

# **Radiation Countermeasures: The Need for Predictive Biomarkers**

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# Outline

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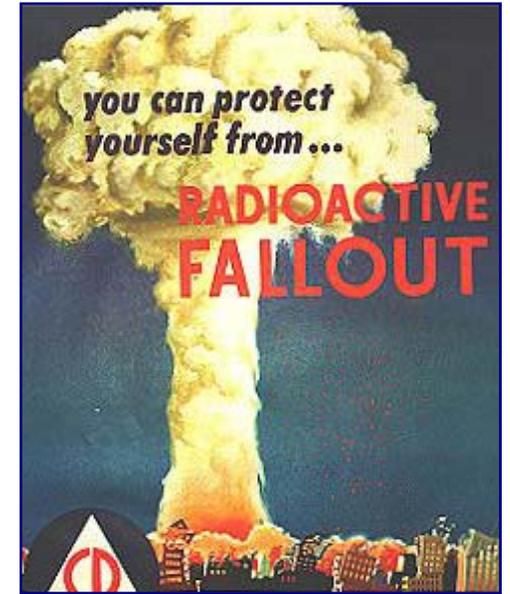
- **Threats**
- **Medical Countermeasures Enterprise**
- **Program**
- **Predictive Biomarkers**

# Radiological/Nuclear Threats

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- Nuclear Detonation
- Radiologic disperseive devices (“dirty bombs”)
- Industrial and shipping accidents
  - Power plant releases
  - Food and medical irradiators
  - Sealed sources



# Improvised Nuclear Device (IND)

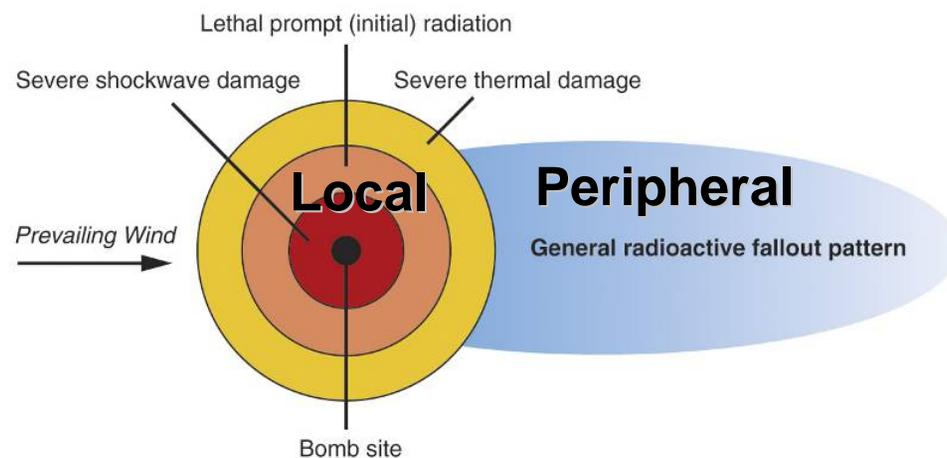
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- If a 10 KT IND is detonated in a major U.S. city hundreds of thousands of victims will need treatment for effects of radiation exposure – and many times that many may request evaluation (“worried well”).

