

**Self-indicating**

**Intant**

**Radiation**

**Alert**

**Dosimeters**

**(SIRAD<sup>®</sup>)**

**SACHIN FILTECH Pvt. Ltd**

**(EXCLUSIVE DISTRIBUTOR FOR INDIA)**

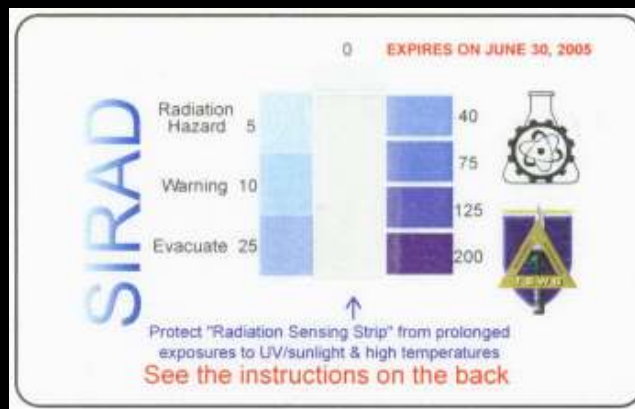
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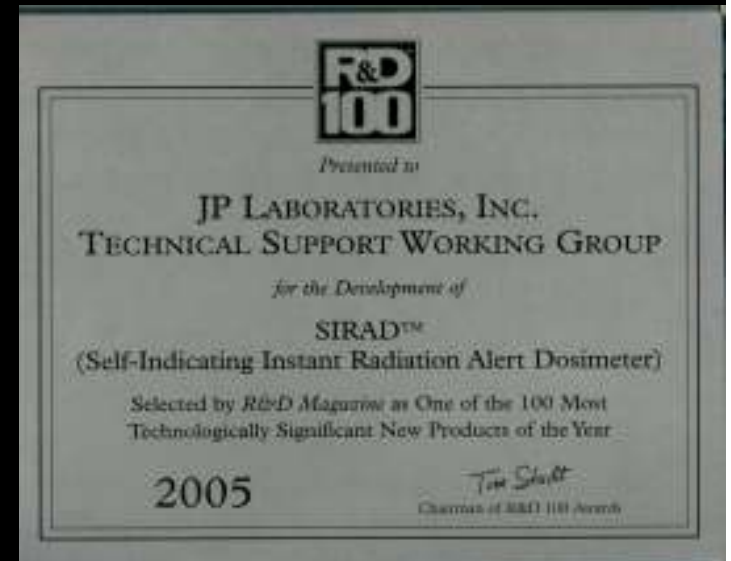
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**A FAMILY OF SMART RADIATION DOSIMETERS**

# SIRAD<sup>®</sup> TECHNOLOGY AN ULTIMATE IN CASUALTY DOSIMETRY

AN AWARD WINNING TECHNOLOGY  
PIONEERED BY  
Gordhan Patel/JP LABORATORIES



**RADIOLOGICAL  
INCIDENCES  
(e.g., DIRTY BOMB)  
&  
NEED FOR SIRAD®**

# RADIOLOGICAL INCIDENTS/ACCIDENTS

- Nuclear power plants
- Radioactive materials/waste storage facilities
- Nuclear submarines
- Radiation processing and treatment facilities (hospitals)
- Nuclear processing facilities
- Nuclear bombs detonation
- Dirty bombs/Radiological Dispersion Devices (RDD) detonation



## MAJOR OBJECTIVES OF A DIRTY BOMB

- Make property uninhabitable
- Generate widespread panic as those in the affected area fear radiation exposure
- Radiation (high dose) known to cause cancer.



Scientific American, November 2002: A simulated detonation of radioactive cesium-137 (3,500 curies) dirty bomb at the lower tip of Manhattan Island.

# TERROR WEAPONS & THEIR EFFECTS

<b>Weapon</b>	<b>Availability</b>	<b>People killed</b>	<b>Property Damage</b>	<b>Duration</b>
<b>Explosive</b>	Easy	Yes/Many	Yes/Large	Shortest
<b>Chemical</b>	Difficult	Yes/Many	No	Short
<b>Biological</b>	Difficult	Yes/Many	No	Short
<b>Dirty Bomb</b>	Very difficult	Few but panic & life time worry	Huge	Longest
<b>Nuclear</b>	Almost impossible	Huge number	Huge	Long

## CHEMICAL Vs RADIOLOGICAL ACCIDENTS

- **BHOPAL, INDIA**  
(Worst chemical accident)  
Re-inhabited in days for ever
- **CHERNOBYL, UKRAINE**  
Will never be re-inhabited



**RADIATION**

**AND**

**HUMAN HEALTH**

# RADIATION EXPOSURES

- Chest X-ray 0.3 mSv
- Natural background 2.5 mSv/year
- Gastric fluoroscopy 4 mSv
- CT (head and body) 10.0 mSv

1 rad = 0.01 Sv (Sievert)\*

1 rad = 10 mSv (miliSievert)

1 rad = 0.01 Gy (Gray),

1 rad = 1 rem\*

\* 1 rad = 1 rem/0.01Sv  
(for tissue equivalent materials)



