

# **PREPAREDNESS OF THE FIRST RESPONDERS FOR THE CBRNE INCIDENT CONSEQUENCE OPERATIONS**

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***CB 050 Military Chemistry, Toxicology and Protection Against High Toxic Agents  
Masaryk University, Faculty of Nature Sciences  
Spring 2011***

# Biography-Pavel Castulik

- Education: University of Defense, Chemical Engineering and NBC Defense, Dipl. Eng., PhD
- Commander of NBC Battalion
- ▣ PhD Thesis on Decontamination
- ▣ Head of Research & Development Decontamination Department
- ▣ Head of R&D Protection Division against Weapons of Mass Destruction
- ▣ Search chem/bio program in Iraq and destruction of chemical weapons
- ▣ Development of the Technical Secretariat of the Organization for the Prohibition of Chemical Weapons
- ▣ Head of Training at the OPCW
- ▣ Head of Chemical Weapons Demilitarization at the OPCW
- ▣ Chief Inspector at the OPCW
- ▣ University lecturer
- ▣ Consultant on CBRNE matters
- ▣ Member of the Association for Crisis Preparedness of the Health and Co-Editor of the Association's journal



# Defensa per Scientia

Profesor Jiří Matoušek, DrSc



# Autor více než:

- **520** odborných a věd. prací v časopisech
- **135** výzkumných zpráv
- **90** patentů, autorských osvědčení a ZN
- **30** realizací v průmyslu a užití v armádě, CO, ochrany životního prostředí a zdravotnictví
- **>470** konferenčních sdělení
- **70** knih a kapitol v knihách o chemii toxikologii, OPZHN, odzbrojení, konverzi zbrojní výroby, bezpečnosti ochrany životního prostředí. a j. globálních problémech

# Ocenění

- **11** státních a vojenských vyznamenání (1955-2008)
- Pamětní medaile VUT Brno (1999)
- Distinguished Leadership Award, ABI, USA (2001)
- Muž roku 2001, ABI, USA (2001)
- American Medal of Honor (2002)
- Nositel Mezinárodní mírové ceny United Cultural Convention 2005
- Zlatý záchranářský kříž (2007)

# Prof. Ing. Jiří Matoušek, DrSc

## Chemik - toxikolog

- Studium VŠCHT Praha a VTA Brno, Ing. chem. 1954,
- CSc. 1958, DrSc. 1967, Prof. 1983.
- Voj. služba 1950-1989 (Plk. v zál.),
- 1954-89 řídicí a výkonné funkce ve voj. výzkumu a tech. a zdrav. ochraně proti ZHN
- 30 realizací v průmyslu a užití v armádě, CO, ochr. živ. prostředí a zdravotnictví.
- Člen Čs. delegace na Konf. o odzbrojení v Ženevě.
- V období "normalizace" zbaven funkce náč. VÚ 070 v Brně.
- 1990-92 host. prof. Internatl. Inst. for Peace (Wien),
- 1992-2000 ředitel Ústavu chem. a technol. ochrany živ. prostředí FCH VUT v Brně,
- Člen 7 stát. zkuš. komisí (Bc, Mgr, RNDr. Ph.D) a řady věd. rad a porad. sborů na úrovni ústavů, fakult a centr. orgánů včetně mezinárodních.
- Předseda Věd. porad. sboru Org. pro zákaz chem. zbraní (OPCW) v Haagu.
- Člen řídicích gremií 4 mezinár. NGO (INES, WFSW, Pugwash, Dublin, Committee), zabývajících se globálními problémy.
- Autor více než 520 odb. a věd. prací v časopisech, přes 430 konf. sdělení, 70 knih a kapitol v knihách o chemii, toxikologii, ochr. proti ZHN, ozdbrojení, konverzi zbroj. výroby, bezpečnosti, ochraně živ. prostředí. a j. globálních problémech
- Naposled prof. Výzk. centra EU pro chemii živ. prostředí a ekotoxikologii PŘF MU v Brně (RECETOX).

# Člen v národních a mezinárodních institucích

- Akademie věd, Bologna
- ABC-Abwehrschule Forum, Wien
- Organizace pro zákaz chemických zbraní, Haag. Předseda mezinárodní vědecké komise OPCW
- American Biographical Institute, USA
- International Biographical Centre, Cambridge (UK)
- NATO Research and Technology Organisation, Bruxelles
- Státní výbor pro jadernou bezpečnost, Praha
- Ministerstvo vnitra, GŘ HZS, Praha
- World Federation of Scientific Workers, Paris
- Stálý výbor pro odzbrojení, akreditovaný představitel WFSW u úřadovny OSN, Wien
- Pugwash Conferences on Science and World Affairs, Washington, D.C. (USA) – Vedoucí, Česká Pugwashská skupina
- International Network of Engineers and Scientists, Berlin
- 7 komisí pro státní závěrečné zkoušky (Bc, Mgr, RNDr, PhD)



# Oppenheimerové



Good Lord! Humble....?

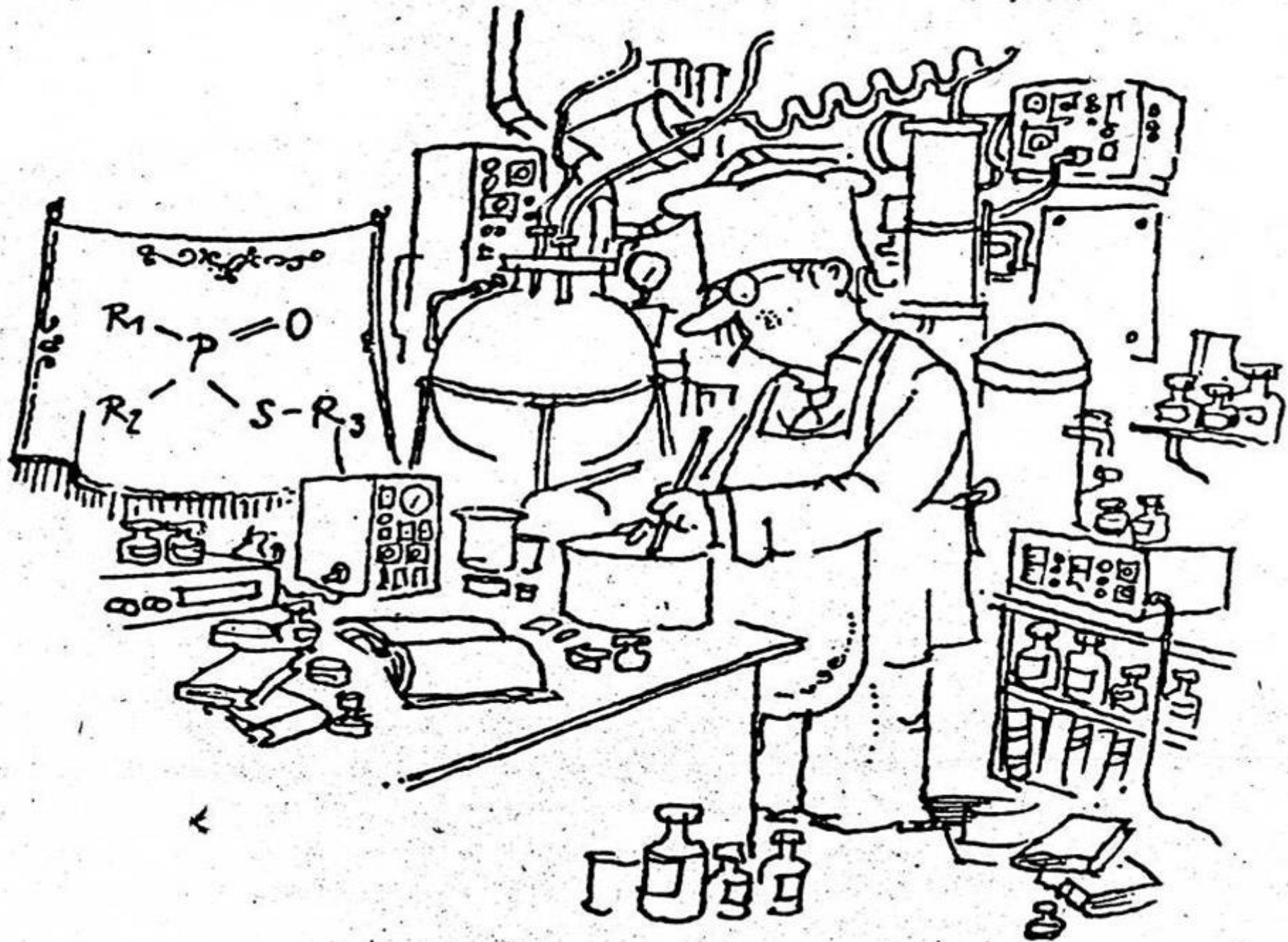
Over 450 conference presentations and all those medals!  
I will be in very hallowed company for the workshop with  
Professor Matousek