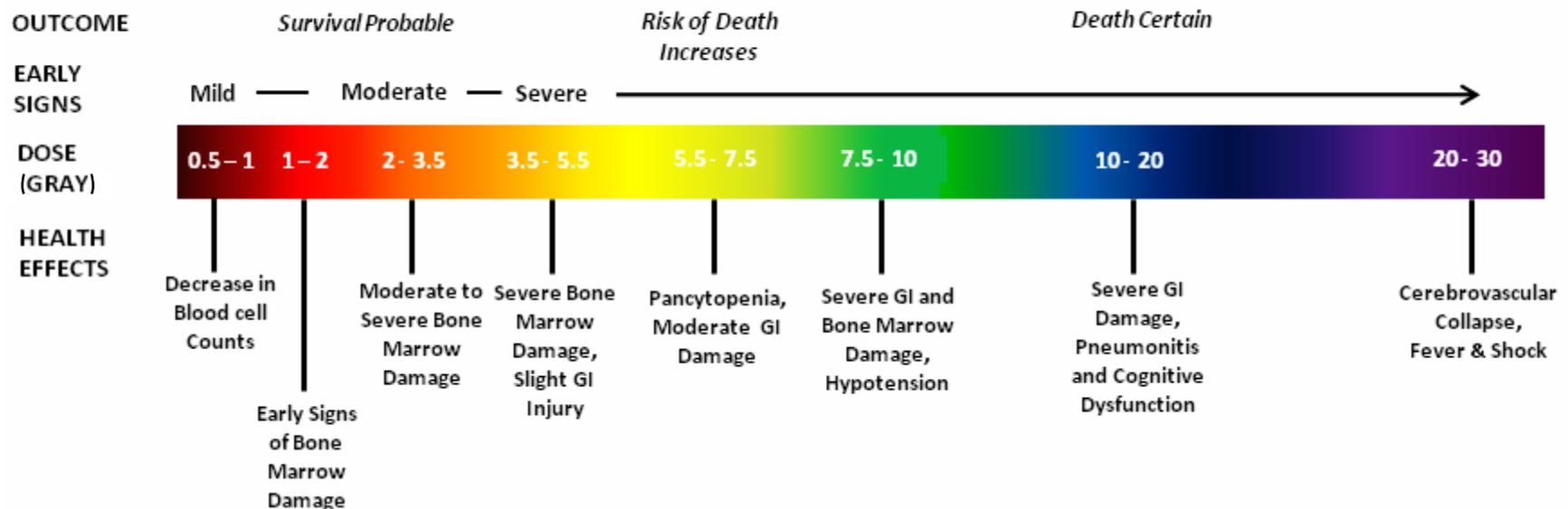
- 10 KT IND scenario

- Medical consequences

- Local Primary Event
      - ❖ Prompt radiation
      - ❖ Burn and blast
      - ❖ Combined injury
    - Peripheral Secondary Events
      - ❖ Fallout radiation

