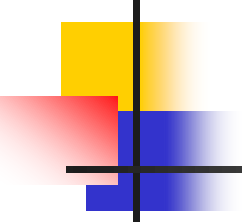


# AN INTRODUCTION TO DISASTER MEDICINE



*Лектор:  
доц. д-р В. Данчева, дм*

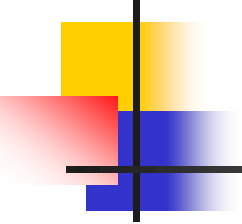
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- ❑ **Disaster medicine** is primarily based on **emergency** and **military medicine**. It is young branch of the medicine, which touches on various disciplines within and outside the medical field.



# Disaster medicine is taught:

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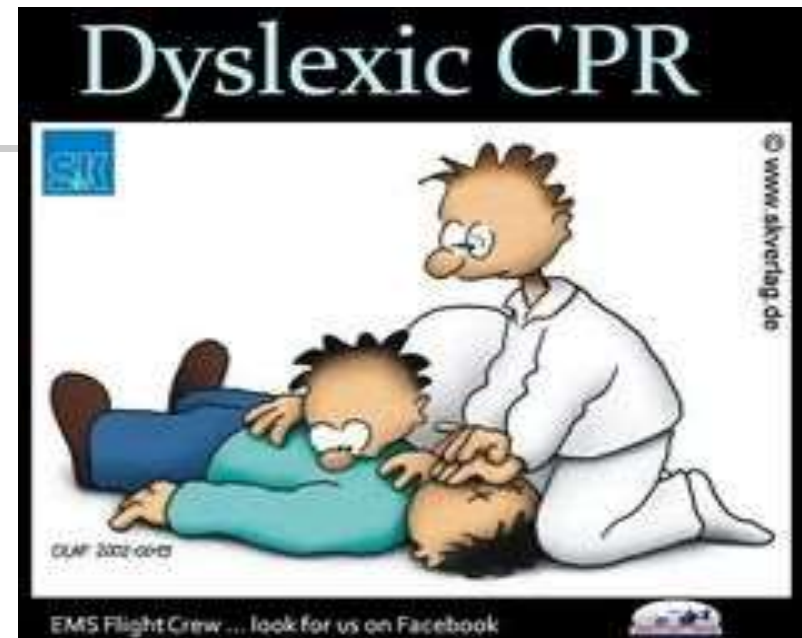
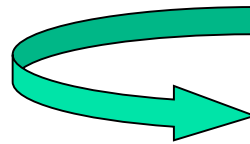
- ❑ On **academic level** for medical students
- ❑ On **post-academic level** for doctors and specialists
- ❑ On **para-academic level** for nurses, ambulance crews and firemen. The first chairs in disaster medicine were established in the beginning of the 80<sup>ths</sup> in **Linköping, Sweden and Amsterdam, the Netherlands**. Today disaster medicine is taught at many universities in Europe and America.

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- 
- ❑ **Disaster medicine is complex of medical and medico-organizational actions into an integrated management system for disaster situation.**
  - ❑ This term cover the whole range of medical cares from the scene of the disaster to the hospital bed.

# The **specific problems** of disaster medicine can be divided into **two groups**:

## **Medical problems:**

- ❑ Advanced life support
- ❑ Basic life support
- ❑ Triage
- ❑ Emergency surgery
- ❑ Emergency anesthesiology
- ❑ Specific disasters (nuclear, chemical, biological)
- ❑ Nutritional aspects of the disasters
- ❑ Psychological aspects of the disasters
- ❑ Hygienic aspects of the disasters
- ❑ Rehabilitation



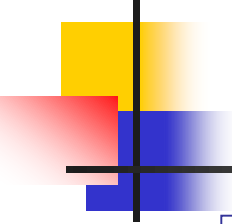


The **specific problems** of disaster medicine can be divided into **two groups**:

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**Medico-organizational problems:**