**5.dubna 2007 byly v pražském Paláci Žofín  
předány  
Zlaté záchranařské kříže**







**Chemie/Agrochemie**

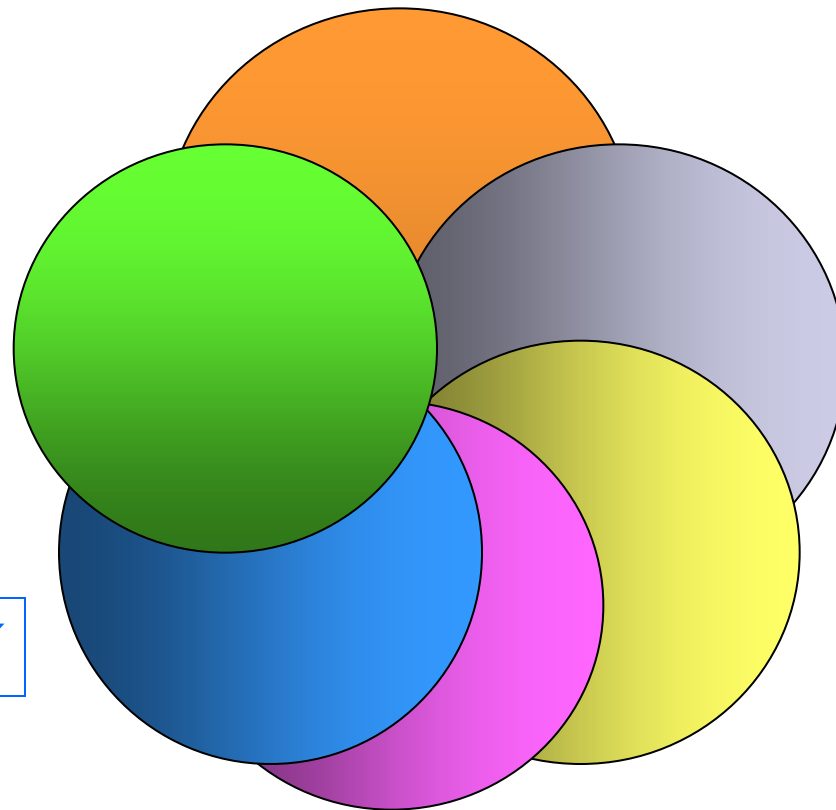
**Ochrana ŽP**

**Vojenství**

**Odzbrojení**

**Ochrana**

**Medicína**

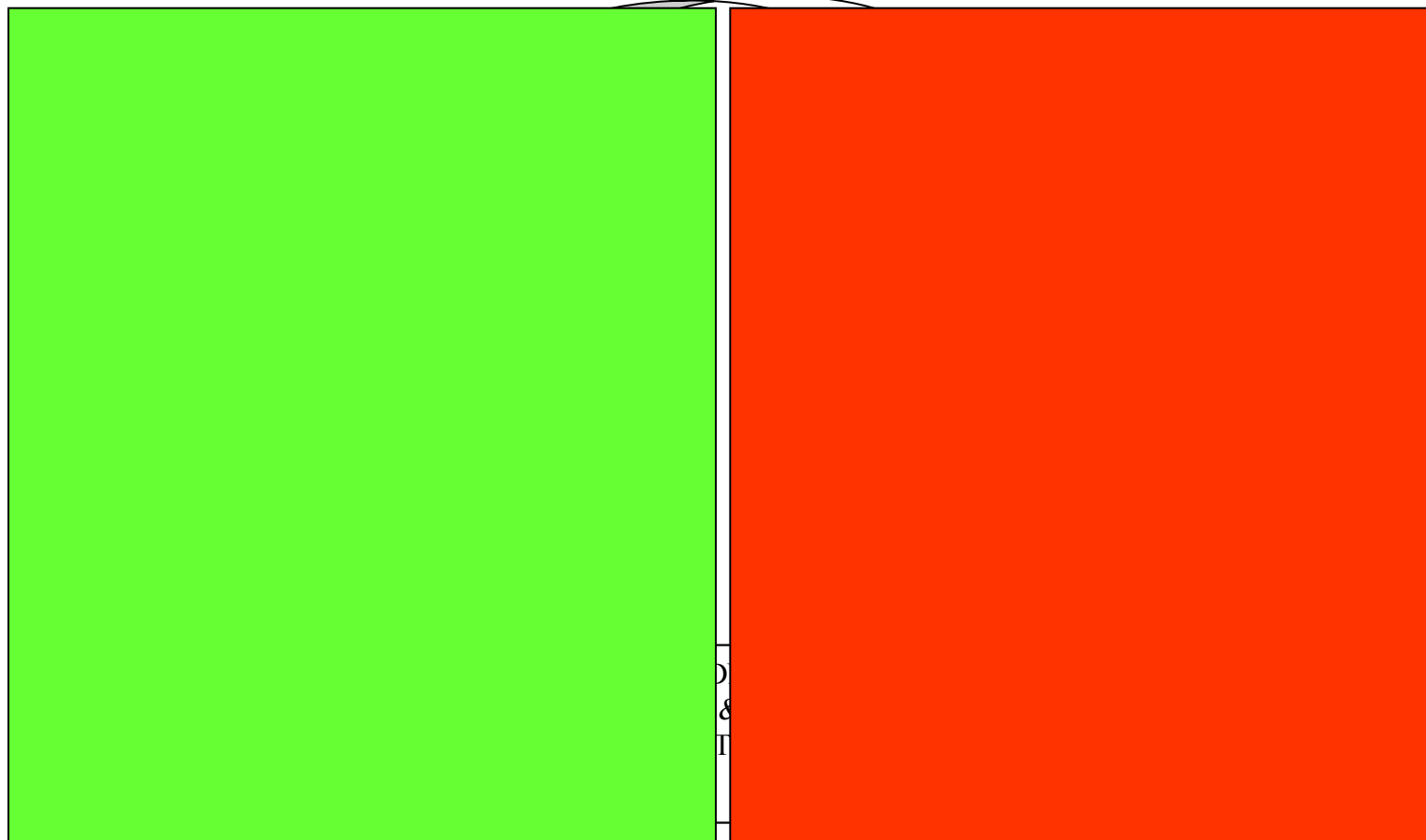


# 1. Priorita

Záchrana života a  
ochrana zdraví



# CYKLUS ČINNOSTÍ PŘIPRAVENOSTI A PROVEDENÍ ZÁSAHU PŘI CBRE INCIDENTECH







# CBRN Threats

# Consequence Management Hazards



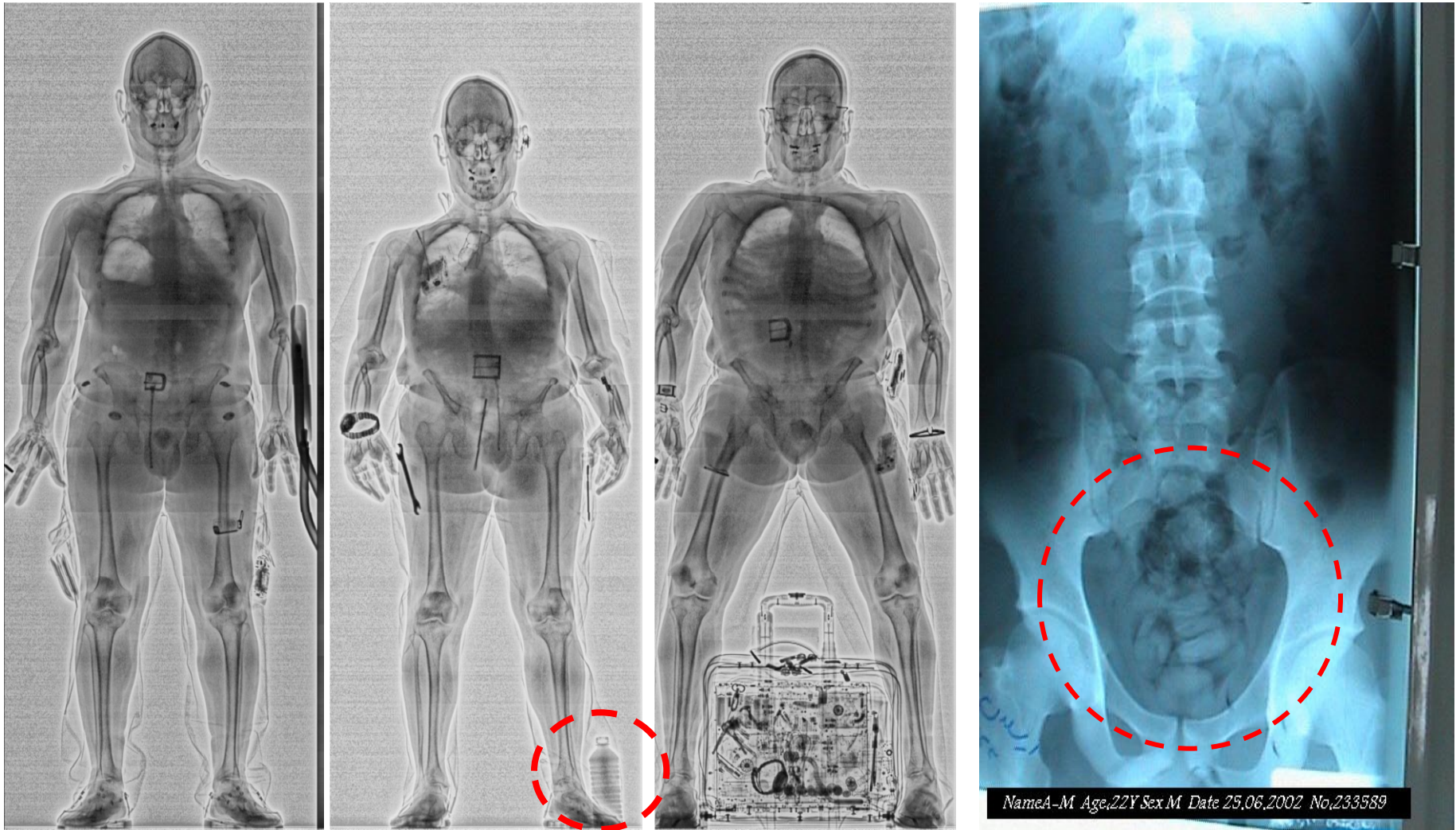
# Bio/Explosive Bomb



# Explosions at Railway Station in Madrid



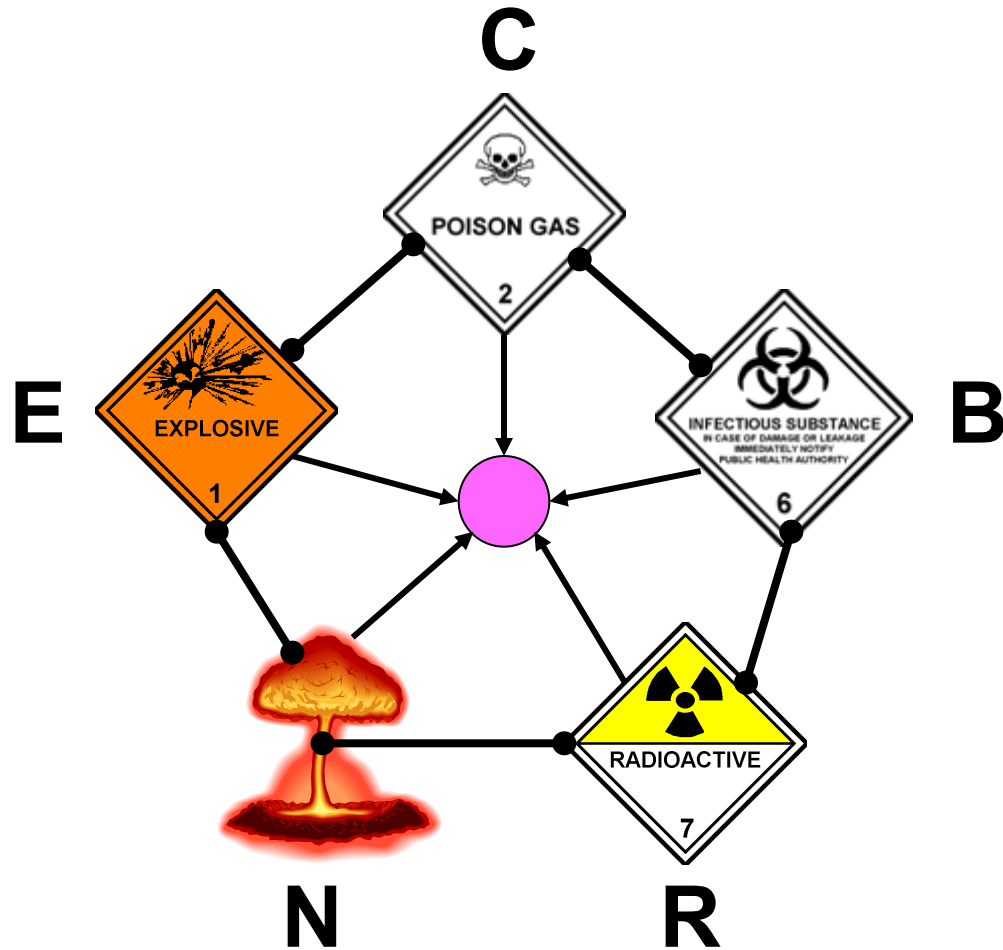
# Security Scans should prevent a new generation of explosive threats



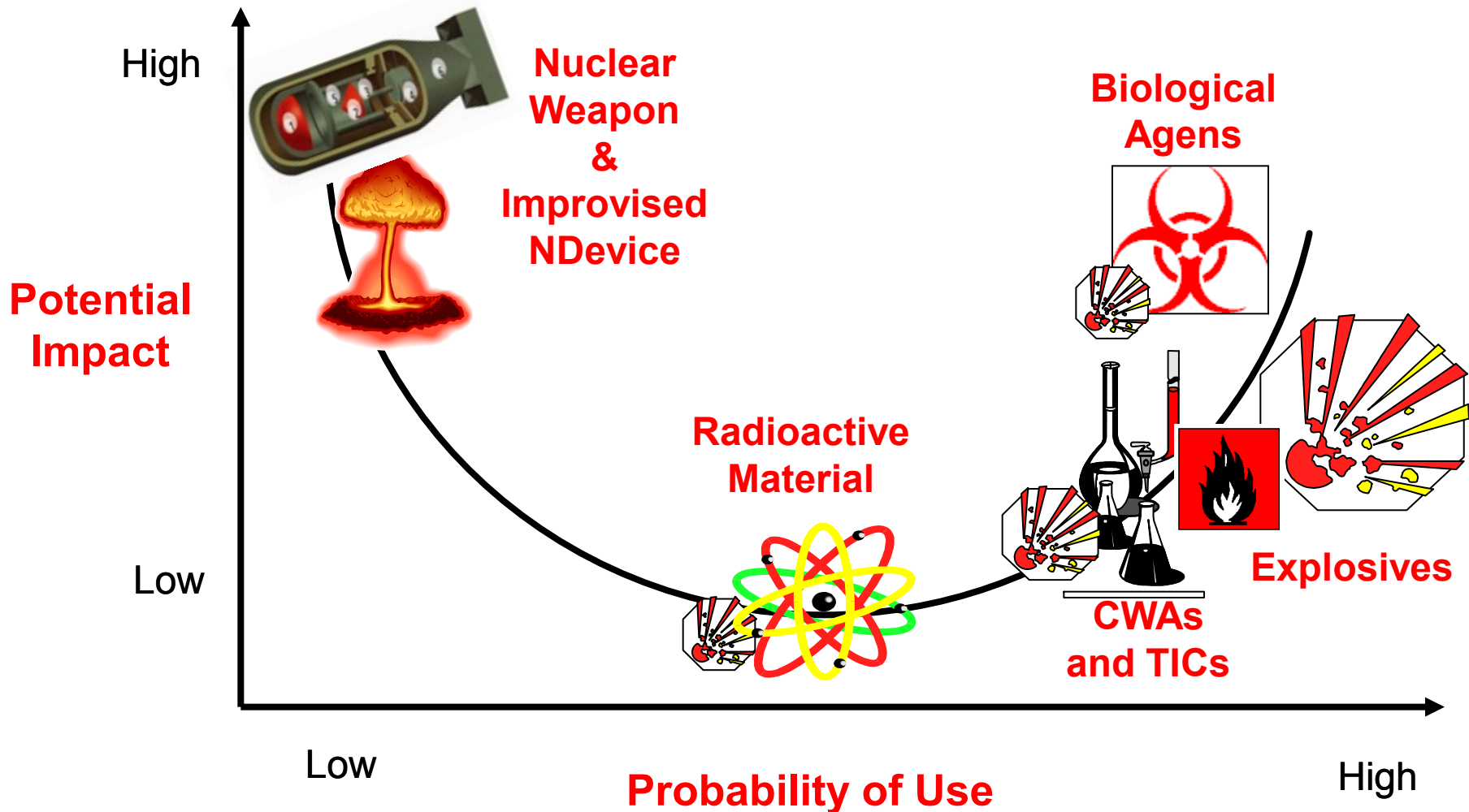
# Dual Purpose Items



# CBRNE - Pentangle



# Probability of CBRNE Incident







# Health & Safety Concerns

## PPE Level „Real“ vs Level „A“



# Health & Safety Concerns



Kolontár

Mud is alkalic and contains mercury, chromium, arsenic

# Exposure of Firemen and Public to “Cocktail” of HazMat



# CBRNE Vulnerable Crowds Unaware and Unprotected



# Scene of CBRNE Casualties



# CBRN Detection vs **Symptoms**

- Non-conventional event has to be considered in its initial phase as **“unknown-whole hazard”** case.
- **Early identification** nature of victim’s exposure is vital for **saving lives and protection of their health**.
- However, detection and monitoring can **be time consuming** and thus delaying emergency medical responses, as well as complicate and lengthen the decontamination process.
- Thus all responders are to be knowledgeable and skilled to identified **CBRN indicators**, as the part of their awareness training.
- Also responder’s knowledge of **signs and symptoms** associated with CBRN exposure should **be mandatory knowledge** too.

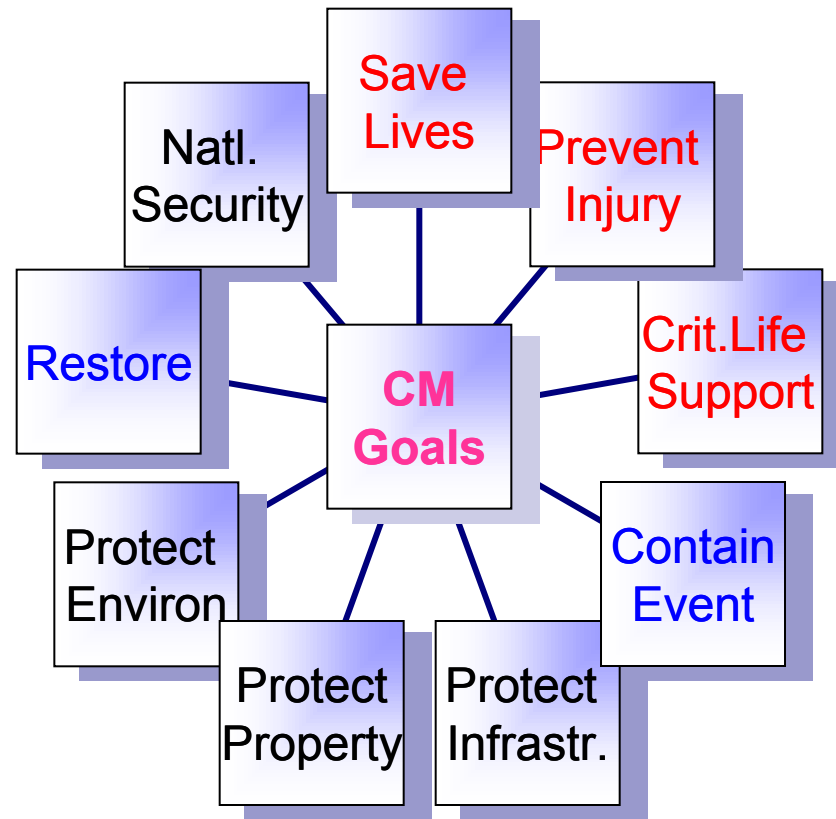




# Consequence Management



# Goals of Consequence Management



# Consequence Management/Operations

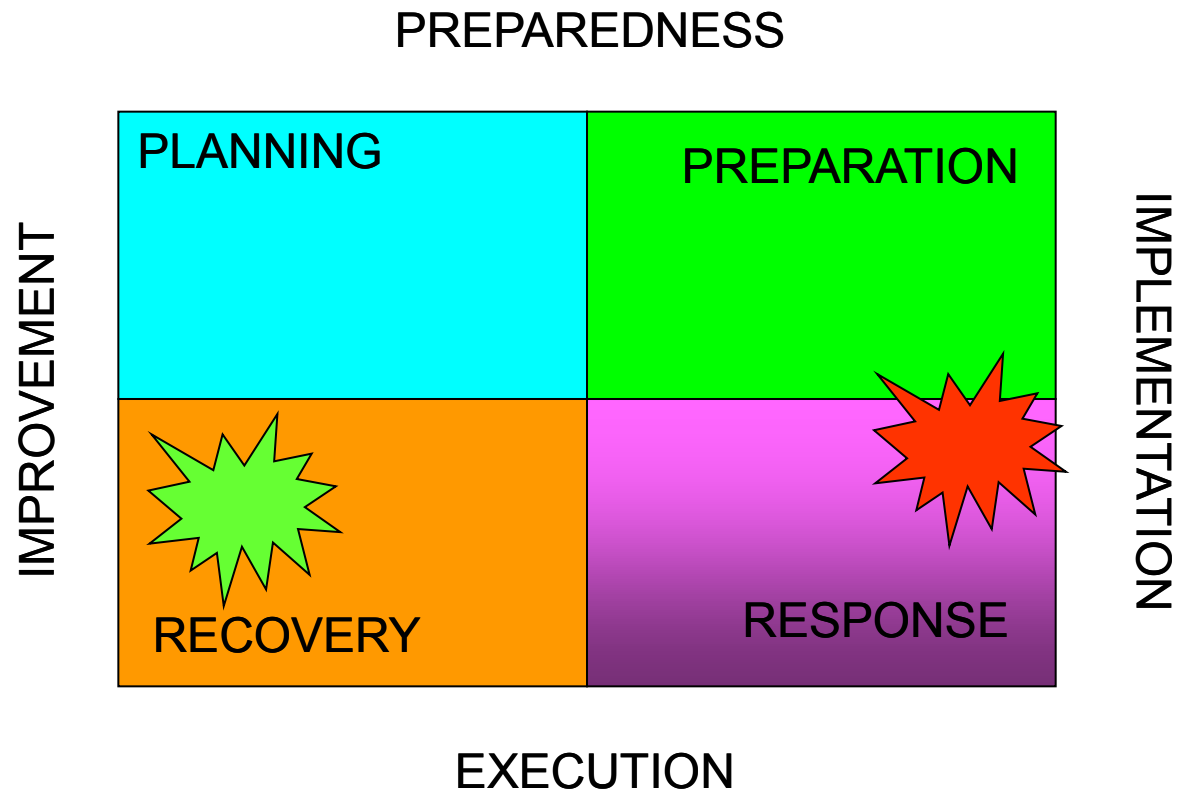
CM are measures taken to:

- Protect human life and public health and safety
- Restore essential local and government services, and
- Provide emergency relief to governments, businesses, and individuals affected by the consequences of CBRNE situation
- Planning (of Preparedness)
- Preparedness
- Response
- Recovery (Rehabilitation)

