

# **NIH/NIAID Radiation/Nuclear Medical Countermeasures Development Program**

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# NIAID Radiation/Nuclear Medical Countermeasures Development Program

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- **HHS assigned NIH/NIAID with the responsibility to identify, characterize and develop new medical countermeasure products against radiological and nuclear attacks that may cause a public health emergency.**
- **Research priority areas of the program are to develop:**
  - **Drugs to treat or mitigate radiation injury**
  - **Drugs to remove radioactive materials from the body**
  - **Biodosimetry tools to determine levels of radiation exposure received by an individual**

# Types of Radiation Exposure

- Radiological terrorist events
  - RDD (Dirty Bombs)
  - RED
  - Food or Water Contamination
- Nuclear detonation
- Accident
  - Power Plant Release
  - Sealed radiological sources



# NIH Strategic Plan and Research Agenda for Medical Countermeasures Against Chemical Threats



05.2005

## NIH Strategic Plan and Research Agenda for Medical Countermeasures Against Radiological and Nuclear Threats



Department of Health and Human Services  
National Institutes of Health  
National Institute of Allergy and Infectious Diseases  
NIH Publication No. 05-5608



# **Components of NIH Strategic Plan and Research Agenda**

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- **Basic & Translational Research**
- **Radiation Biodosimetry**
- **Focused Product Development**
- **Infrastructure for Research & Product Development**



# Radiation Countermeasure Mission Space

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## ■ ARS/DEARE

- Hematopoietic ARS:
  - Neutropenia
  - Thrombocytopenia
  - Anemia
  - Lymphopenia
- GI ARS
- CNS Injury
- Cutaneous Injury
- Lung Injury
- Kidney Injury
- Combined Radiation Injury

## ■ Biodosimetry Methods and Devices

## ■ Radionuclide Threats

- Am-241
- Co-60
- Cs-137
- I-131
- Ir-192
- Po-210
- Pu-238/239
- Sr-90
- U-235

## ■ Late Effects

- Carcinogenesis
- Cardiovascular Disease
- Cataractogenesis

# Radiation/Nuclear Medical Countermeasures

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## ■ Mechanisms of Action

- Anti-oxidants
- Anti-inflammatories
- Anti-apoptotics
- Growth factors and cytokines
- Cell-based therapies
- Others

## ■ Radiation Syndromes

- Acute radiation syndromes (HE, GI, CNS)
- Delayed effects of radiation exposure (skin, lung, kidney, others)

## ■ Radionuclides

- Blocking agents
- Decorporation agents

# NIAID's Radiation/Nuclear Medical Countermeasures Program



Build Infrastructure  
and Research Capacity



Basic Research and  
Discovery



ARS Treatments and  
Radionuclide Decorporation  
Agents Development



Biodosimetry

**NIAID**

Product  
Development  
Support Services



# Radiation/Nuclear Medical Countermeasure Development Programs

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## ■ Cooperative Agreements

- Centers for Medical Countermeasures against Radiation

## ■ Specific Tissue Injury Grants

- Immune reconstitution
- Oral Decorporation Agents
- Mechanisms, Diagnostics, and Medical Countermeasures (MCMs)
- Gastrointestinal MCMs
- Lung MCMs
- Skin MCMs
- Combined Injury MCMs