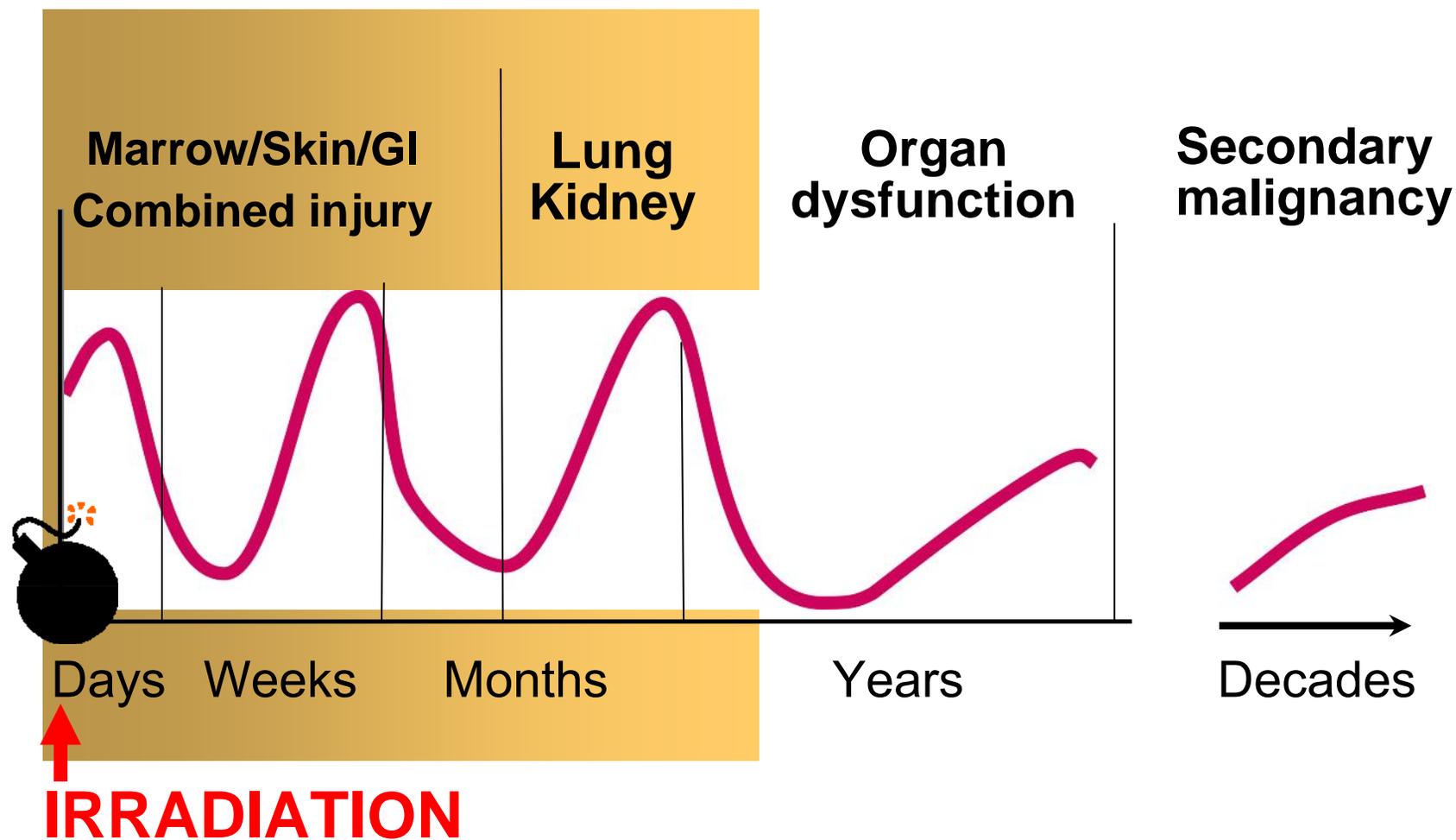


# Spectrum of Radiation Health Effects



# Syndromes Manifest Over Time

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# Radiation Countermeasure Mission Space

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- ARS/DEARE
  - Hematopoietic ARS:
    - Neutropenia
    - Thrombocytopenia
    - Anemia
    - Lymphopenia
  - GI ARS
  - CNS Injury
  - Lung Injury
  - Kidney Injury
- Cutaneous Radiation Syndrome
- Combined Injury
- Radionuclide Threats
  - Co-60
  - Cs-137
  - Sr-90
  - I-131
  - Ir-192
  - Po-210
  - Ur-235
  - Pu-239
  - Am-241
- Carcinogenesis
- Cataractogenesis