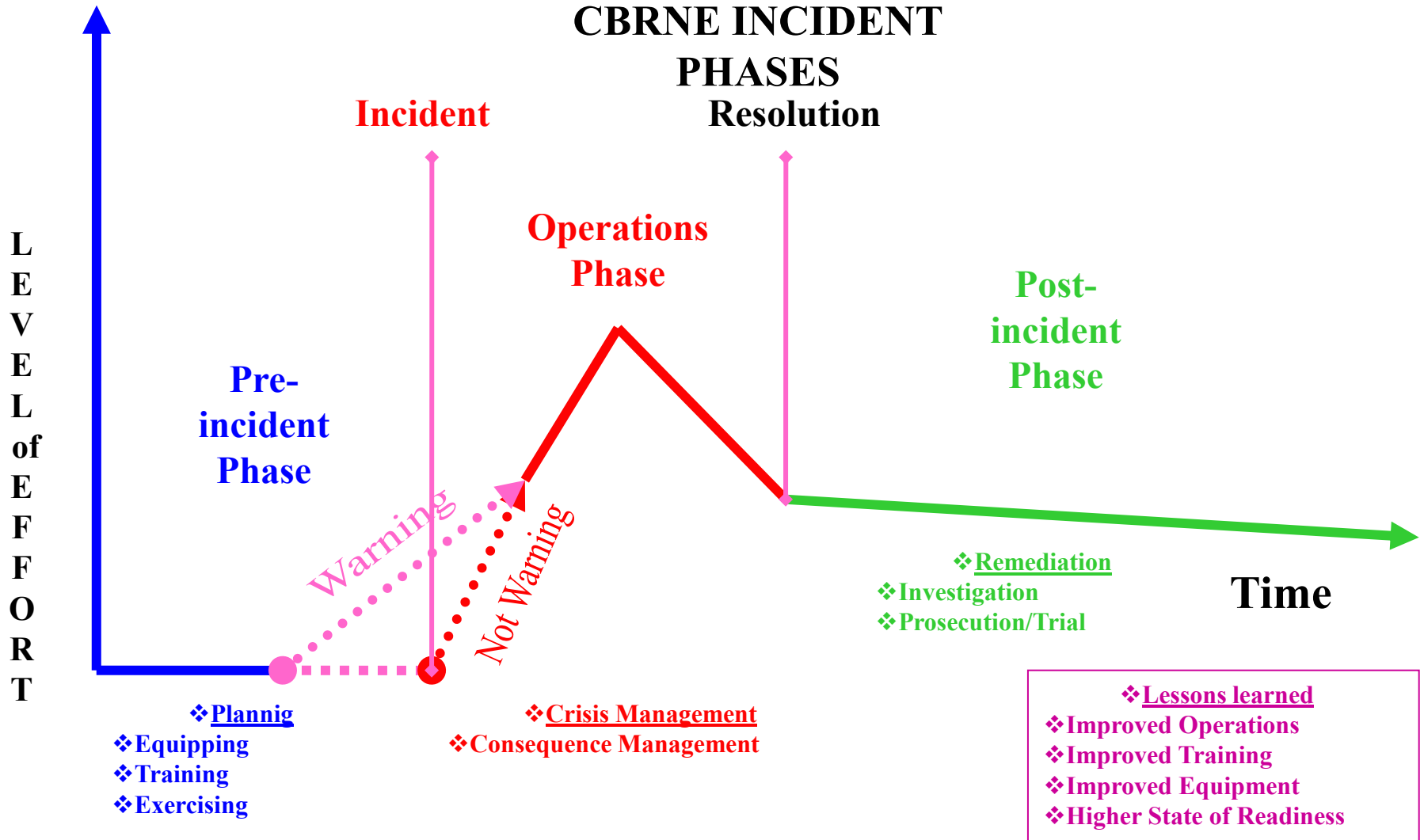
# CBRNE Incident Objectives

- **Saving lives (grates priority during CM)**
- Search & Rescue (remove victims from harms way)
- Provide first aid to victims and Temporary Critical Life Support
- Rescue, consider decontamination, triage, treat and transport victims
- Assess situation
- Be cognizant of secondary devices
- Secure the perimeter, set up operation areas, establish hazard control zones (i.e., hot, warm and cold zone)
- Control and identify CBRE material involved
- Stabilize incident
- Coordinate operations
- Avoid additional contamination
- Decontamination
- **Secure evidence and treat as a crime scene**
- **Investigate a crime scene**
- Conduct Logistics

# CM Process



# CBRNE INCIDENT PHASES Resolution



# KEY PROCEDURES OF CM EFFECTIVENESS

- **PLANNING** TACTICS, TECHNIQUES, AND PROCEDURES
- **PREPAREDNESS** TACTICS, TECHNIQUES, PROCEDURES, **EQUIPMENT, TRAINING AND EXERCISES**
- **RESPONSE** TACTICS, TECHNIQUES, PROCEDURES AND **EQUIPMENT**
- **RECOVERY** TACTICS, TECHNIQUES, PROCEDURES AND **EQUIPMENT**
- ***IMPROVEMENT TACTICS, TECHNIQUES, PROCEDURES, EQUIPMENT TRAINING AND EXERCISES***

# Practices-SOPs-Standards-Competencies Guidelines

NFPA 471

Recommended Practice  
for Responding to  
Hazardous Materials  
Incidents

2002 Edition

NFPA 472

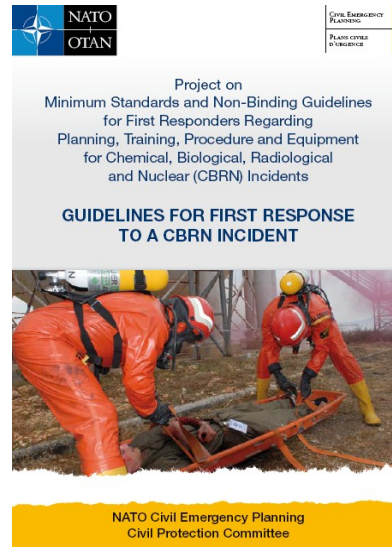
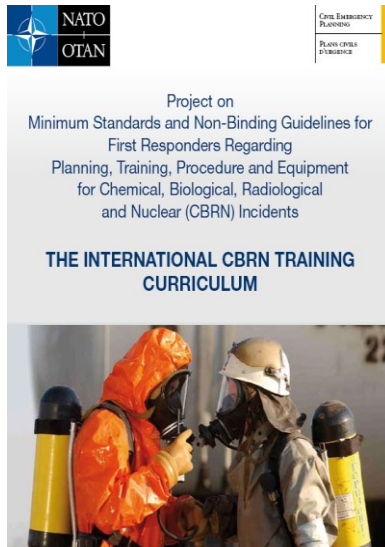
Standard for  
Professional Competence  
of Responders to  
Hazardous Materials  
Incidents

2002 Edition

NFPA 473

Standard for  
Competencies for  
EMS Personnel  
Responding to  
Hazardous Materials  
Incidents

2002 Edition



NATO Standards  
Allied Engineering Publications  
STANAGs, Handbooks  
Field Manuals, Guidelines

Structure of the International  
Shipboard Emergency Egress  
Training Curriculum

# First and Emergency Responders

- **First Responders** are local and governmental police, fire, and emergency medical personnel or nongovernmental organizations who, in the early stages of an incident, are responsible for the protection and preservation of life, property, evidence, and the environment, including:
- **Emergency responders** are firefighters, law enforcement, security personnel, emergency medical technicians, emergency management and operations personnel, explosive ordnance disposal (EOD) personnel, physicians, nurses, medical treatment providers at medical treatment facilities, public health, clinical care, mortuary affairs personnel, disaster preparedness officers, public health officers, bio-environmental engineers, armed forces personnel etc., and
- **Emergency response providers** include public works, and other skilled support personnel (such as equipment operators) who provide immediate support services during prevention, response, and recovery operations.



# Qualification of Responders

- CBRN responders are **civilian** (local and governmental police, fire, and medical emergency personnel) and/or **armed forces** personnel who are **trained** to respond to CBRN incidents and **certified to operate safely** in **CBRNE hazardous environment** at the **awareness, operations, or technician** level according to particular standards

# Components of CBRNe Consequence Response Operations

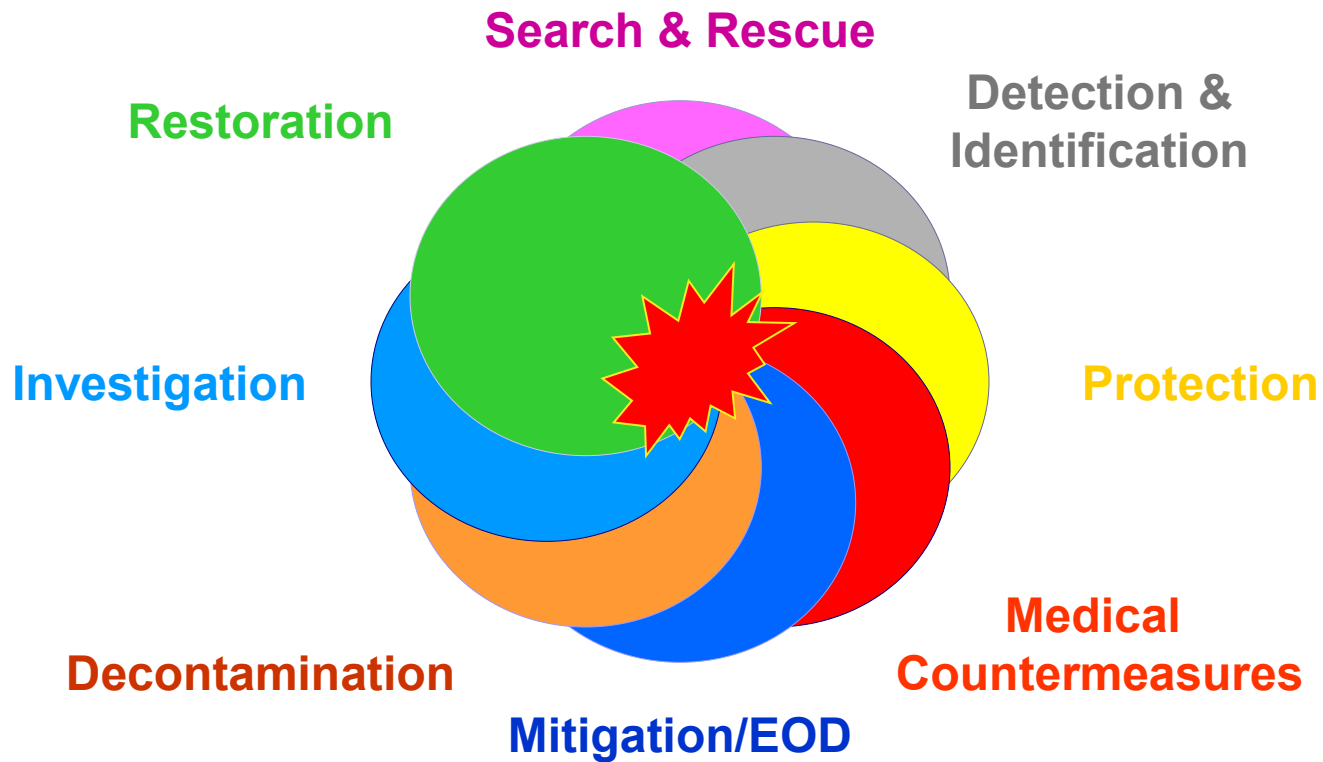
## Principal components:

- Fire Brigade Rescue Corps
- Emergency Medical Service & Hospitals
- Law enforcement  
(Police, EOD, S.W.A.T., Forensics, Intelligence, Attorney,....)
- CBRNe & Scientific Experts.....

## Other components:

- Civilian Defense
- Administration
- Army
- Red Cross
- Technical Services
- Business
- Companies
- Associations
- Foundations

# Complexity of Activities During CBRNE Consequence Management





# UNSCOM in Iraq

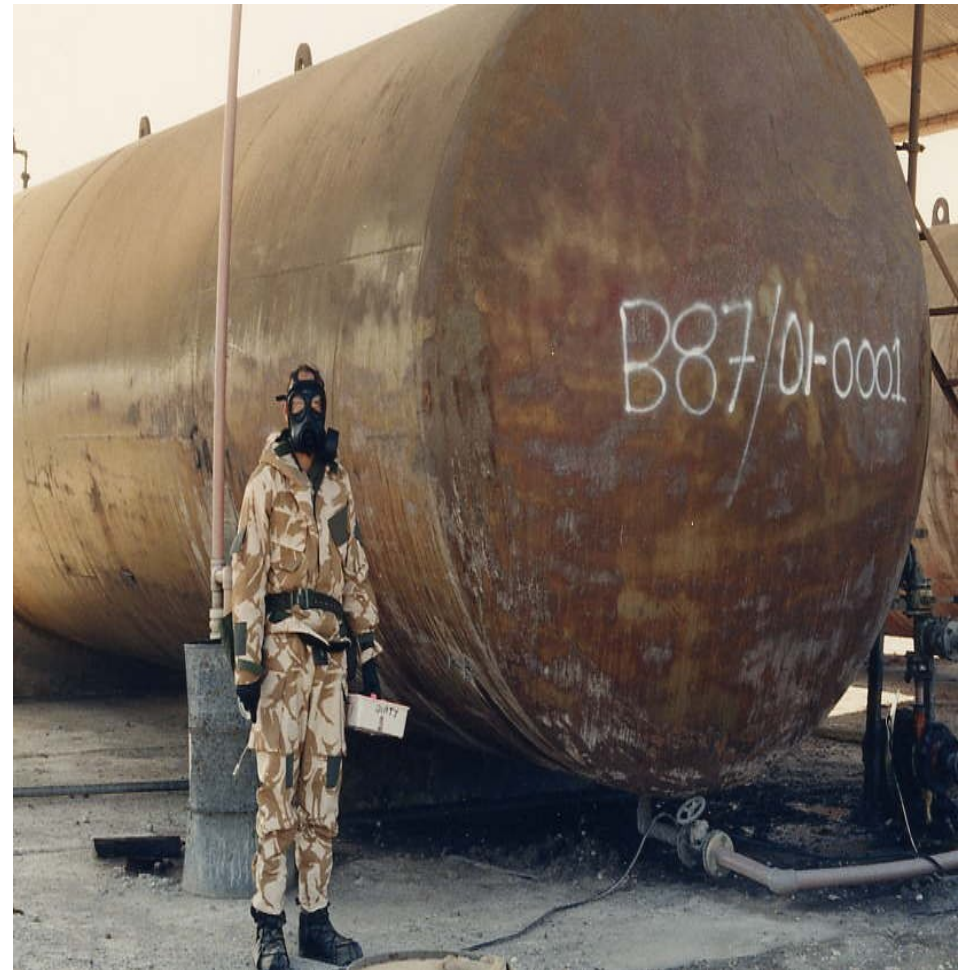
# Destroyed CWPF with sarin leaking technology at Al Muthana



# 3 MT containers with sarin



# Barrels and tanks with precursors



# Destruction of 122 mm artillery rockets with leaking sarin





# Checking residues of sarin in burning pit



# Hunting of escaped 122mm rockets



# Destruction of 500 kg aerial HD bombs (pits contaminated with HD)



# Decontamination of trailer contaminated with HD



# Emergency decontamination



# ?Sampling of 122 mm Warhead?

- Fountain of Sarin
- The invitation to the Heaven



# Lessons learned from UNSCOM

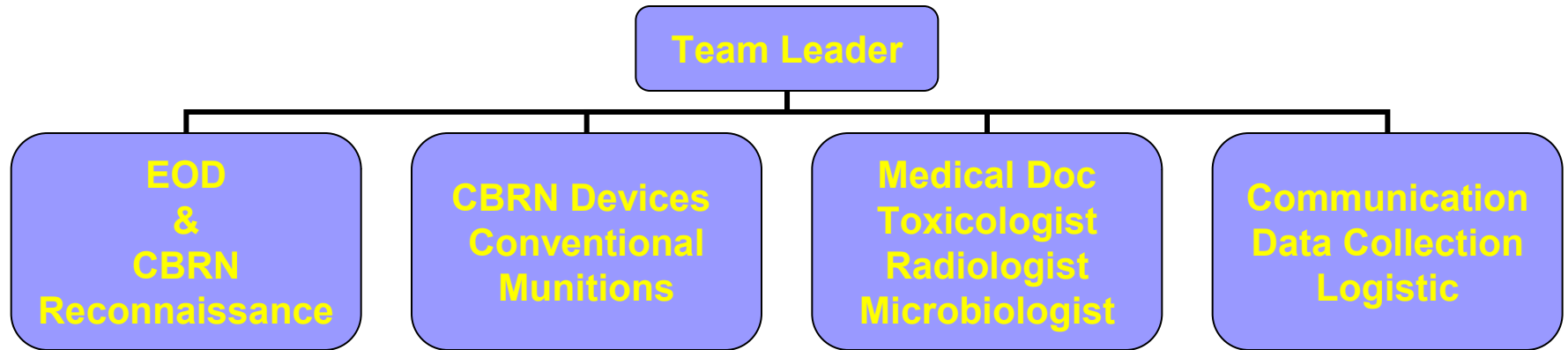
- Experience from UNSCOM`s operations had been utilized in the development of the Organisation for the Prohibition of Chemical Weapons
- Training program for inspectors
- Selection and improvement of equipment
- Inspection SOPs for Challenge inspection, [Investigation of Alleged Use CWs](#), Old and Abandoned CWs
- Training with Live CW Agents



# CBRNE Investigation



# CBRN Investigation Advance Team



# Qualification of Investigators

- The qualification of those individuals and/or teams doing CBRN Forensic is crucial because the results of the investigation are very important in order to decide if they **are conclusive or inconclusive**.
- Technical capabilities of CBRN Forensic individuals are so high that ordinary individuals/responders/soldiers **not “forensically minded”** could actually **compromised the successful identification of CBRN materials** and nature of CBRN attack.