## ■ SBIR

- Medical Countermeasure Development
- NIAID Omnibus

## ■ Contracts

- Oral Forms of DTPA (2)
- RERF
- Product Development Support Services

## ■ Inter/intra Agency Agreements

- NCI
- NIA
- NIDDK
- NIH RAID
- AFRRRI

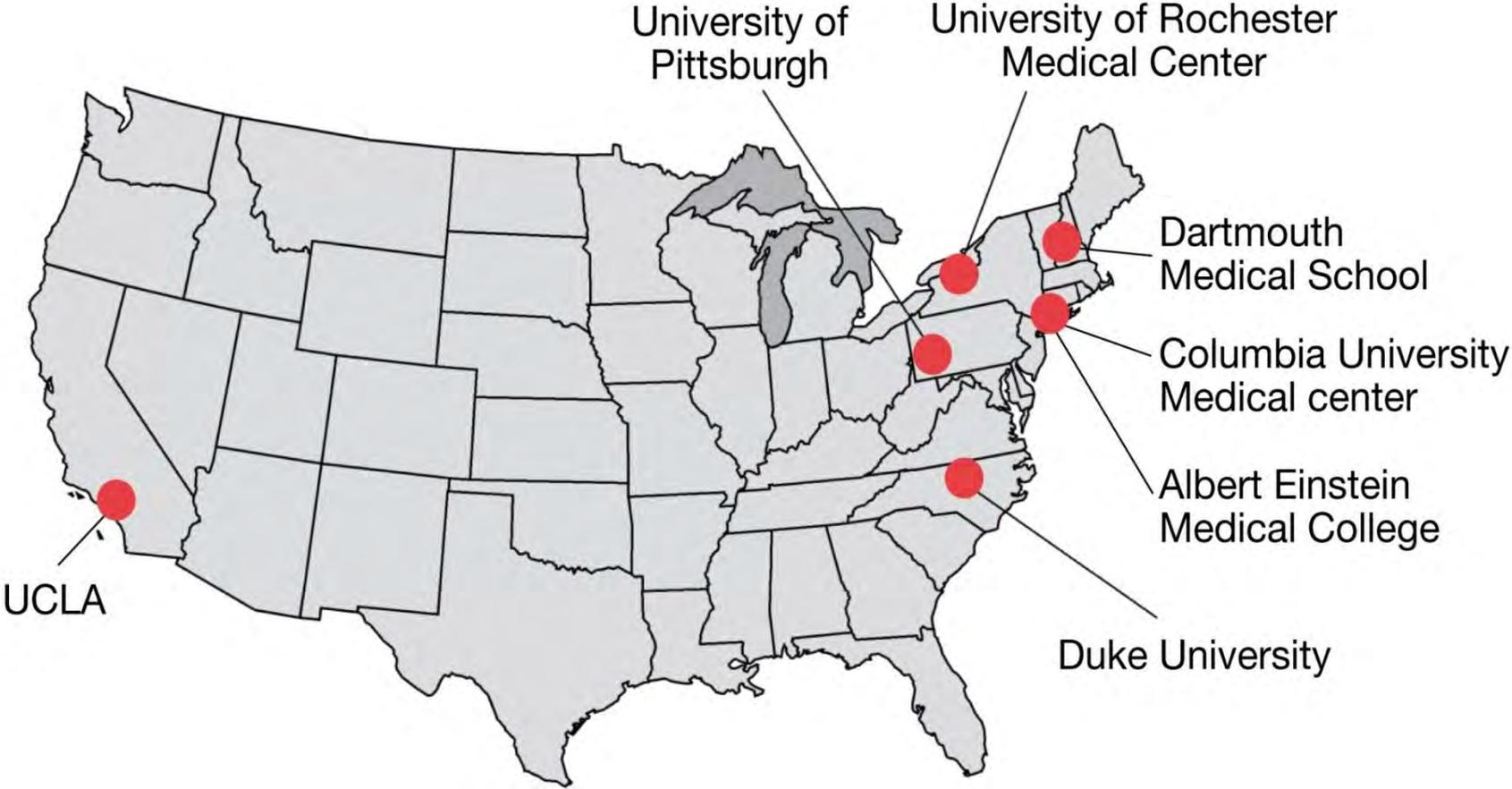
## ■ Company Collaborations

- Contacts and presentations
- Candidate efficacy screen
- Candidate Optimization
- Candidate Development

## ■ International Collaborations

# Centers for Medical Countermeasures against Radiation – 2010-2014

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# **MCM Tissue Specific Injury Mitigation Grant Programs:**