- ❑ Disaster relief organization
- ❑ Mobil medical teams
- ❑ Transportation of casualties
- ❑ Hospital procedures
- ❑ Evacuation of populations
- ❑ Disaster epidemiology
- ❑ Disaster victim identification
- ❑ Managerial aspects
- ❑ Legislative aspects



# **Classification of disasters** **(according to the nature of the** **destructive agent)**

## ***1. Natural disasters:***

- ☐ **earthquakes**
- ☐ **floods**
- ☐ **cyclones,  
hurricanes,  
tornadoes**
- ☐ **volcanic eruptions**
- ☐ **landslides**

## ***2. Man-made (technologic or cultural) disasters:***

- ☐ **Physical (water, coal,  
gas, petrol)**
- ☐ **Chemical**
- ☐ **Nuclear**
- ☐ **Bacteriologic**

# Classification of disasters (according to the nature of the destructive agent)



## ***3. Socio-economic disasters:***

- ☐ **Epidemics**
- ☐ **Famines**
- ☐ **Terrorism**
- ☐ **Wars**

## ***4. Transport disasters:***

- ☐ **Railways**
- ☐ **Automobiles**
- ☐ **Air crash**
- ☐ **Maritimes**
- ☐ **Fluvials**

## ***5. Mixed disasters***





# CHEMICAL DISASTERS

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Chemical disasters result from the storage, processing and transportation of large amounts of highly flammable, explosive, and toxic chemicals.

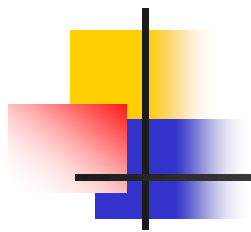
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- The released toxic substances or their byproducts into the environment result in ***intoxication***. Most catastrophic chemical release or spills occur in the transportation phase of the industrial process.



- ❑ The fires very often cause ***blast burn*** or ***inhalation injuries***.
- ❑ On other hand the explosions result in ***mechanical traumatic*** lesions
- ❑ The chemical contamination of the water table, the soil and the food chain can cause ***delayed effects*** for years with impairment to the ***neurological*** or ***immune system***.

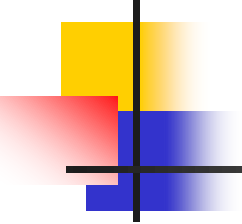
# 1. Scope of the problem



**The problems related to industrial safety in developing countries include:**

- the inability to ensure the proper use of new technology
- the **lack of effective urban zone that separate residential communities from industrial sites**
- the **lack of prehospital emergency medical services**