# Investigation team expertise composition

- Command
- Crisis and Consequent Management
- Explosive Ordnance Disposal/Unexploded Ordnance
- Chemical Weapons
- Conventional Weapons
- NBC/CBRN service
- Analytical Chemistry
- Chemistry/Chemical Technology
- Forensics
- Medicine
- Pathology
- Dermatology
- Toxicology
- Microbiology
- Epidemiology
- Anthropology
- Plant Pathology
- Sociology
- Psychology
- Ethnology
- Interviewing
- Interpretation
- Communication
- Logistician

# ?Crime Investigators?

Just another victims



# The role of the Forensic Scientists

There are several main areas of duties:

1. Examination of physical evidence
  2. Reporting on results of a forensic examination
  3. To assists in tracing an offender
  4. Provision of evidence for presentation of a case to a court
  5. Present verbal evidence in court (expert testimony)
  6. Training of police officers to become “forensically minded” when investigating crime scene
- CBRN Forensic Team will in the form of specialists composing multidisciplinary investigation team enable to work effectively under CBRN HazMat environmental conditions

# When is CBRN Forensic Science Needed?

- The Forensic Science needs are derived from Conventional Forensic Science in order to investigate crime scene and answer three principal questions:
  1. Has a crime act been committed?
  2. Who is (are) affected/victimized
  3. Who is (are) responsible for crime? and
  4. Is the suspect responsible for the crime act?
- In this regard the link of CBRNE Forensic Science to Conventional Forensic Science should be following:
  1. Has a crime act/release of CBRN been committed/occurred?
  2. Who is (are) affected/victimized by the CBRN attack?
  3. Who is responsible for the crime act/CBRN attack?
  4. Is there a suspect responsible for the crime act/release?
  5. What is the likely release?

# Hands-on skills/Training

- Hazard identification
- Personal protection
- Detection
- Reconnaissance
- Sample collection  
(environmental and biological samples)
- Handling samples  
(Chain of custody)
- On-site analysis
- Non Destructive Evaluation
- Decontamination
- First Aid
- Interviewing
- Recording/Documentation
- Reporting
- Communication
- Good Laboratory Practice regulations (GLP)

# Reconnaissance/Detection





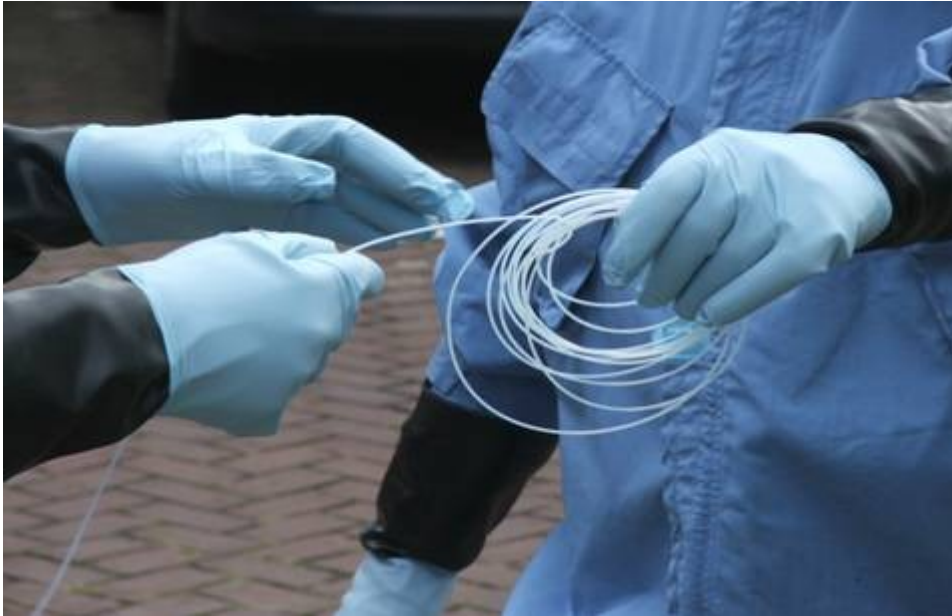
# EOD/UXO Reconnaissance



# Sampling and Detection



# Liquid Sample Taking



# Sampling A.S.A.P



# Sample Packing and Sealing



# Packing Samples for Transport and Chain of Custody



# On-Site Analysis

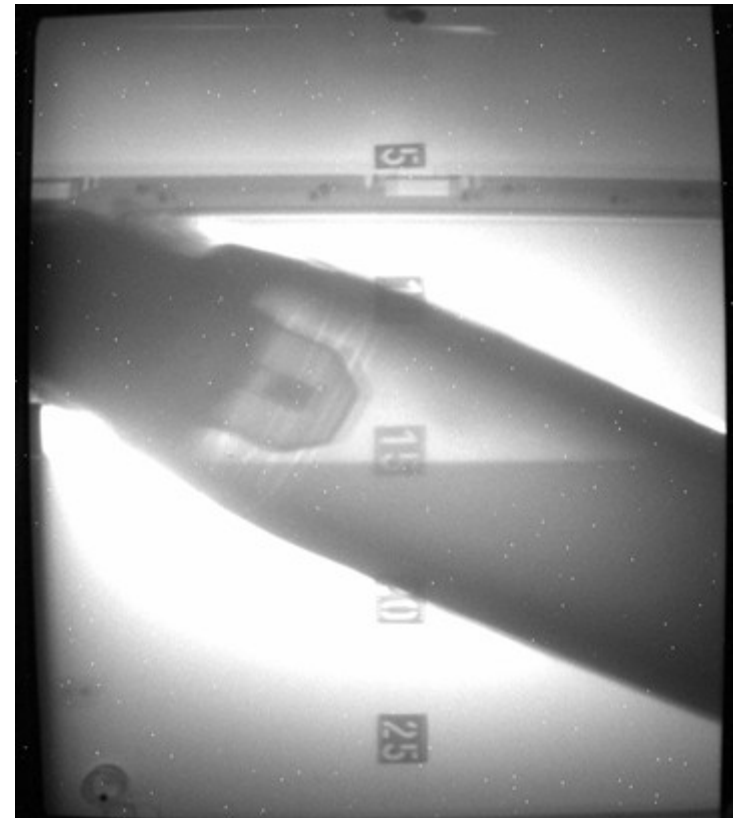


# Non-Destructive Evaluation X-Ray Imaging





# X-Ray Image of Liquid Fill





# CBRN Exercise Cases

# Aircraft kidnapped with Bio-Device



# Hostages released



# Transfer hostages for decontamination



# S.W.A.T. arrests Perpetrators



!!!No Health&Safety provisions!!!

No prevention of protection  
and/or decontamination  
occurred prior  
departure from the scene

# Deliberate Chemical Incident



# Victims removed by SWAT





# Sampling Team on Scene



# Transfer of victims for decontamination



# EMS available-responding till ZERO+70



# Mitigation of Chem/Explosive Device



# Investigation Team



# Investigation Team

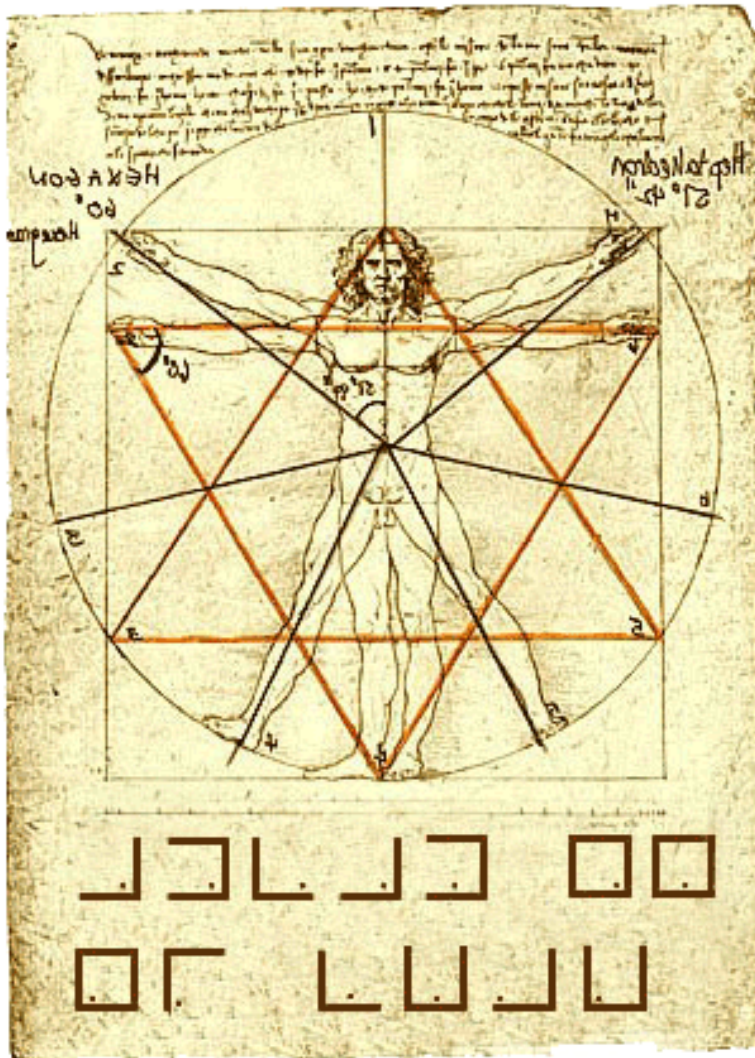


# Investigation Team



**ABSENCE OF ANY  
DECONTAMINATION  
PROVISIONS**

# Vitruvian's Symbol of the Ideal

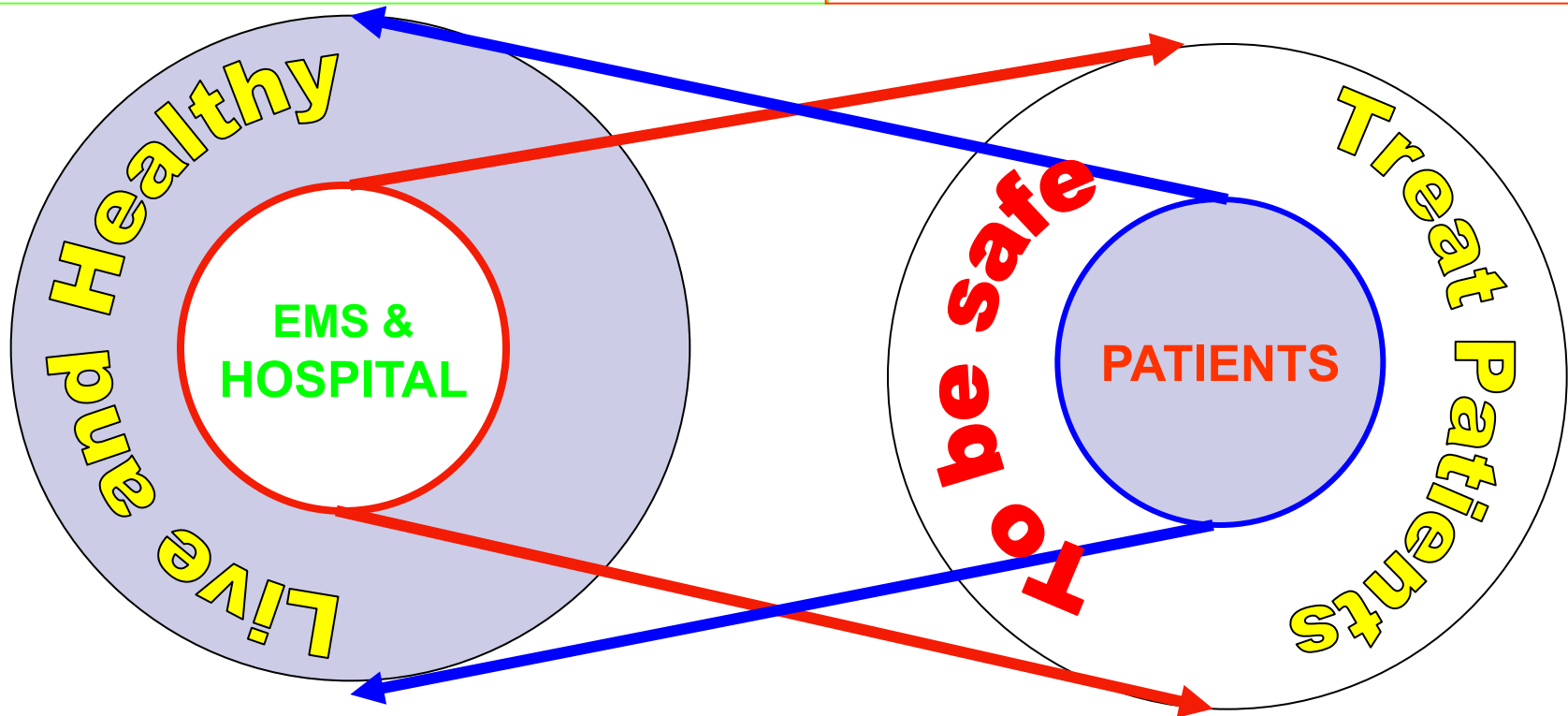




# Clashes of Interests Between Patients and Safety of EMS and Hospital Providers

VIEW FROM POSITION OF EMS & HOSPITAL

VIEW FROM POSITION OF A PATIENT

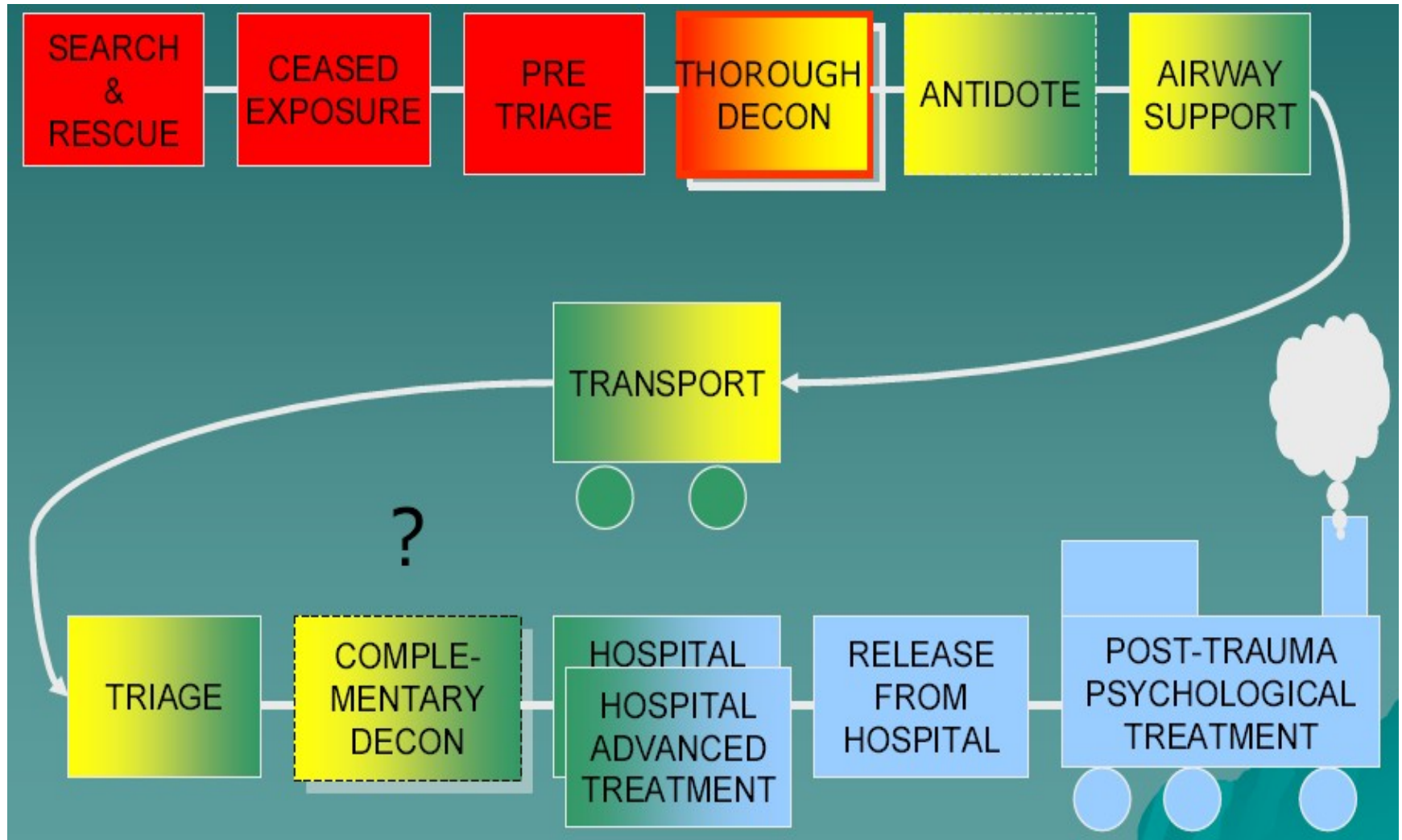


**MEDICAL CARE HAVE TO BE PROVIDED AS FROM PATIENT'S POINT OF VIEW  
ASSSUMING REASONABLE RISK FOR  
HEALTH CARE PERSONELL AND FACILITIES**