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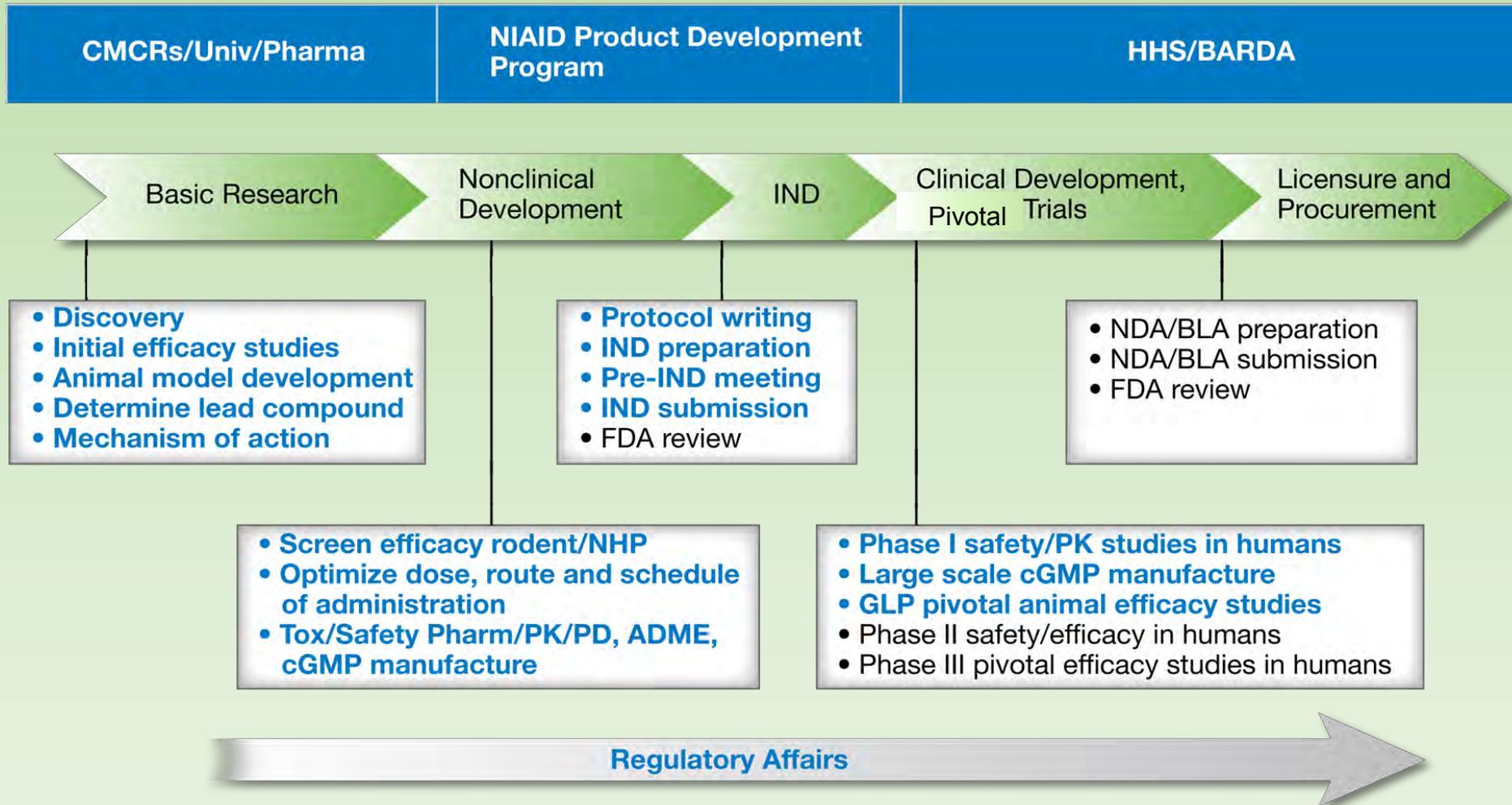
- **Investigator-initiated awards (R01s); 11 grants**
- **Radiation Combined Injury (R21/R33s); 11 grants**
- **Thrombocytopenia; 7 grants**
- **Lung Radiation Injury; 9 grants**
- **Cutaneous Radiation Injury; 4 grants**
- **RC2 GO Grants; 5 GI and 1 Decorporation Agent**

# Product Development Support Services Contractor Capabilities

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- Evaluate efficacy of candidate countermeasures
  - Acute Radiation Syndrome
    - Rodent hematological and gastrointestinal models
    - NHP hematological models
    - Developing canine hematological model (Thrombocytopenia)
    - Developing NHP gastrointestinal model
  - Radionuclide Decorporation Agents
- cGMP manufacturing support and stability studies
- GLP toxicology and safety pharmacology studies
- GLP pivotal animal efficacy studies (Animal Rule)
  - NHP and rodent models for efficacy in ARS
- Phase I clinical safety and pharmacokinetic studies
- FDA submission support for p-IND

# Radiation/Nuclear Medical Countermeasure Product Development Pathway



NIAID program capabilities are in blue.

# **Radionuclide Medical Countermeasures Development Programs**

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## **■ Background**

- Oral administration for mass casualty use**
- Enhanced decorporation efficacy**
- Increase range of radionuclides**