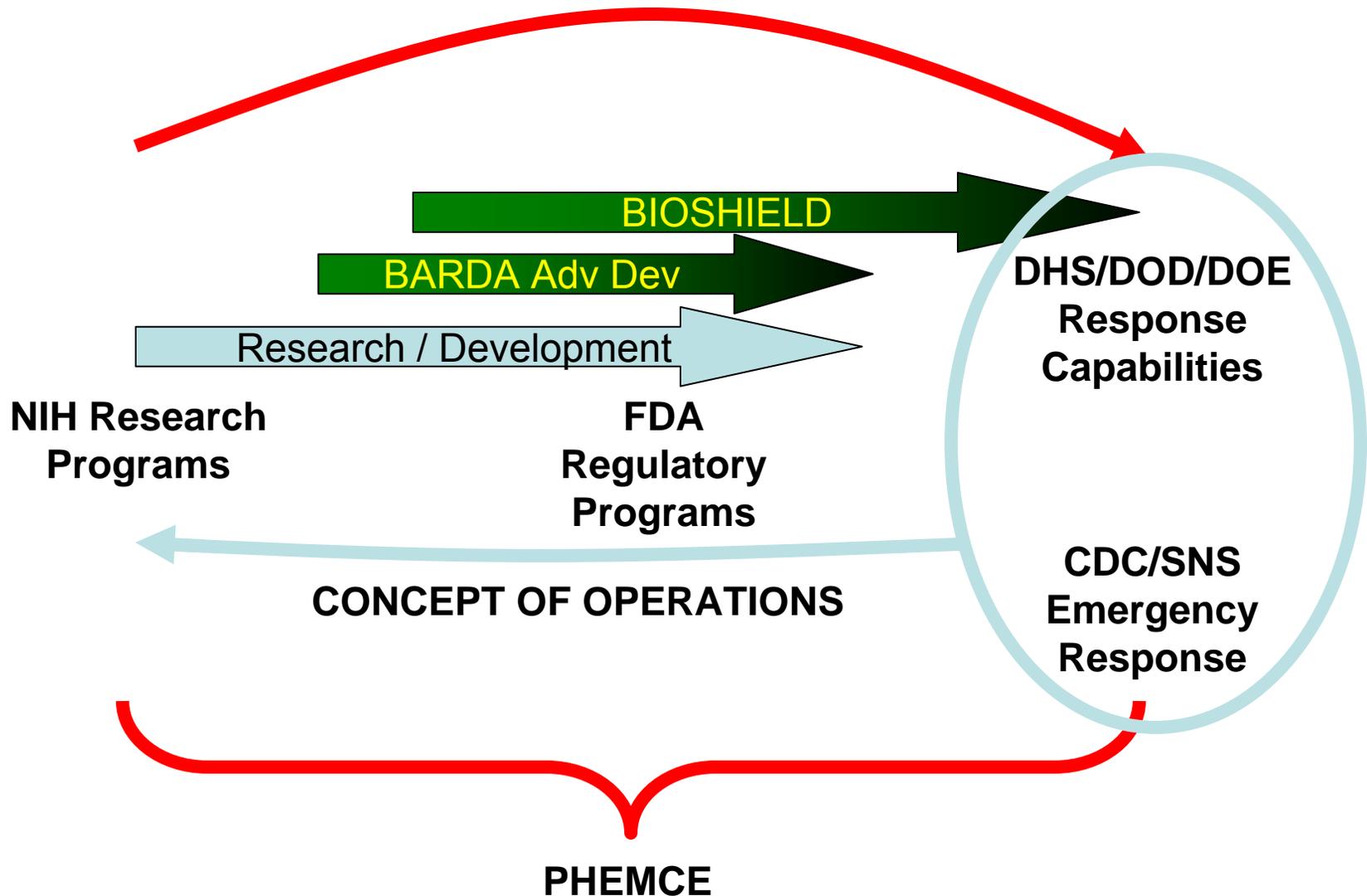
# HHS Public Health Preparedness: Complementary Roles