# Health&Safety (HS) and Healthcare (HC) Concerns

- **Planning-** lack of interagency coordination, not sufficient funds for H&S and HC, not fully materialized
- **Preparedness-** limited availability of certified procedures and equipment, lack of training, lack of HC emergency infrastructure preparedness
- **Response-** H&S and HC negligence and/or exaggeration and/or mismanaged
  - Serious impact to the life saving of victims
- **Recovery-** H&S negligence

# Current Emergency Medical Train



# Victims at Collection Point waiting for Decontamination

Decontamination Site  
Min 40 minutes for set up



Concerns of delayed First Aid

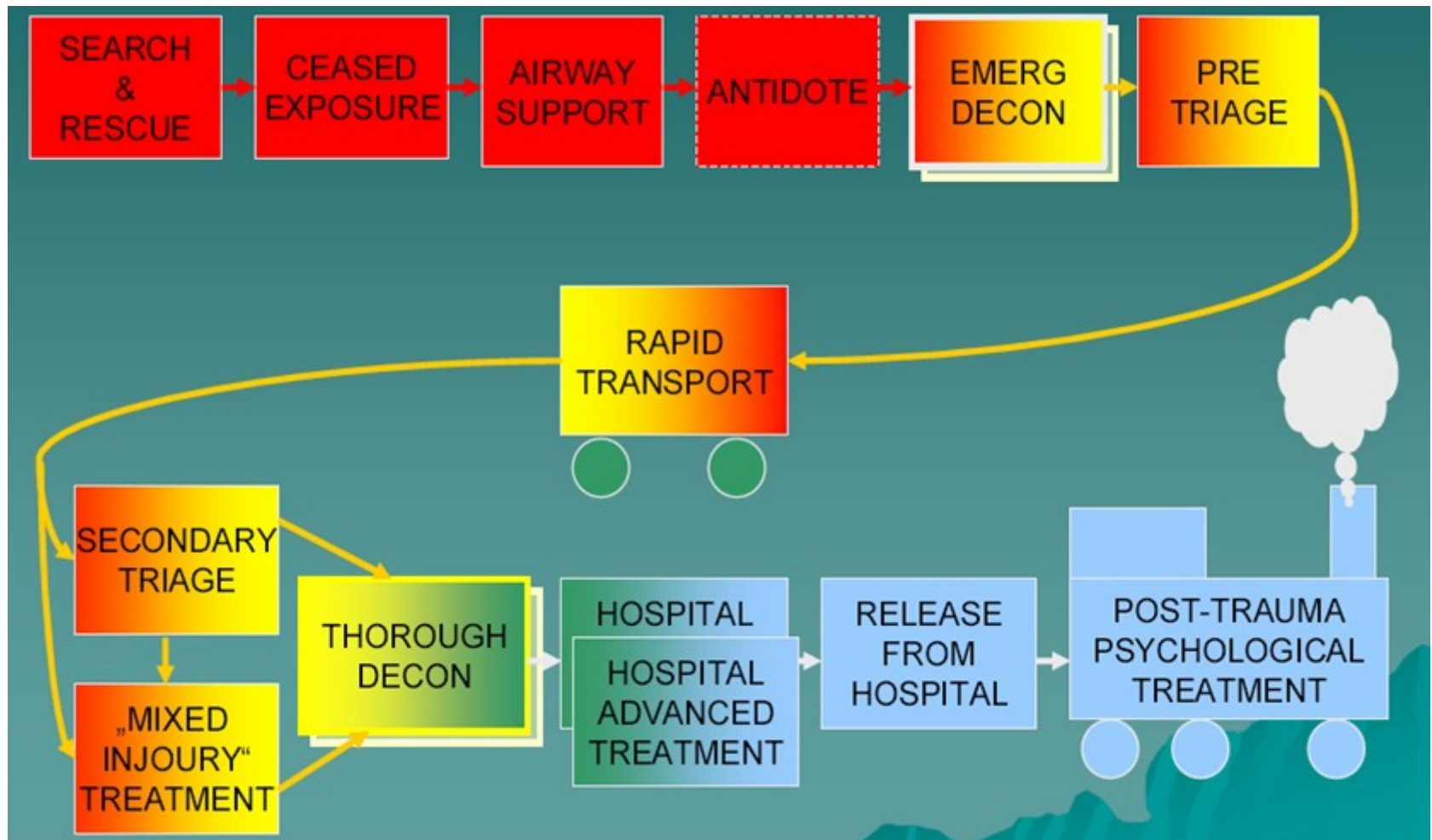
# Transfer Victims for Decontamination



# Assisted Decontamination of Casualties



# Advanced Emergency Medical Train



# Emergency Decontamination Prior Protective Mask Donning

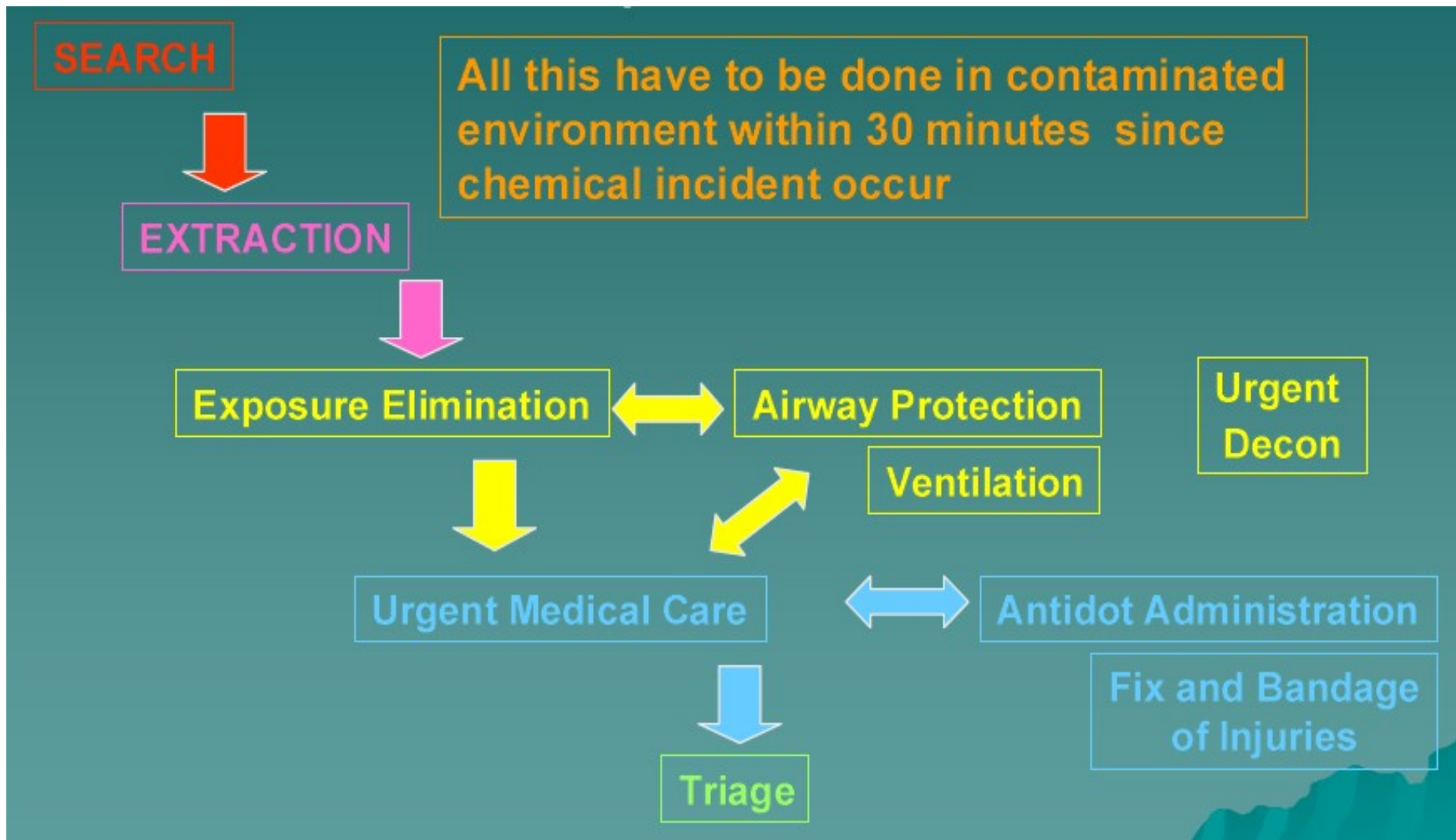




# Airway Protection and Evacuation from Hot Zone



# What Kind of Help the Victims are Expected ?





# Equipment

# Equipment-Standards

- **Protecting RESPONDERS Who Respond to Chemical, Biological, Radiological, Nuclear Explosive Events**
- Responders may be involve in responding to HazMat, chemical, biological, radiological, and nuclear incidents. They also may face dangers posed by clandestine drug laboratories, including potential injury from explosions, shooting, flash fires, chemical burns, toxic fumes, x-ray radiation, heat stress, etc.
- To ensure that responders have adequate personal protective ensemble and other mission oriented essential equipment when responding to these situations, associated authority have to provide adequate standards.
- There is a variety of other standards existed for various emergency service workers, ranging from firefighters, law enforcement, army, EOD to hazardous materials response teams.
- However, not all of the standards fully addressed responders needs (e.g., integration, human threats, stealth operations, durability, dexterity, protection factors, readiness, selectivity, sensitivity, broad spectrum, etc.)

# Personal Protective Equipment

- All Hazard Protection
- **Level A and B** limited performance of responders (air supply, weight, workload, heat stress, vision, communication, dexterity)
- **Level C** Air Permeable Ensemble challenged with Toxic Industrial Chemicals and diluted CW Agents
- Needs for complex evaluation of whole Personal Protective Ensemble (Protection Factor and Heat Stress Factor)
- Needs of PPE against penetration radiation
- Needs for airway protection of responders 7/24 (one size)

# Levels of PPE Protection



**Level A**



**Level B**



**Level C**



**Level D**

# Efficiency of Personal Protective Ensemble



TICs/CWAs/Bio  
Rad. Contam.



CW Agents



Chem/Bio  
Rad&Nuclear  
Ballistic

# Protection Underwear





# Protective Coverall

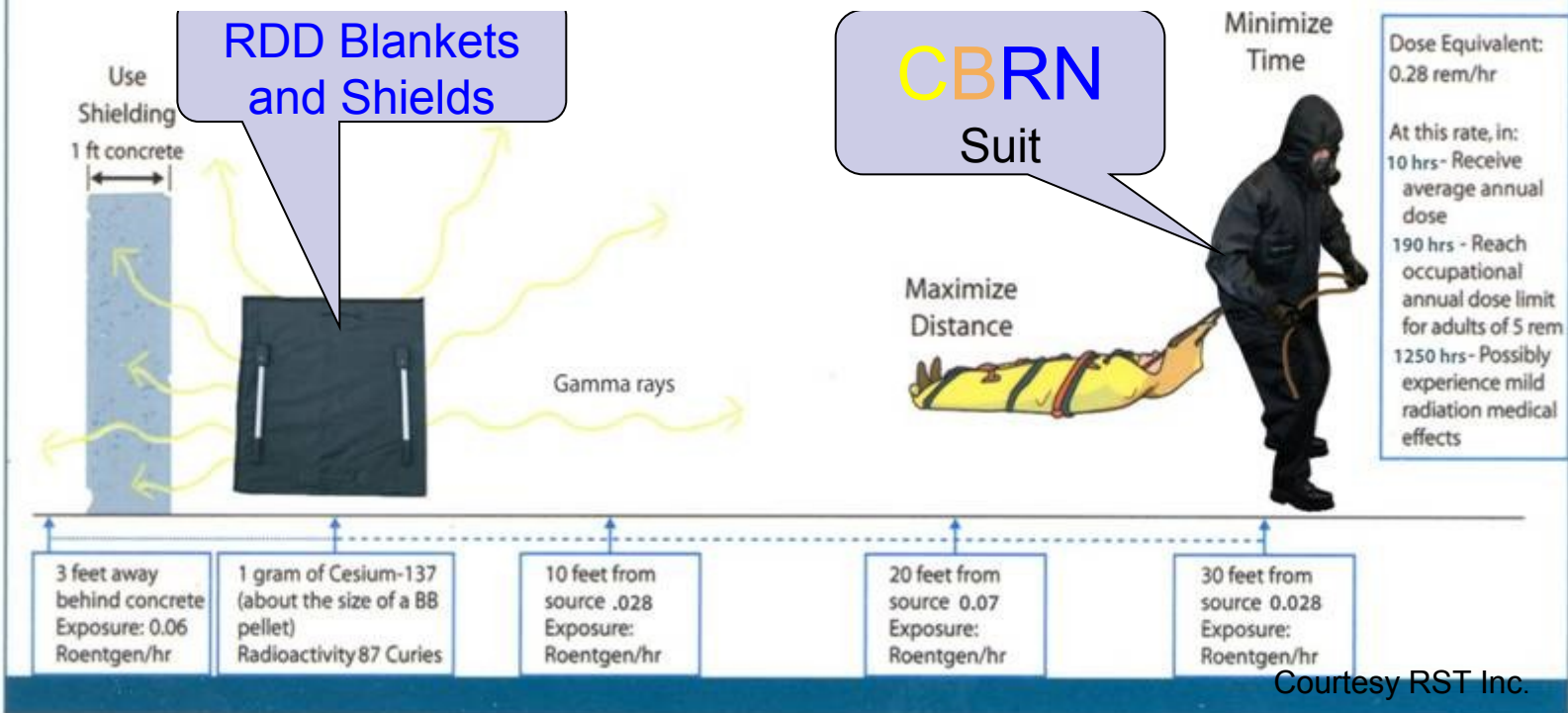
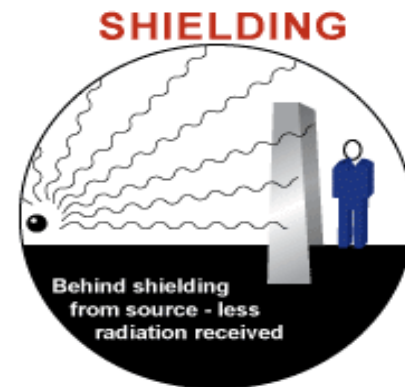
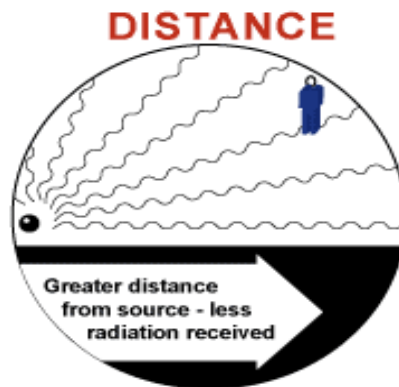
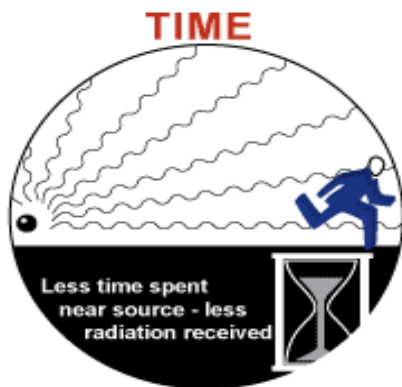


# Current CB(RN) PPEquipment



- All fabrics and skin block  $\alpha$ -particles
- Inhaled or ingested  $\alpha$ -particles are hazardous
- Provides Low Energy  $\alpha$  and  $\beta$ -particles protection only
- Impermeable PPEs are heat sinks and limit operations
- Protection against x and  $\gamma$ -rays is „Zero“ and High Energy  $\beta$ -particles is also negligible

# Improving Radiation Protection



Courtesy RST Inc.