## **■ Contract and Grant Programs**

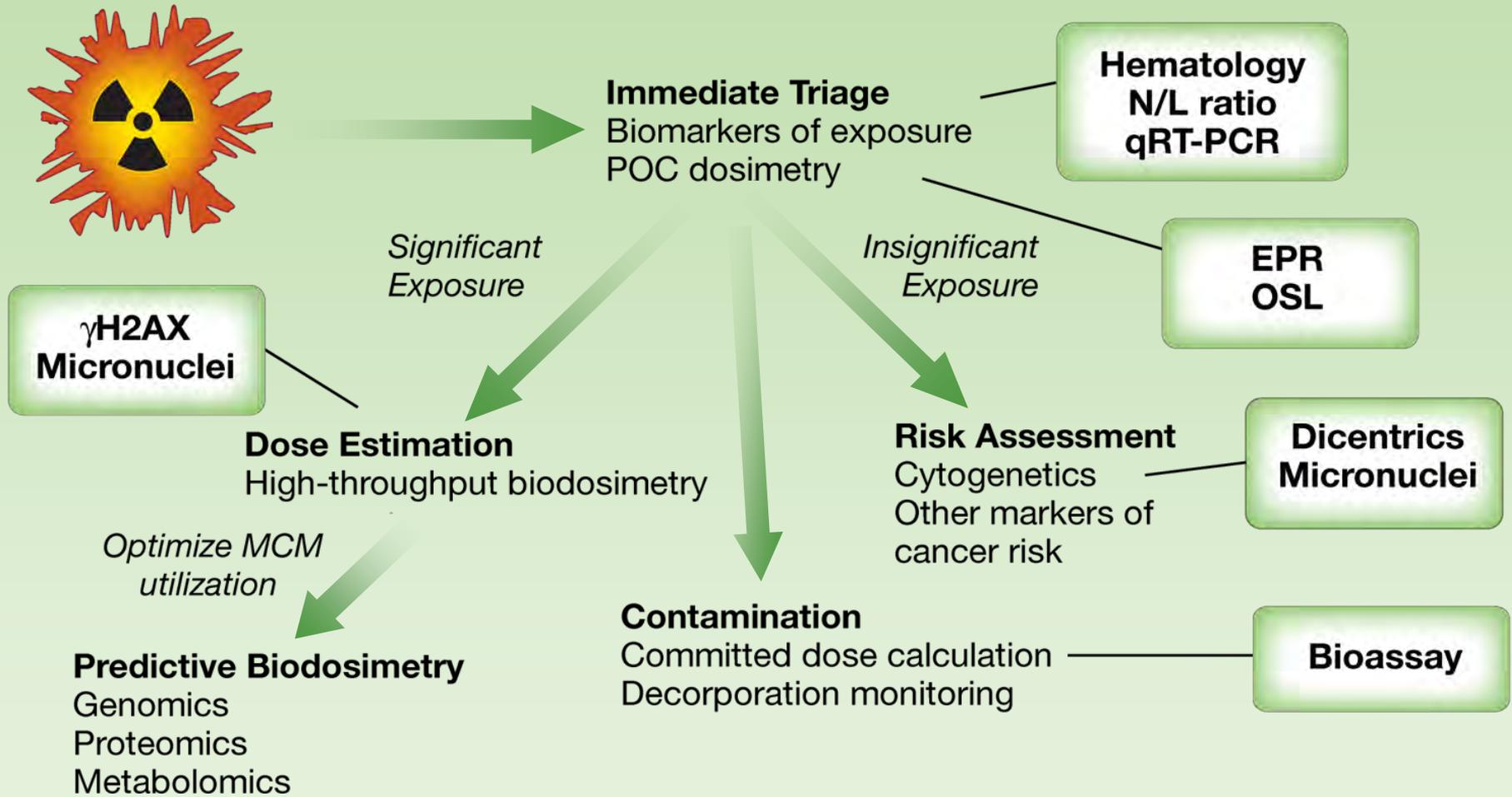
- Oral Form of Diethylenetriaminepentaacetate (DTPA)**
- Oral Radionuclide Decorporation Agents**

# Biodosimetry Program

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- **Technical Requirements of a Biodosimetry Architecture**
  - Capability for rapid screening of large populations
  - Sufficiently accurate to guide clinical decision-making
  - Sufficiently flexible to address different needs for different types of radiation exposures
  
- **Medical / Operational Impact**
  - Identification of patients requiring urgent medical assessment/triage
  - Optimization of resource allocation
  - Reassurance for anxious individuals
  - Improved risk assessment for delayed or late effects of radiation exposure
  - Identify specific tissue/organ injuries
  - Monitoring of therapy (bioassays)

# Biodosimetry Architecture



# Successful Radiation/Nuclear Medical Countermeasure Product Development

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- **Urgency and priority for national preparedness for rapid development and licensure of safe and effective medical countermeasures**
- **Success will require unprecedented collegial collaboration, communication, coordination, and interaction among**
  - **Government agencies especially FDA, CDC, NIH, HHS, DOD**
  - **Pharmaceutical industry**
  - **Academia**
- **Product development plans need to be developed with label indication in mind**

# Bridging the Radiation/Nuclear Medical Countermeasure “Animal Rule Pathway”

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Discovery, Research,  
and, Development

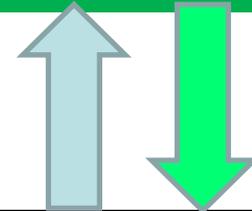
Licensure and  
Procurement

Government, Academia, Corporate Partnerships

Food and Drug Administration – CDER, CBER, and CDRH

National Institute of Allergy and Infectious Diseases

HHS/Biomedical Advanced Research and Development Authority



# **NIAID Radiation/Nuclear Medical Countermeasures Development Program Team**

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# Radiation/Nuclear Medical Countermeasures Product Development Program

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