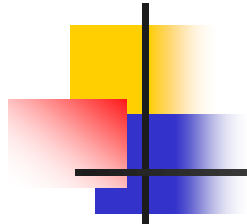
## 2. Basic concepts



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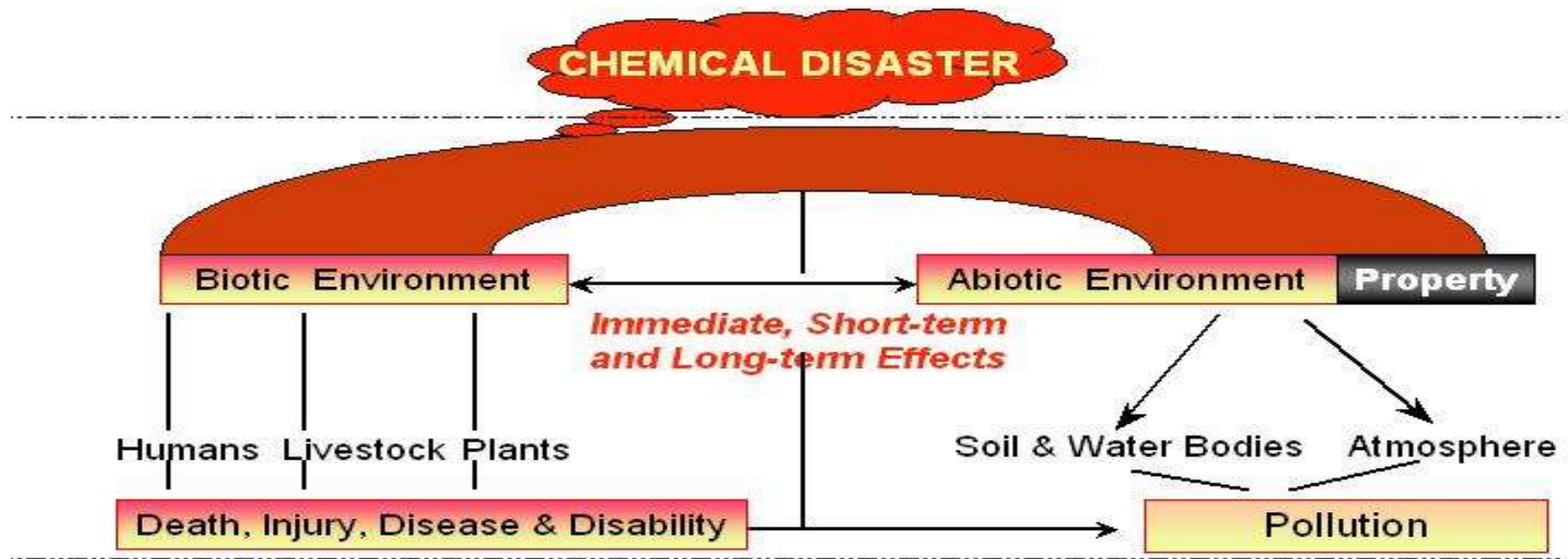
The term ***chemical disaster*** may be understood as a great calamity in which **many people (at least 50) perish** and in which a chemical cause the **death or injury** of so many people that the **normal health and emergency services** are, or **threaten** to become, **overburdened**.

## 2. Basic concepts

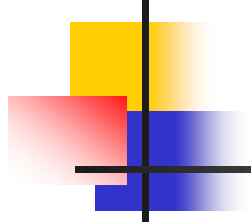


- ❖ A ***catastrophic situation*** may be considered a threat to perhaps **10 persons**. This is the number of individuals with which the crew of an Emergency Medical Services (EMS) ambulance can effectively cope.
- ❖ An event in which **only one or a few persons** are the victims may be considered as an ***accident***.
- ❖ A ***catastrophe*** can be considered to encompass any situation in which the need for aid surpasses the normal capacity to deliver medical and technical assistance.
- ❖ A ***hazard*** exists where there is a situation that in particular circumstances could lead to harm.

# Impact of a Chemical Disaster



### **3. Classification of the chemical disasters:**



**Disaster may be classified as follows:**

- **1. According to the number of victims produced by an incident.**
- **2. The extent of the contaminated area.**
- **3. The population density in a contaminated area for volatile chemicals.**
- **4. The amount of chemical involved.**
- **5. The toxicity of the chemicals.**
- **6. The magnitude of the measures that must be taken to counteract the accident and to limit its consequences.**
- **7. Consequences on the environment.**



## 4. Factors affecting the severity and occurrence of industrial disasters

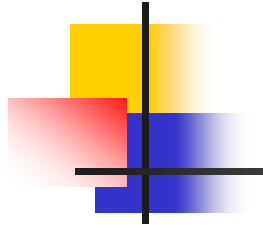


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The community's risk for industrial disaster is increased from some natural and human factors:

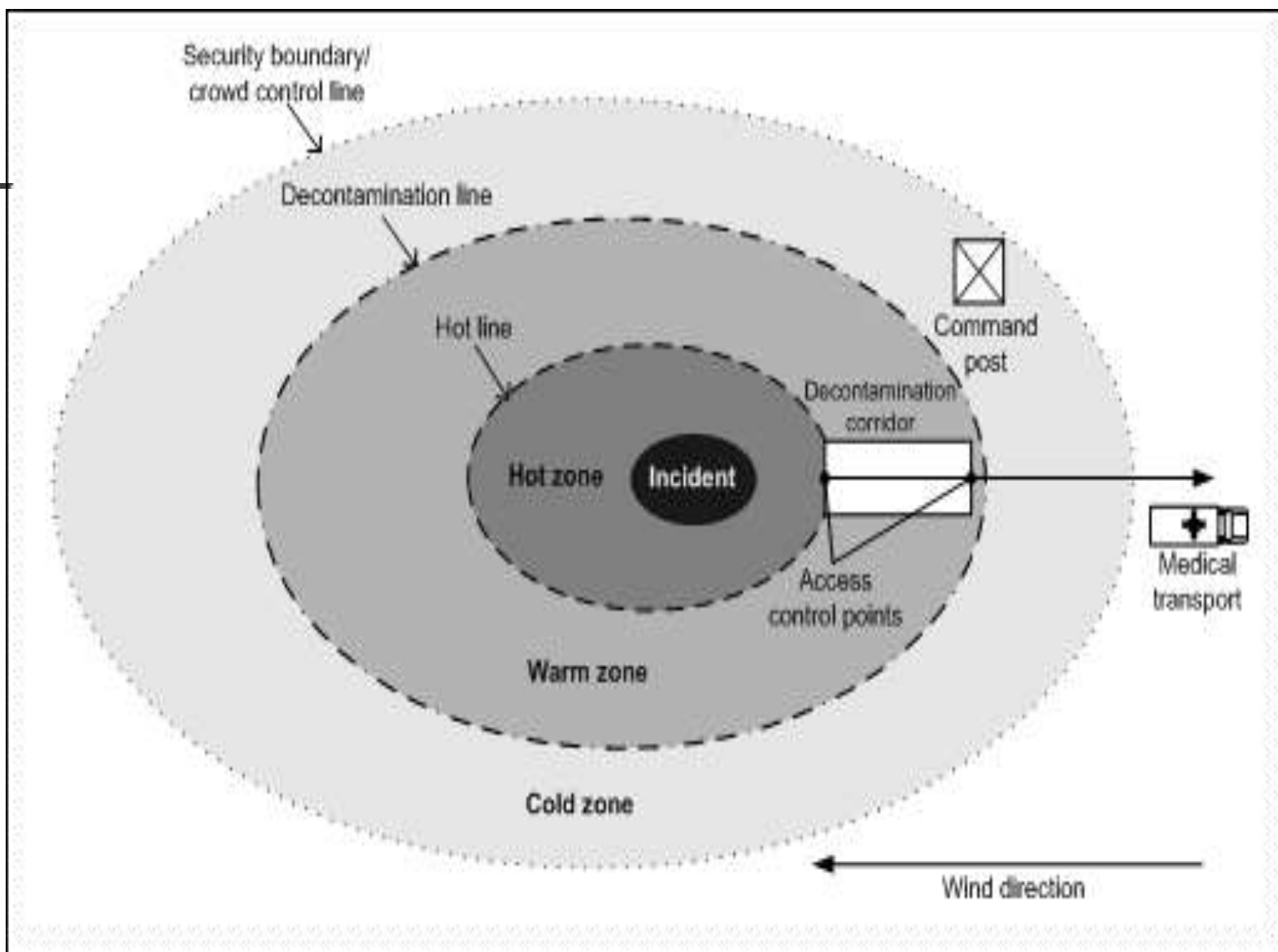
- • **The location** of industrial sites in **regions** subjected to **natural disasters**. **Flood**, **earthquakes** and **hurricanes** can destroy a community's civil infrastructure and its industrial base, critical industrial safety systems, etc.
- • **Human factors** as human **errors** from **fatigue** or **inadequate training**;
- • **Lack of strong occupational and industrial health expertise or functioning emergency medical systems**