Minimizing radiation exposure

# Multiple Hazard Protection Composite Material

Polymer with radiopaque fillers is sandwiched between layers of fabric

Chemically resistant foil/membrane

Chem/Bio

Carrying and binding fabric

Mechanical, Fire, Ballistic

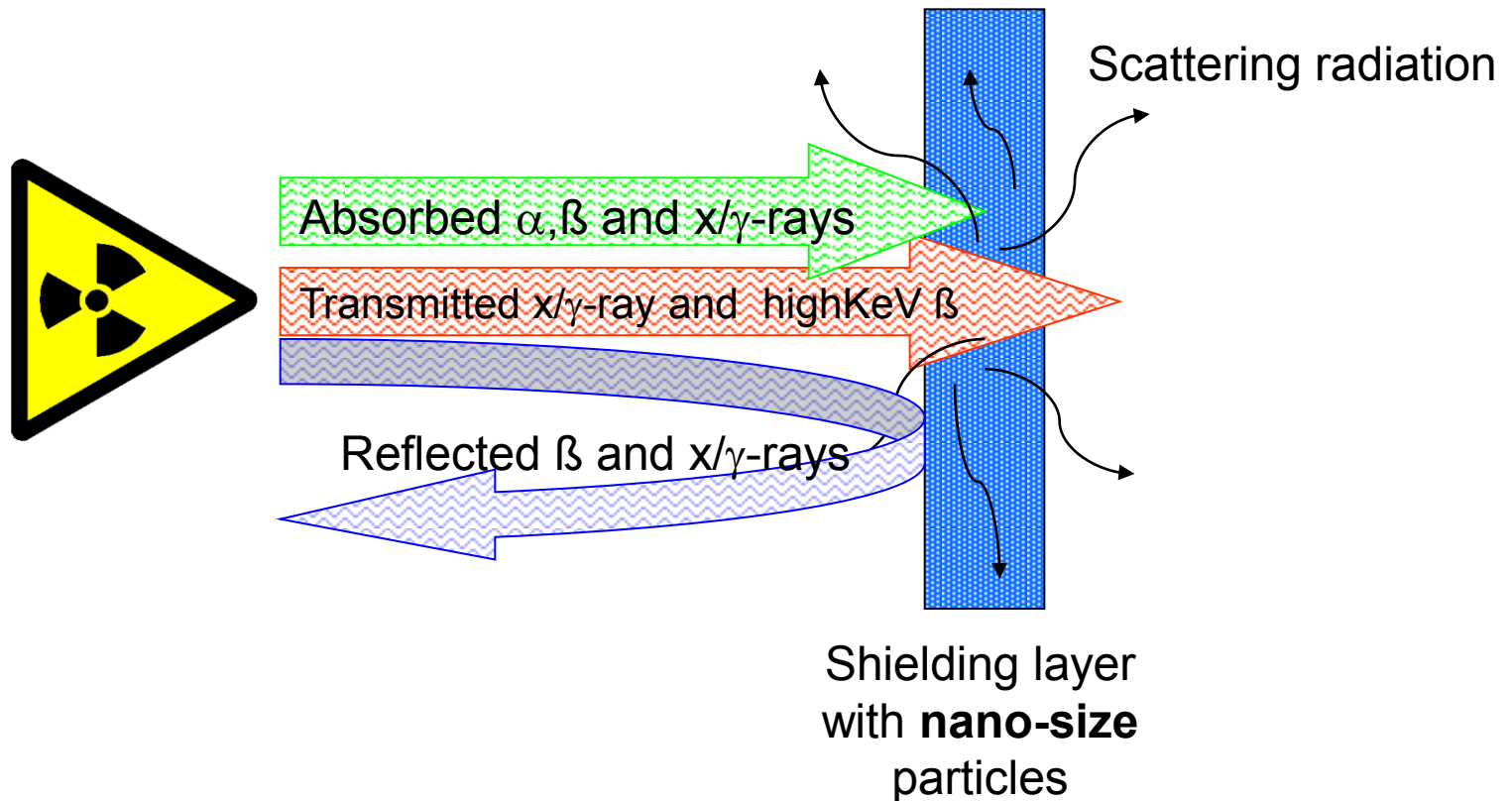
Nano-Radiopaque filler in a polymer

Radio/Nuclear (Chem/Bio)

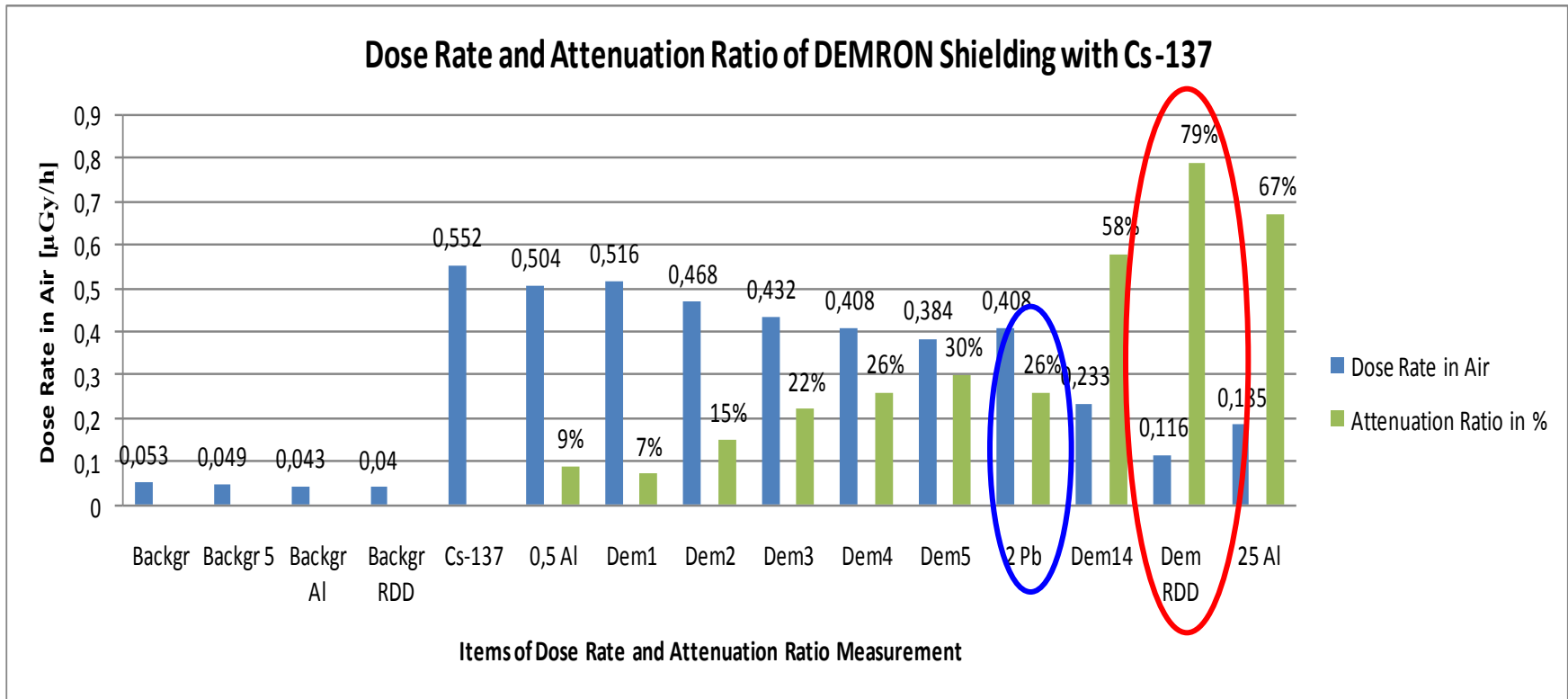
Inner fabric

Skin contact

# Shielding composite with nano-particles

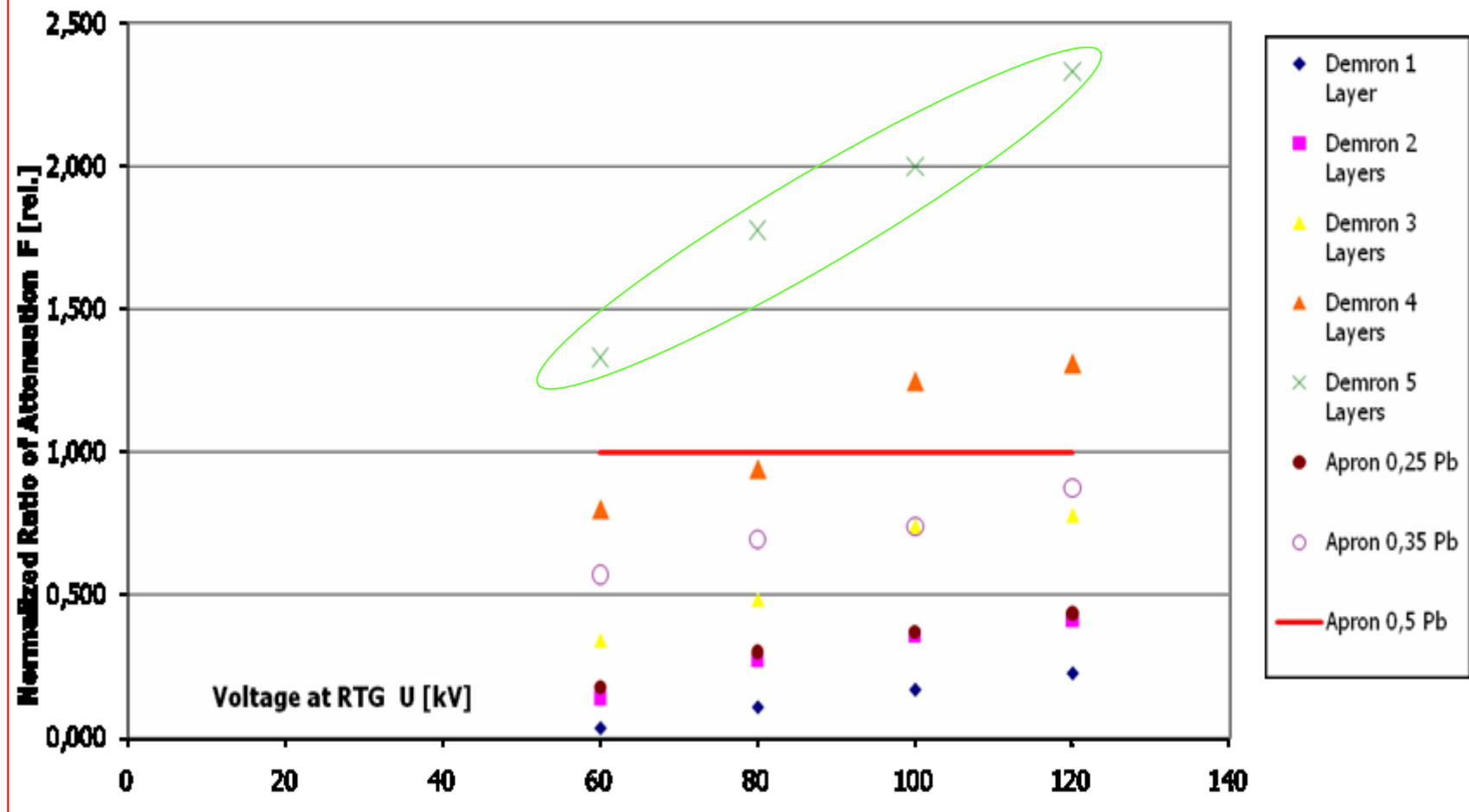


# Cs-137 ( $\beta$ )512 keV and ( $\gamma$ )662 keV



- During the measurement background dose rate fluctuated between 0,04-0,05  $\mu$ Gy/h and Cs-137 source gave dose rate of 0,552  $\mu$ Gy/h. Folding of DEMRON layers provide synergy effect in increasing of attenuation rate. 4 layers of DEMRON are surprisingly equivalent to 2 mm of Pb. Sample of multiply DEMRON layers as RDD shield provide effective attenuation of 79% against Cs-137 source.

### Normalized Ratio of Attenuation F (0,5 Pb Apron) versus Voltage at RTG



# Light-weight x-ray(rtg) Apparel

Old generation of Pb composite with poor mechanical properties and tendency to defects



- Non-lead (Pb) composite
- Nano-sized fillers
- ~30 % lighter
- Attenuation improvement
- CBRN protection/shielding
- Mechanical improvement
- Whole body apparel
- Thermo conductivity
- Recycling



# Escape Hood



# Integrity of the mask with optical device(s)



# “State-of-the-art”

how to aim with small arms wearing the mask



State-of-the-art respirators include SCBA and PAPR.