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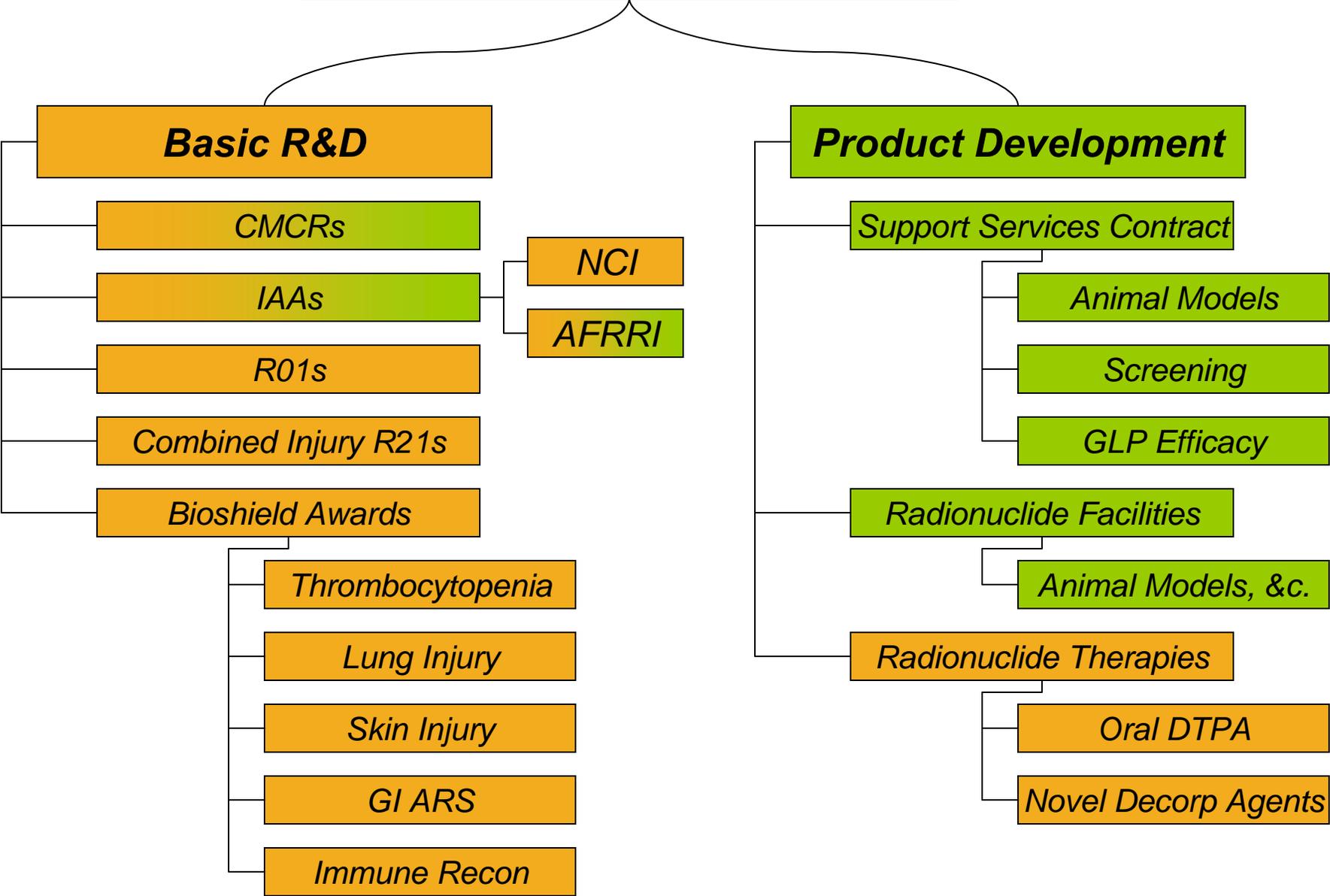
- CDC** →
- Surveillance and Detection
  - Train Local Response Teams
  - Maintain Vaccine/Antimicrobial Stockpiles
- NIH** →
- Conduct Basic Research
  - Develop Medical Interventions
  - Develop Research Infrastructure
- FDA** →
- Regulatory Approval
    - Vaccines
    - Therapeutics
    - Diagnostics
- ASPR** →
- HHS-Wide Coordination of Emergency Preparedness Activities