# ACCEPTABLE RADIATION EXPOSURES

- **US NRC Guidelines for Radiation workers**
  - **50 mSv/5 rads: Yearly limit**
  - **250 mSv/25 rads: Life time limit**
- **US EPA Guidelines for Emergency workers (once-in-a-lifetime event)**
  - **250 mSv/25 rads: For voluntary maximum radiation dose to emergency workers for non-life saving work during a reactor emergency.**
  - **750 mSv/75 rads: For maximum radiation dose to emergency workers volunteering for life saving work.**

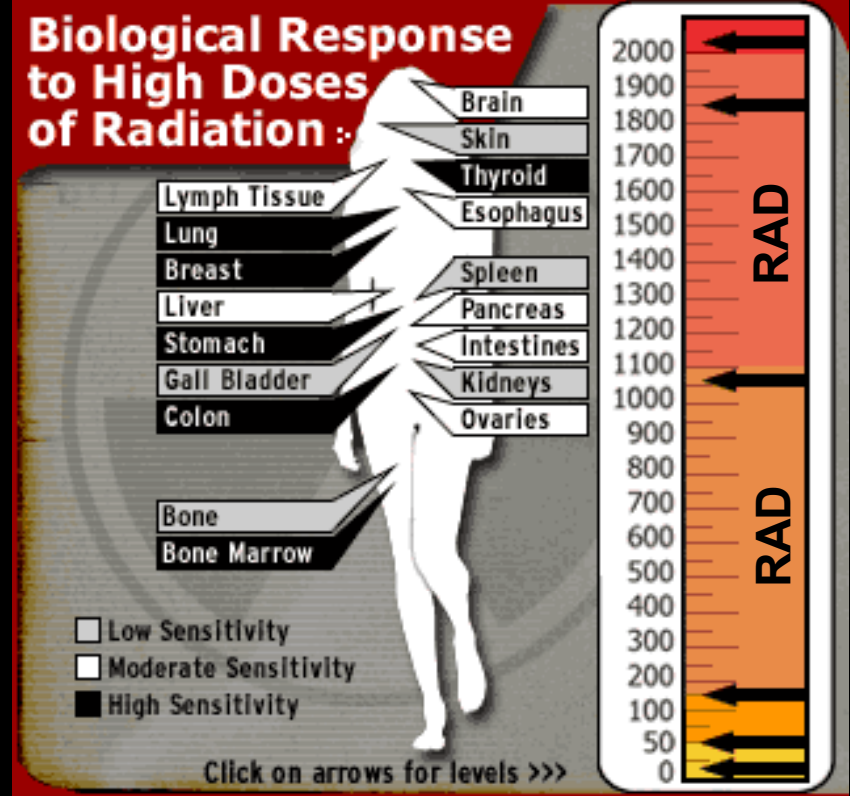


US NRC: United State Nuclear regulatory commission

US EPA: United States Environmental Protection Agency

# ACUTE RADIATION EXPOSURE

- 0-250 mSv:** No observable effect
- 250-1,000 mSv:** Slight blood changes
- 1,000-2,000 mSv:** Significant reduction in blood platelets and white blood cells (temporary)
- 2,000-5,000 mSv:** Severe blood damage, nausea, hair loss, hemorrhage, death in many cases
- >6,000 mSv:** Death in less than two months for over 80%



**ACCIDENTS**

**AND PANIC**

# PANIC



**31 August 2005: Stampede in Baghdad Kills Over 800 Shiite Pilgrims**

# WORRY

- Most experts agree that in the event of a dirty bomb attack, the greatest number of casualties would result from panic and worry.



# IN THE EVENT OF A DIRTY BOMB DETONATION

## How to Minimize Panic and Concern?

- Educate public about radiation and its effects
- Provide radiation dosimeters capable of monitoring harmful dose before an attack
- If they know they received...
  - Very low dose (e.g., below 10 mSv): It is less likely widespread panic would occur (vast majority would get below 10 mSv)
  - 50-250 mSv: They will be worried (a tiny fraction may get above 50 mSv)
  - Above 250 mSv: They will be treated first (least likely anybody would get above 250 mSv)

# HOW TO MINIMIZE THE PANIC

- When exposed to radiation from a "dirty bomb" or nuclear detonation, the sensing strip of SIRAD develops blue color instantly and the color intensifies as the dose increases, providing the wearer and medical personnel instantaneous information on cumulative radiation exposure of the victim.
- People who have not received high dose will not rush to hospitals. This will minimize the panic and people who received high dose will be treated first. It can take days to get that information by other methods. SIRAD is affordable.

# WOULD HIGH SENSITIVITY RADIATION DEVICES CAUSE MORE PANIC AND WORRY?

- Likely, especially for general public because:
  - Alarms will sound slightly above the natural background radiation
  - People may get over concerned
  - TLD/OSL/X-ray film type dosimeters are not instant, need to send back for analysis and takes days/weeks to get the results

TLD – Thermoluminescence

OSL – Optically Simulated Luminescence

# TYPE OF DOSIMETER NEEDED

- Instant, Self-indicating (color developing)
- User friendly, Inexpensive
- Light weight, Wearable
- Always ready without a power source
- Shelf life of at least one year
- Practically non-destructible
- Capable of monitoring 10-10,000 mSv

**SIRAD<sup>®</sup> FAMILY OF DOSIMETERS**

**IS THE ANSWER**