# Only the mask in the World compatible with optical devices



# Respiration and Dermal Protection

7/24 Availability



# Emergency Medical Service CBRNE Intervention and Protection Equipment



# EOD responder vulnerable against CBR hazmat



# Ventilation of EOD helmet without CBR protection





# Lack integrity of EOD`s helmet with respiratory protection



# EOD`s CBRN Integrated Helmet



# Air-way Support Means in Contaminated Environment



# Intraosseous (IO) Administration of Antidotes and Fluids

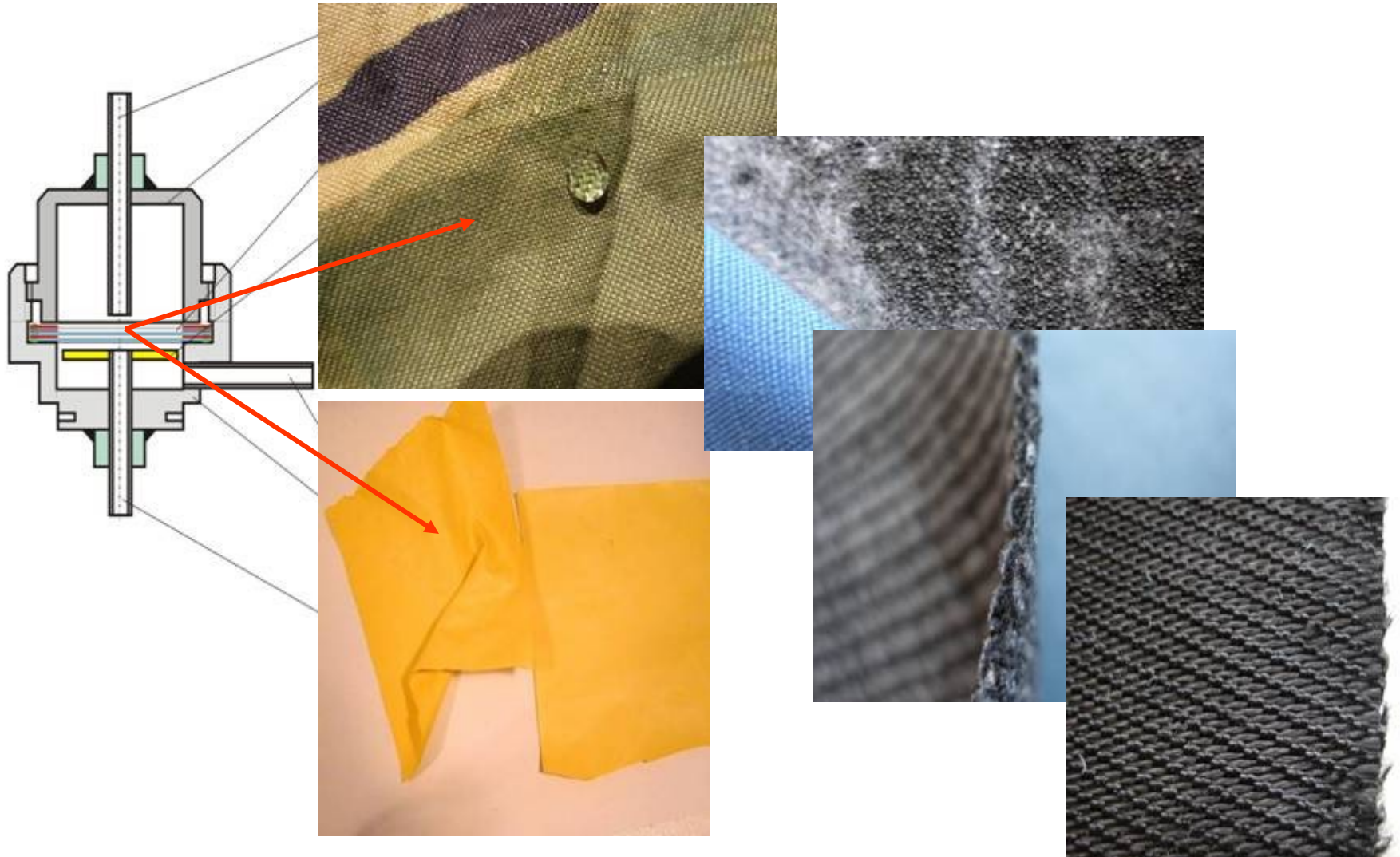


Ben-Abraham 2003 Acad Emerg Med 10:1407-1410

# Scissors versus Cutter

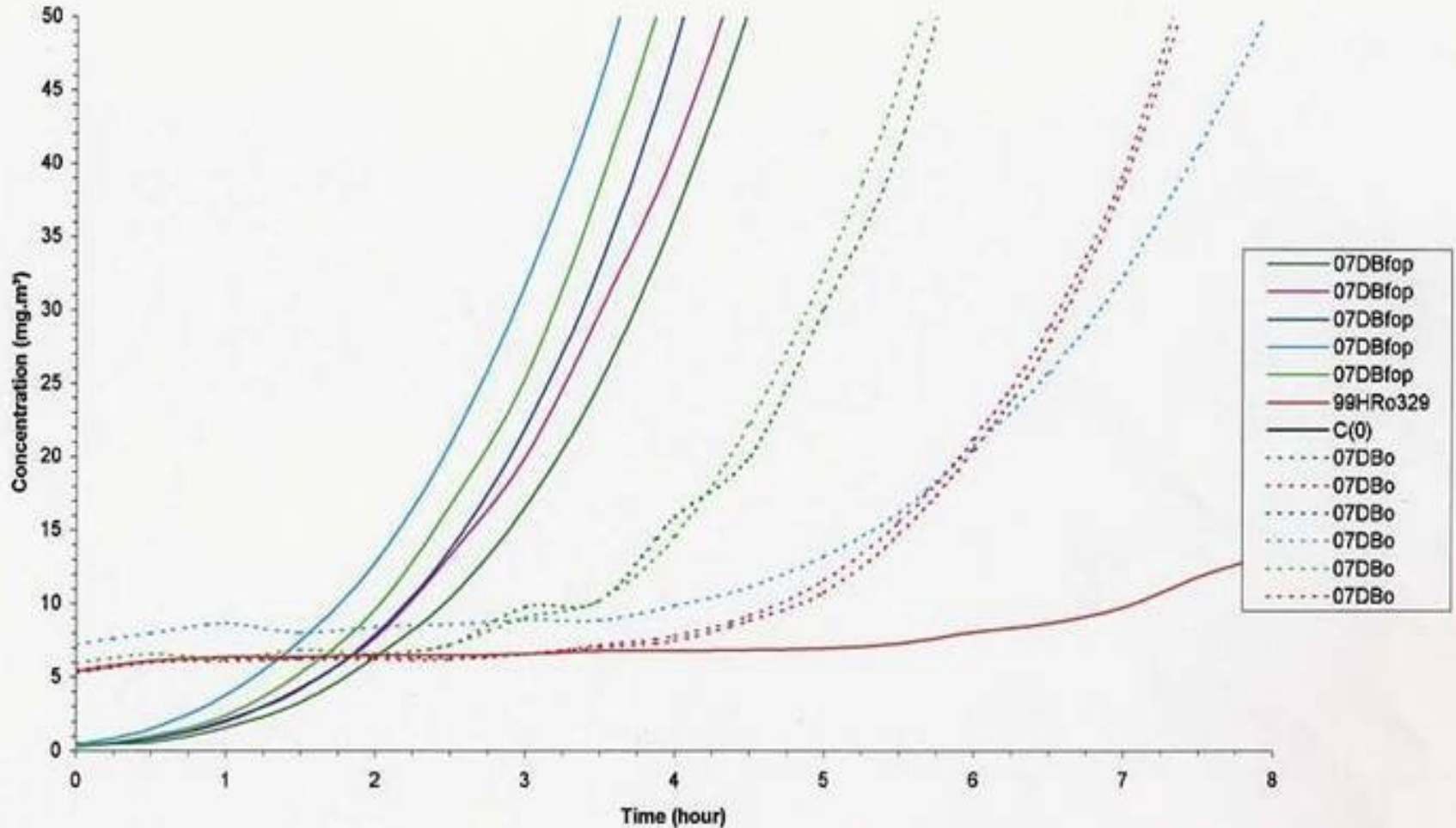


# Swatch Testing with Permeation Cell



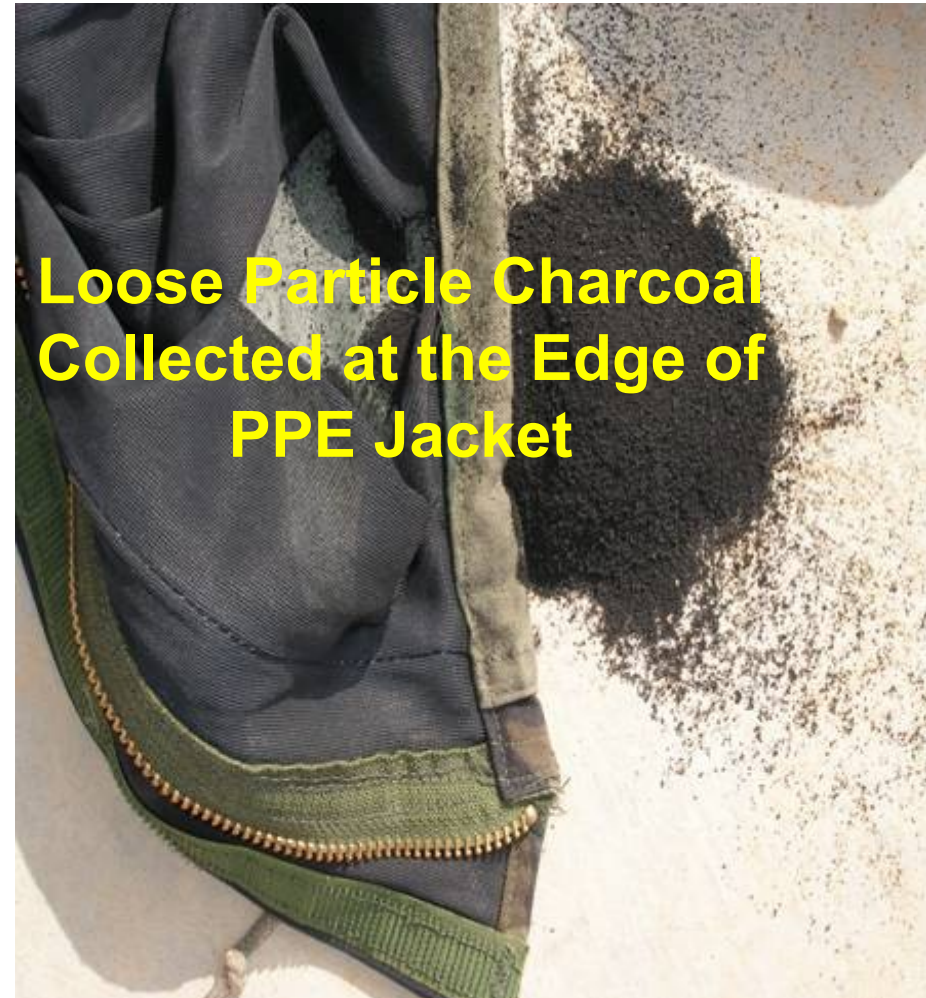
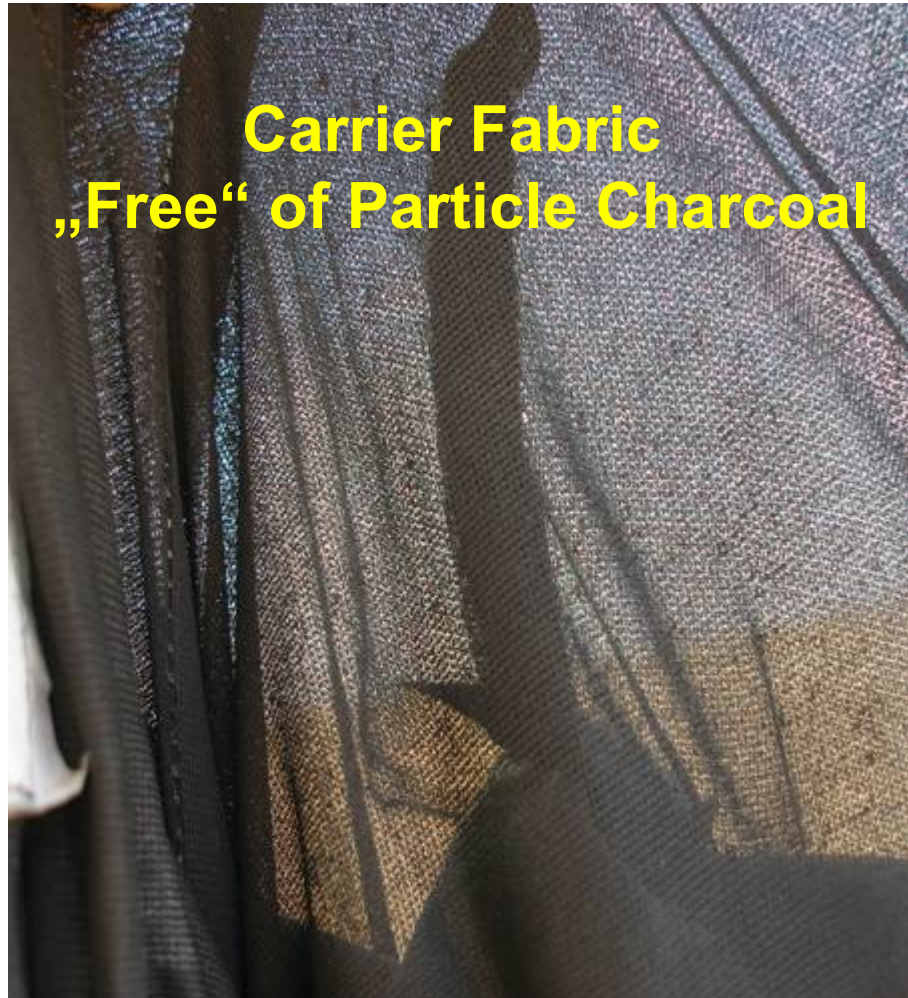
# Adsorption of HD at Charcoal Fabrics

Dynamic Adsorption



# Technology Failure

## Particle Charcoal Fallen Apart from Carrier Fabric





# Testing PPE with Volunteer Individuals in Gas Test Chamber



# Testing PPE with Semi-robotic Mannequin in Gas Test Chamber

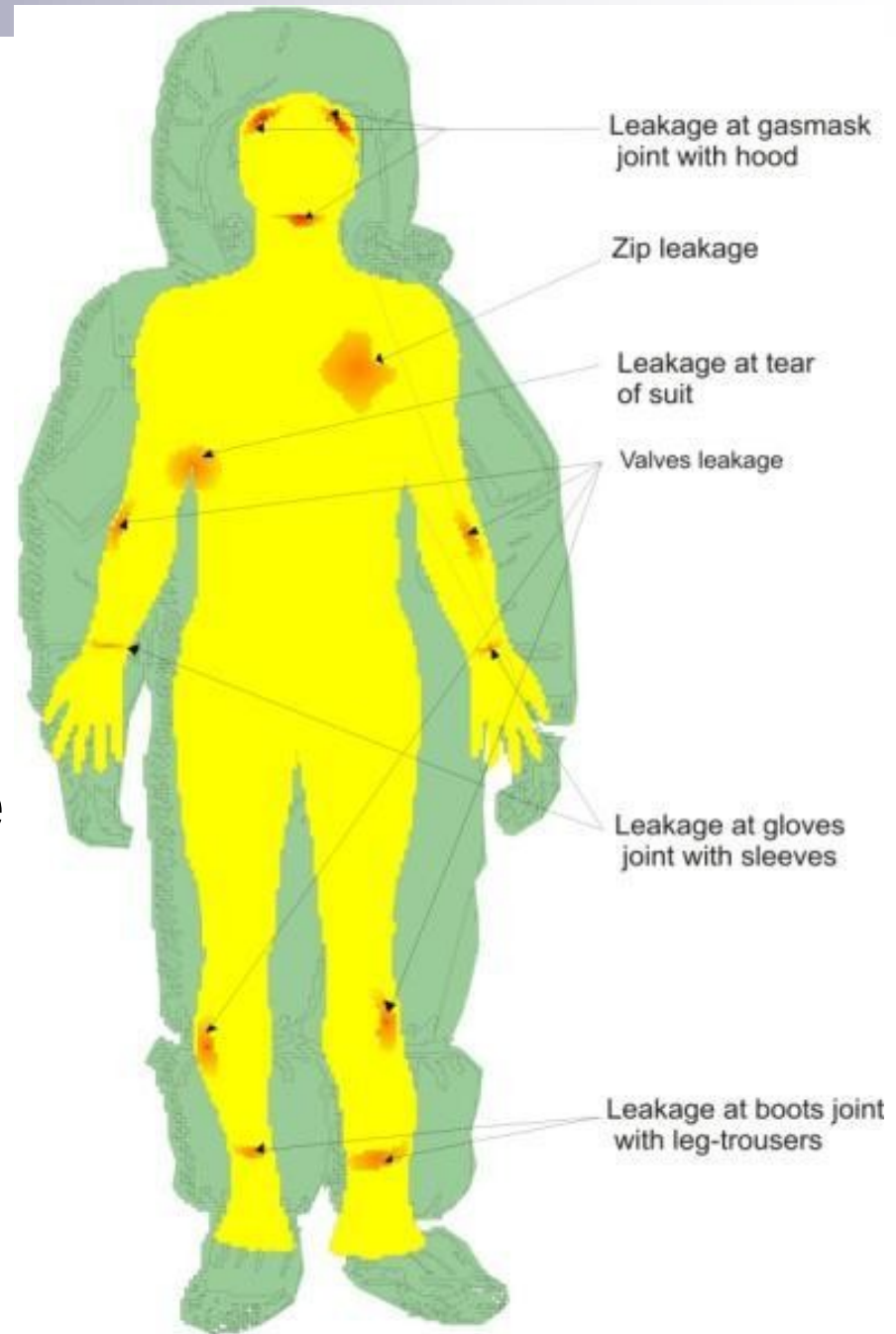


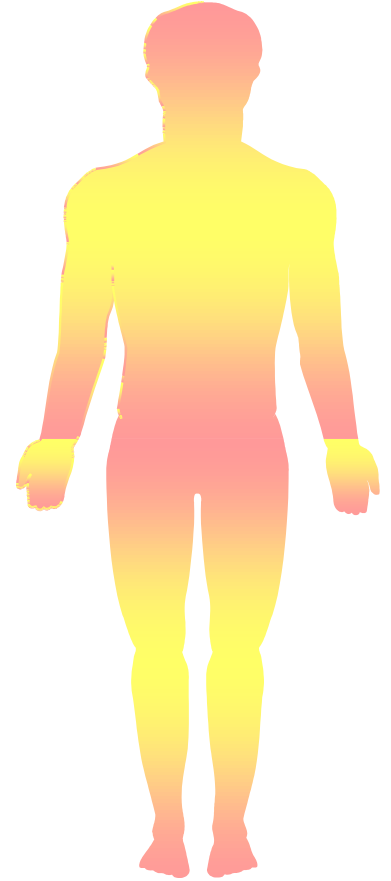
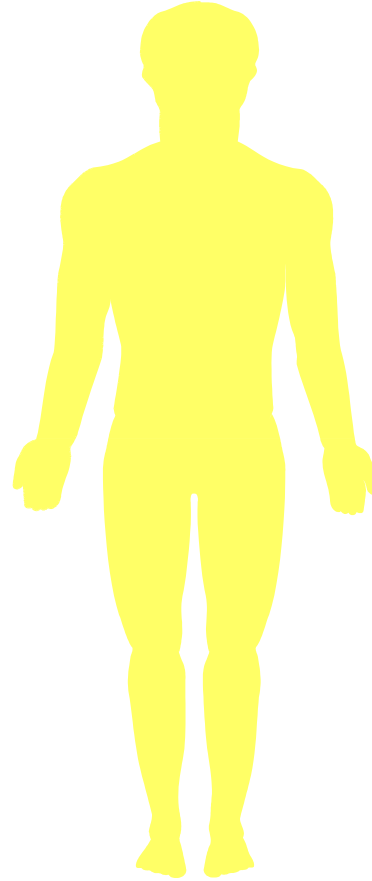
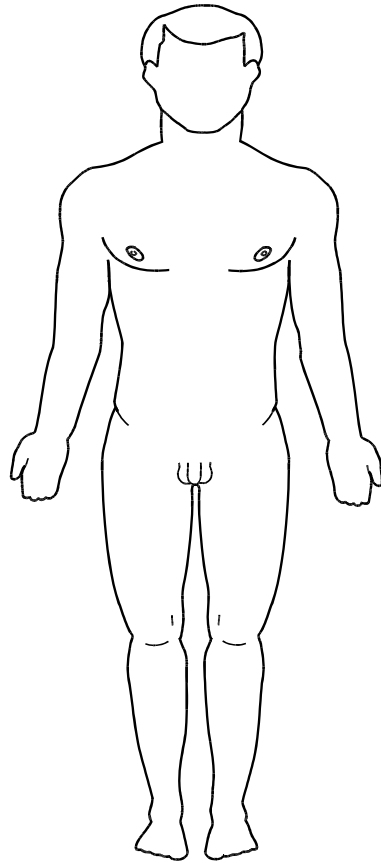
# V-MIST