# The Big Picture

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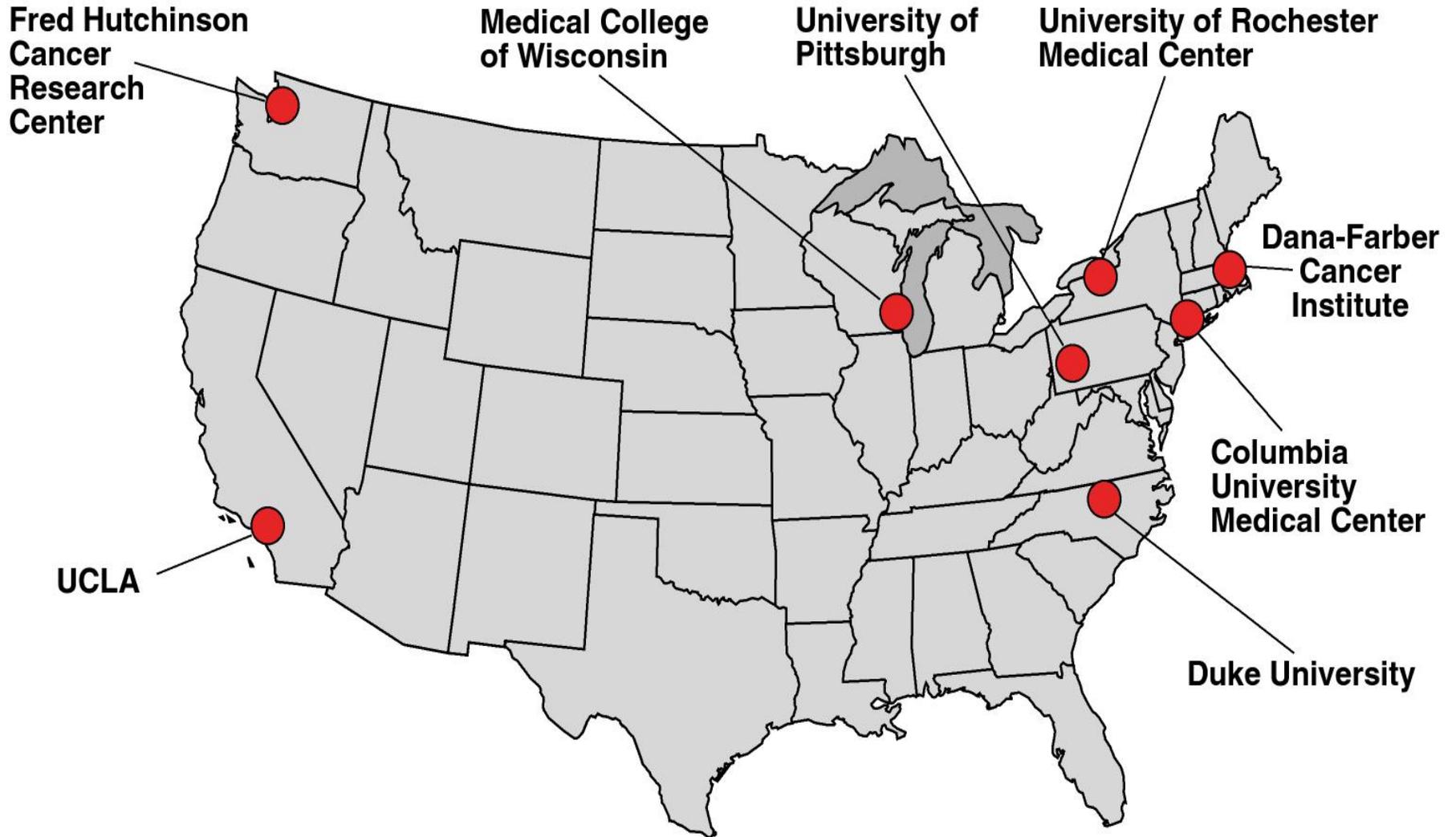