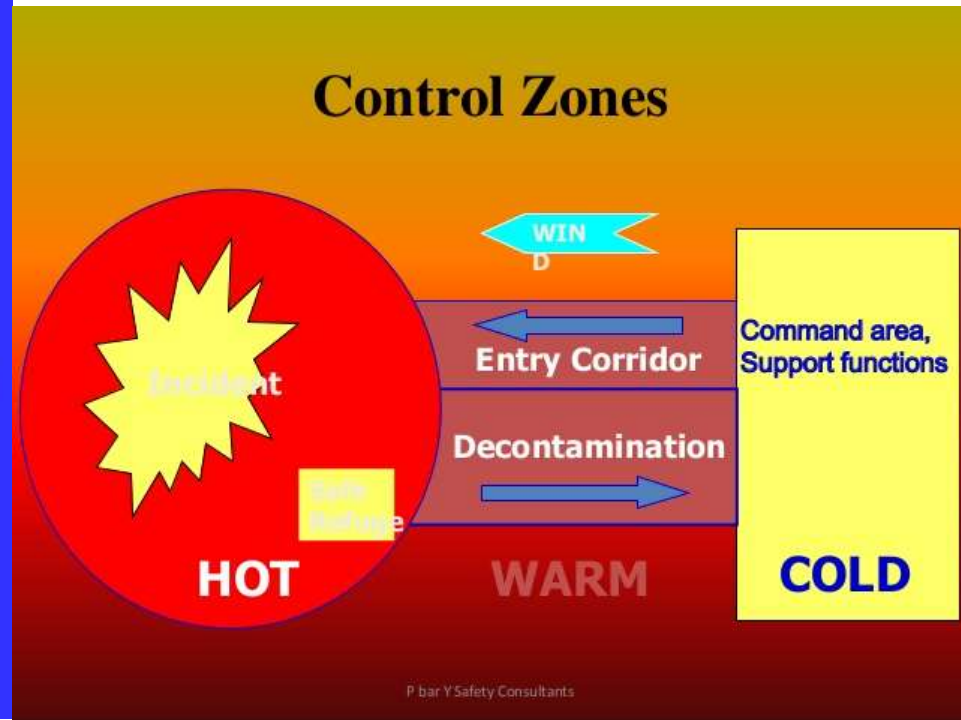
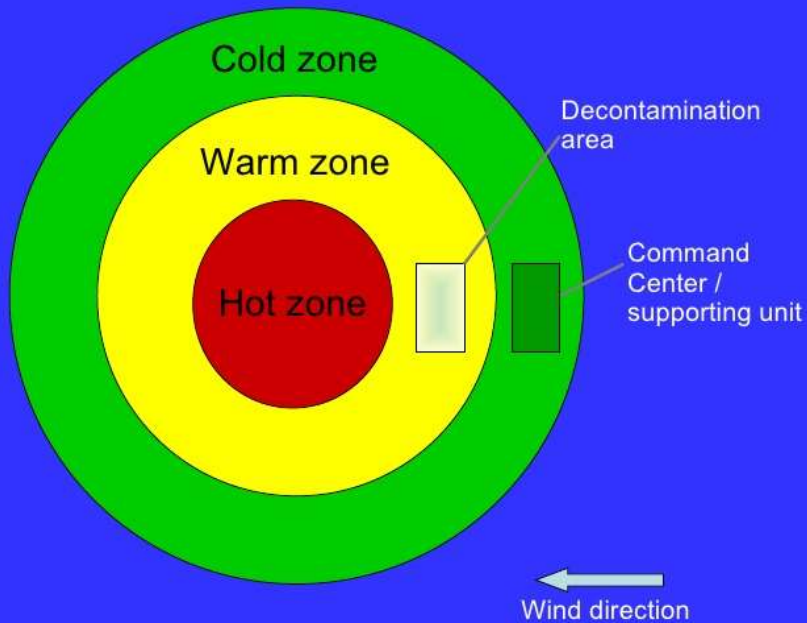
## 5. Chemical disaster procedures