## Visual

## Man-In Simulant-Test

is enable  
precisely and  
objectively identified  
penetration of challenge  
agents/simulant  
through deficiencies of  
personal protective  
ensembles



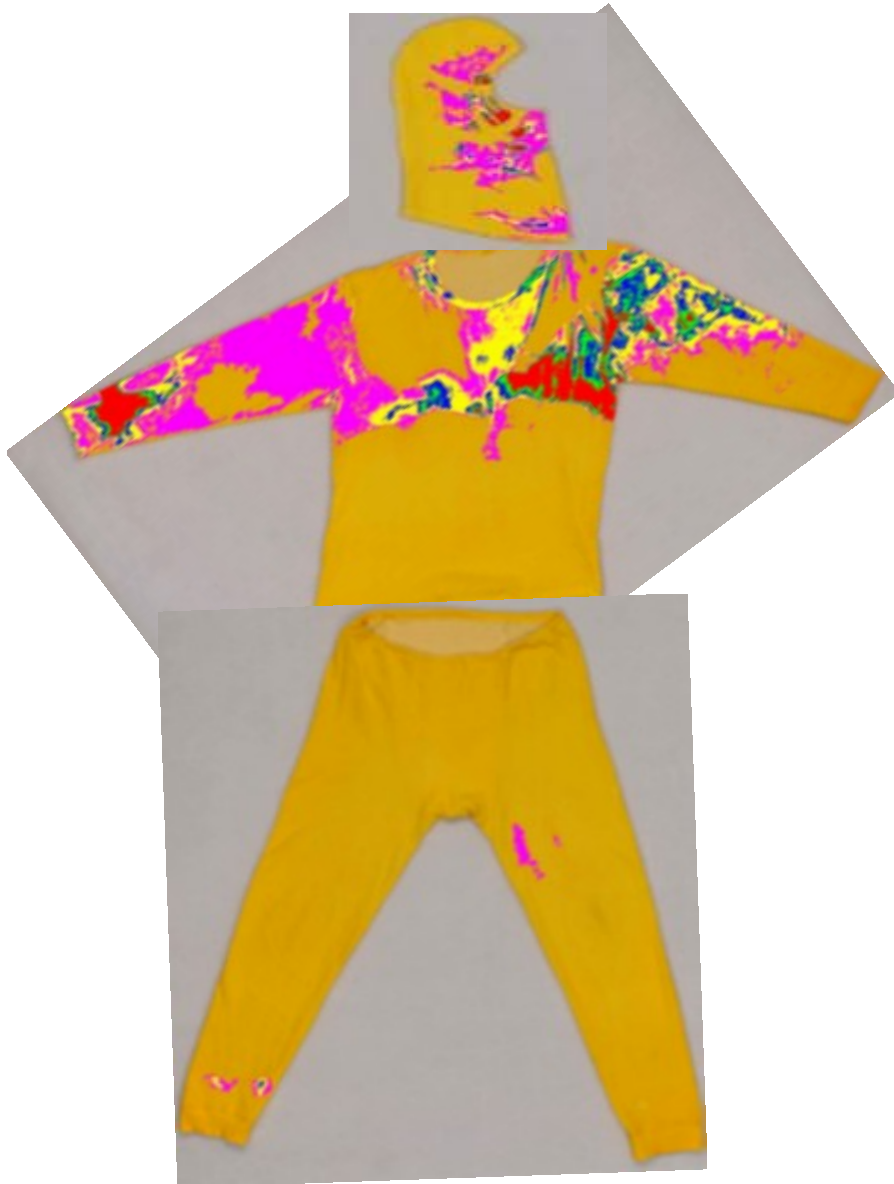


# Mannequin „Golem“ in PPE and V-MIST detection of Chlorine penetration



**Chimney`s/Pocket`s  
Effect**

# Image of Whole Body Exposure



**WHOLE  
BODY  
S=18322 cm<sup>2</sup>  
D= 1022 µg  
PF= 760**

# „Chimney“ Effect of Legs Exposure when Trousers are Worn over Boots



# „Bellows“ Effect of Under-suit Exposure





# „Wind Shield“ Penetration Effect



Penetration through zipper closure

Sub-millimeter hole (0.9mm)

Penetration „signature“ through a hole

# Heat Stress Collapse



# Physiology evaluation in Climate Test Chamber



# Climate Chamber

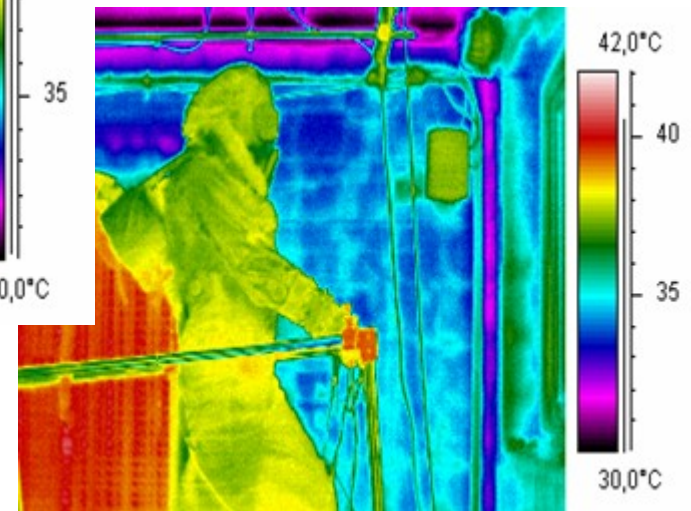
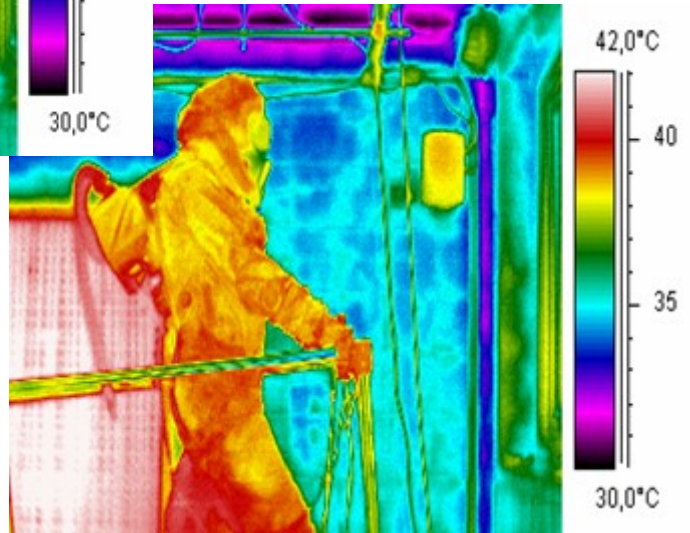
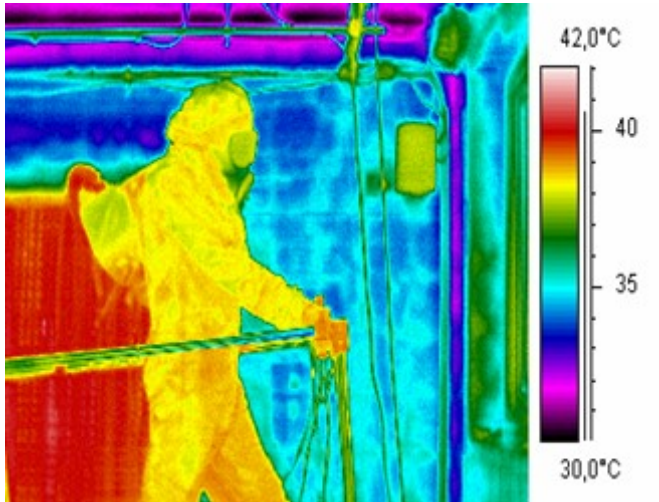


Pictures by courtesy SUJCHBO

# Heat Workload and Ventilation/Cooling Evaluation



# Thermo-imaging of Heat/Cooling Dissipation



# Decontamination

- There is firm opinion and exercised practice, that **victims exposed with the CBR contaminants have to be decontaminate directly on-site of an CBRNE incident, prior medical emergency aid will be provided and also prior their transportation to medical facilities for advanced emergency care.**
- **This approach significantly delayed measures for saving lives** of victims on-site and also complicate their health recovery at the medical facilities.
- Therefore, there is vital recommendation, that **medical facilities have to be equipped with independent stand by decontamination capacities**
- Another improvement should be considered that the **emergency decontamination means** have to be permanently available to responders for their safety and for assisted decontamination of critical parts victim's body prior providing first aid on-site. This measure can significantly contribute for saving lives of patients and protection their health with minimized delay.



# CBRN Training & Skills



# Preparedness of Responders

## Key Assumptions

- **Policy** (HazMat vs CBRNe)
- **Standards** (equipment, operations, competencies of FRs)
- **Standard Operations Procedures** (consistent with CM)
- **Equipment** (consistent with policies, standards, SOPs, mission oriented, interoperability, tested)
- **First Responders** (medical and psychological examinations, fitness)
- **Training of FRs** (consistent with CM, SOPs, equipment, competency criteria)
  - Individual training-Team training
  - Awareness-Advanced-Specialized-Rehearsal Levels
- **Exercises** (individuals-teams-inter agencies)
  - Feed back for improvement of operations, SOPs, equipment, FR performance, training&education

# Training Programs

- **Training programs** are vital part of the process for preparedness and response in order to **prepare the responders for their prime and secondary roles**.
- Training programs will serve also for **validation** of the guidelines, SOPs, working procedures, protocols, agreed roles, competencies, capabilities and capacities for effective response in CBRNE consequence operations.
- The **exercises** of different level verify and help to **improved tactical response operations** and associated guidelines, SOPs, protocols and proficiency of specialized protection and intervention equipment.

# Priority of Training Program Development

- Define the program **aim(s)** and individual/team **competencies, measurable goals** and **enabling objectives**.
- **Content of policies, guidelines, SOPs and protocols is the basis** for development of particular courses, instructions, lessons, their content, performance evaluation and exercises.

# Quality Assurance/Quality Control

- Development of courses should be also managed according quality assurance and quality control (QA/QC) standards.
- This would be the part of training programs/courses **certification and accreditation**, in order to be able issued **formal performance certificate** to graduates.
- Taken into account variety of agencies and specialized responders it will be important to guarantee consistency and integrity of individual and team knowledge and skills.

# Modular Training Program

- THREATS OF CBRNE
- CBRNE SUBSTANCES AND MATERIALS
- EXPOSURE TO CBRNE
- HEALTH AND SAFETY AT CBRNE EVENTS
- PROTECTION AGAINST CBRNE
- HEAT STRESS MANAGEMENT
- MEDICAL COUNTERMEASURES AGAINST CBRNE
- EMERGENCY MEDICAL RESPONSE AT CBRNE EVENTS
- DETECTION, MONITORING AND IDENTIFICATION OF CBRNE
- DECONTAMINATION AND CLEAN-UP OF CBRNE
- CRISIS AND CONSEQUENCE MANAGEMENT
- RISK ASSESSMENT
- CRISIS PREPAREDNESS
- INTEGRATED RESCUE SYSTEM
- RESPONSE TO CBRNE EVENTS
- INCIDENT COMMAND-CONTROL-COMMUNICATIONS
- INVESTIGATION OF CBRNE EVENTS
- SECURITY AND PUBLIC RELATIONS
- EQUIPMENT MAINTENANCE, REPAIR AND STORAGE
- EXERCISE OF CBRNE RESPONSE

**Level I-Basic Course(s) ; Level II-Advance Course(s); Level III-Specialist Course(s)**  
**(awareness) (operations) (technicians/specialists)**

# Intervention Response On-site in Contaminated Zone



# First Aid Support in Staging Area



# Victim's Emergency Decontamination





# Disrobing (Cut-Off) of Victims



# CBRN TTC-First Aid-Emergency Cut Off



# TTC–Hot Site-Control Tower Command & Operations Room supervising Hot Area



# TTC–Hot Site

**Toxicity of chemicals demonstration**



**Training Tasks**

# Detection tasks



Pictures by courtesy Blaz Mihelic

# TTC-Demonstration of explosive dissemination of a contaminant



Pictures by courtesy Blaz Mihelic

# CBRN TTC-Decontamination tasks

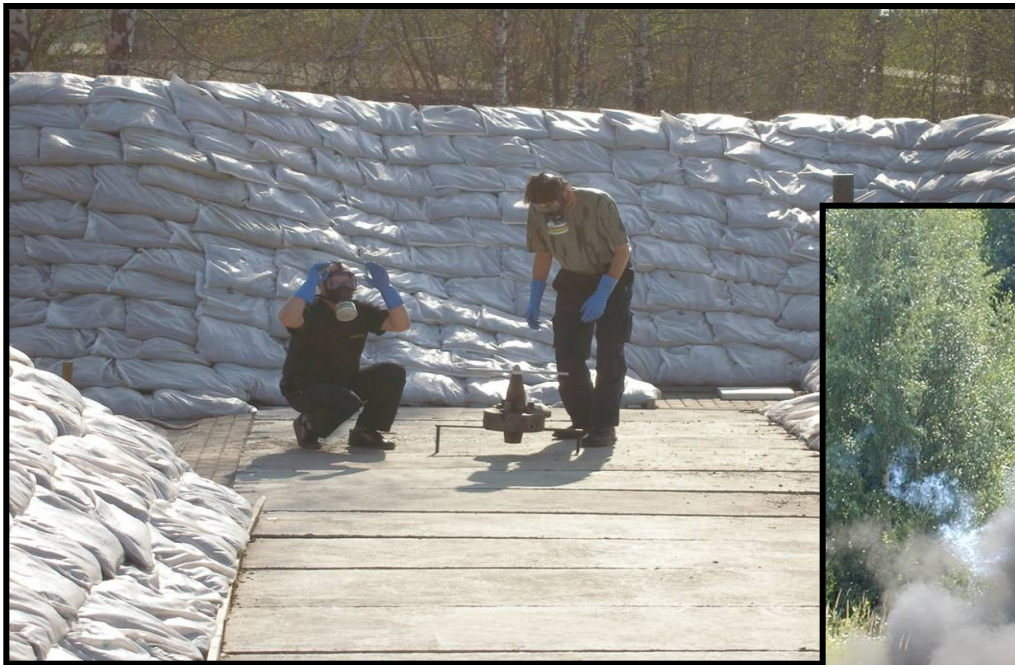
**Emergency decontamination  
of a person**



**Operational decontamination of  
reconnaissance vehicle**



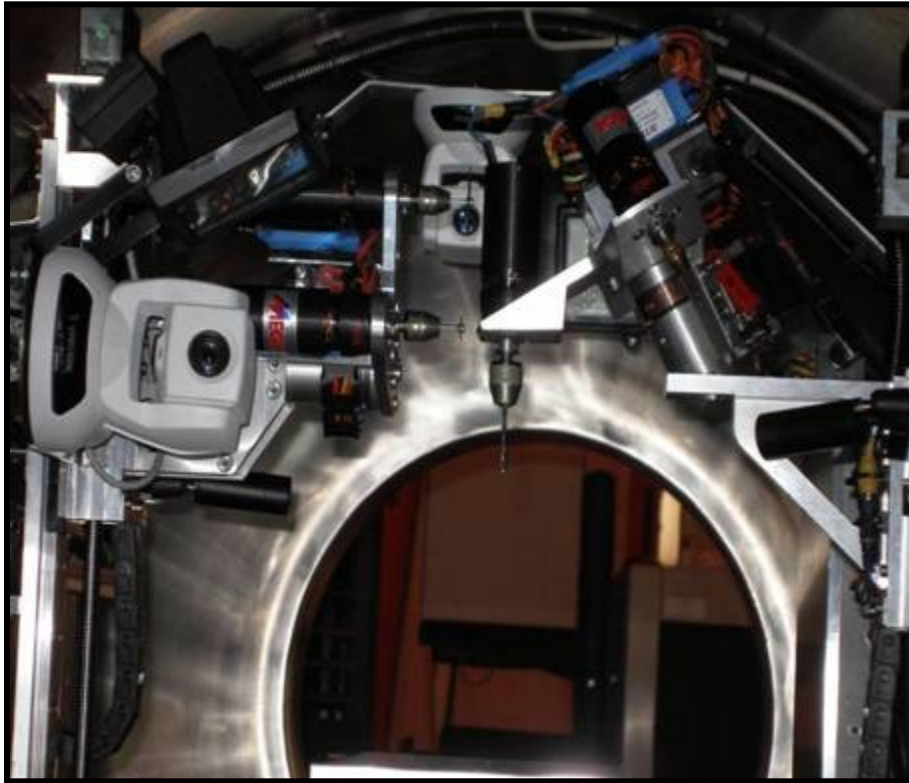
# NINCBO-Blasting Area “Dirty Bomb” simulation



Pictures by courtesy SUJCHBO



# Opening Munitions for Sampling





Thank you for your Attention

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