# RadNuc Countermeasures



# Centers for Medical Countermeasures Against Radiation (\$28.0M in FY08)

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# **Diagnosics Program**

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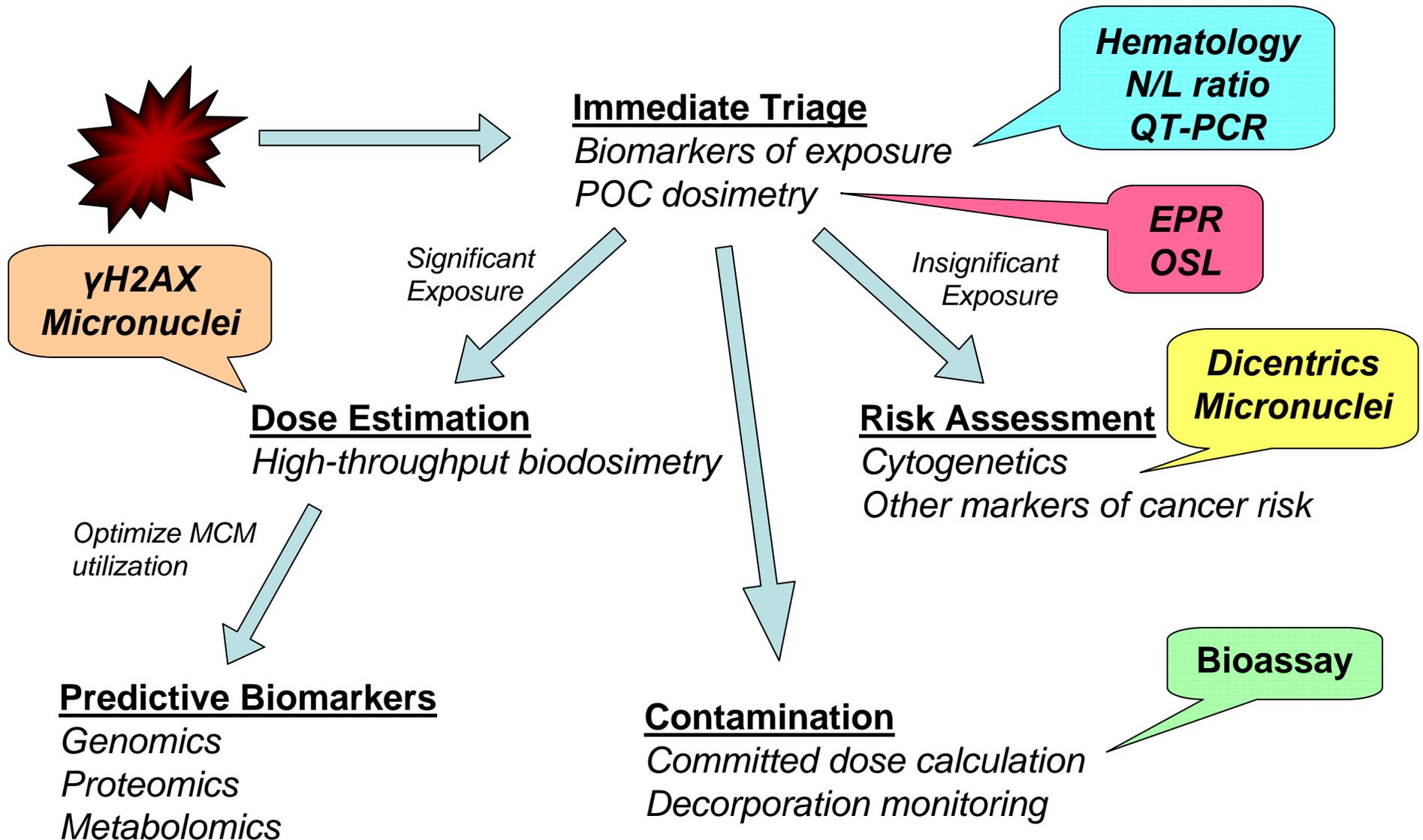
## **■ Technical Requirements of a Diagnostics Architecture**

- Capability for rapid screening of large populations**
- Sufficiently accurate to guide clinical decision-making**
- Sufficiently flexible to address different needs for different types**

## **■ Medical / Operational Impact**

- Optimization of resource allocation**
- Identification of patients requiring urgent medical assessment**
- Reassurance for anxious individuals**
- Improved risk assessment for delayed or late effects of radiation exposure**
- Monitoring of therapy (bioassays)**

# Diagnosics architecture



# NIAID Rad/Nuc Website

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<http://www3.niaid.nih.gov/research/topics/radnuc>



**Questions?**