14 days after exposure
- Neutrophil count < 100/µl after 5 days of myeloid cytokine therapy
- Expected to survive other injuries
- Suitable donor is available:
  - 8/8 match (HLA-A, B, DRB1) using bone marrow or PBSCs
  - Alternatives, if a matched donor is unavailable:
    - At least 6/6 matched umbilical cord blood of adequate cell number
    - Haploidentical donor
    - Mismatched, related or unrelated donor with T-cell depletion

Check www.ritn.net for updates to these guidelines.
Referral Guidelines: www.RITN.net/treatment

Guidelines for Identifying Radiation Injury and Considering Transfer to a Specialized Facility

Purpose: to provide hospitals with a concise guide for identifying casualties in the aftermath of a radiation incident who may have received a clinically significant dose of radiation.

Regional RITN hospital contact information for specialized consultation:

Hospital Name:
Department:
Phone:
E-mail:

Overview: Ionizing radiation affects the hematopoietic system even at very low doses; hematology and oncology medical staff treat these effects daily. Irradiated patients may develop severe organ dysfunction over time and require intense and specialized management.

For extensive information on the acute radiation syndrome (hematologic, gastrointestinal, cutaneous, central nervous system), types of radiation incidents, and radiation decontamination, see: www.remm.nlm.gov (Radiation Emergency Medical Management (REMM) website)

Consultation/Referral Criteria: Any patient suspected of having a radiation injury can be discussed with your local RITN center. The ability to accept referrals will depend on the size of the incident and the capacity of regional RITN center(s).

a. Criteria for considering RITN center consultation/referral include:
   i. Absolute neutrophil count less than 1,000/µL
   ii. Absolute lymphocyte count less than 1,000/µL
   iii. Severe nausea, vomiting and/or anorexia
   iv. A localized cutaneous radiation injury that requires extensive management
   v. Suspected or known internal contamination (e.g. involving a wound, the lung or GI tract)
   vi. Current facility not equipped to provide irradiated, leukoreduced blood products
Medical Grandrounds: Medical Response to Radiation Exposure: the Role of Hematologists
Rev. March 2016

Agenda

- Radiation Injury Treatment Network
- Radiological Event Scenarios
- Radiation Biology
- Dosimetry
- Acute Radiation Syndrome
- Mitigation and Treatment
- Available resources
Web Based Training on RITN.net/training (FREE TRAINING)

• Web based training
  – Intro to RITN
  – Basic Radiation Training
  – RITN Concept of Operations
  – Radiation Safety Communication
  – GETS Card 101
  – Satellite Telephone 101
  – Non-Medical Radiation Awareness Training (ESL)

• Medical Grand Rounds training

Adopted by NNSA for USAID training
Exercise Materials on RITN.net/exercises

- Tabletop SITMANs (13 years of exercises and results)
- Regional Tabletop and Full scale exercise materials
- Data from exercises
- AARs

Big Apple
10 Kiloton Nuclear Explosion
Regional Radiation Injury Treatment Network Tabletop Exercise
June 25, 2014

AFTER ACTION REPORT/IMPROVEMENT PLAN
FINAL DRAFT – August 21, 2014

RITN Midwest Coordination & Treatment of a Radiation Mass Casualty Incident Tabletop Exercise
After-Action Report/Improvement Plan
August 2013
• RITN What You Need to Know (Video): 4 min overview video

+ 

• Exercise videos
Resources

www.RITN.net

www.REMM.NLM.gov

Download the phone App or the entire site to your computer
Critical to Success

Partners