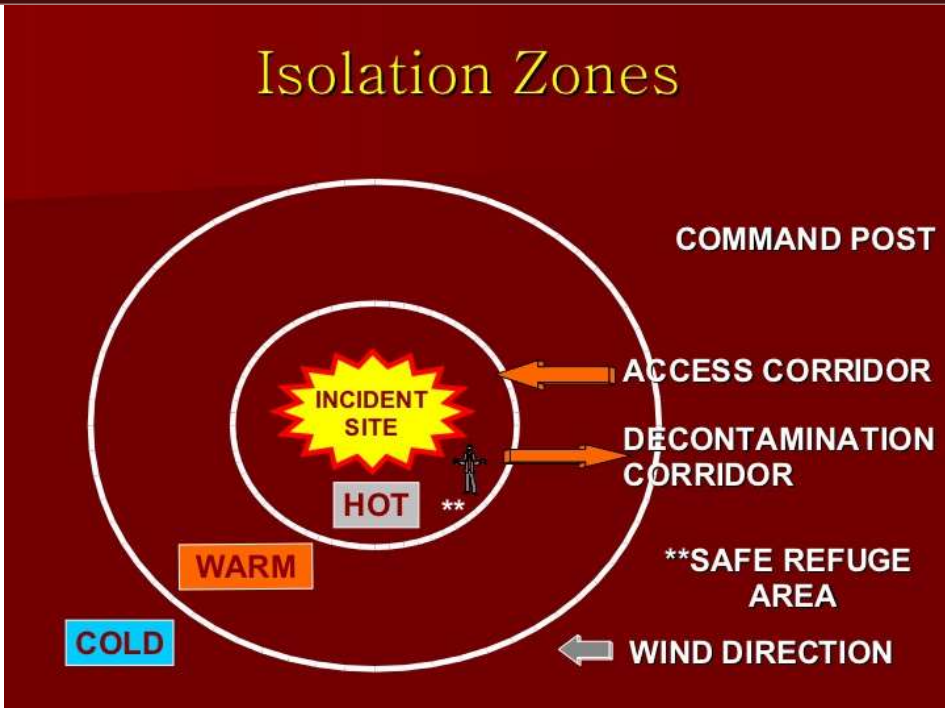
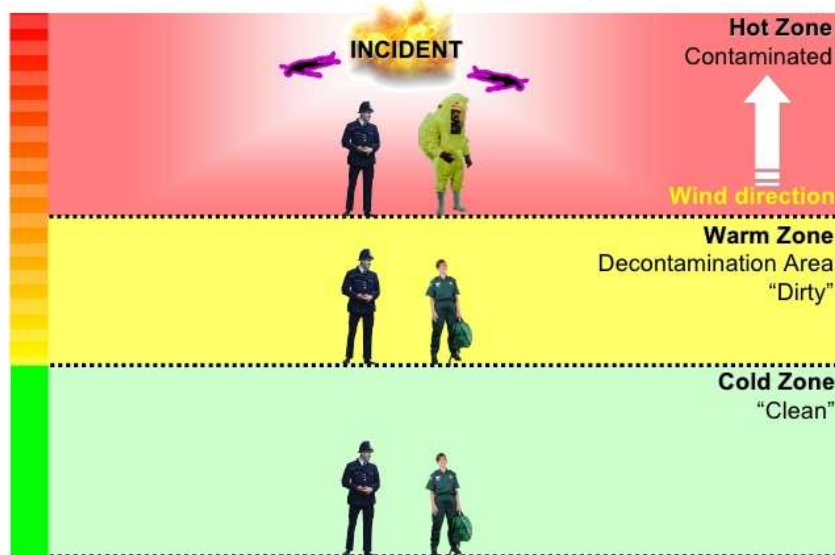
### **Chemical disasters pose some unique problems:**

- ❑ Substance identification is important prior to a massive rescue effort.
- ❑ On-site decontamination procedures are essential for both victims and emergency medical services personnel.
- ❑ On-scene separation of **hot**, **warm**, and **cold** zones will facilitate safe initial responses to the injured.
- ❑ Protective clothing may be essential for those involved in rescue and triage procedures.

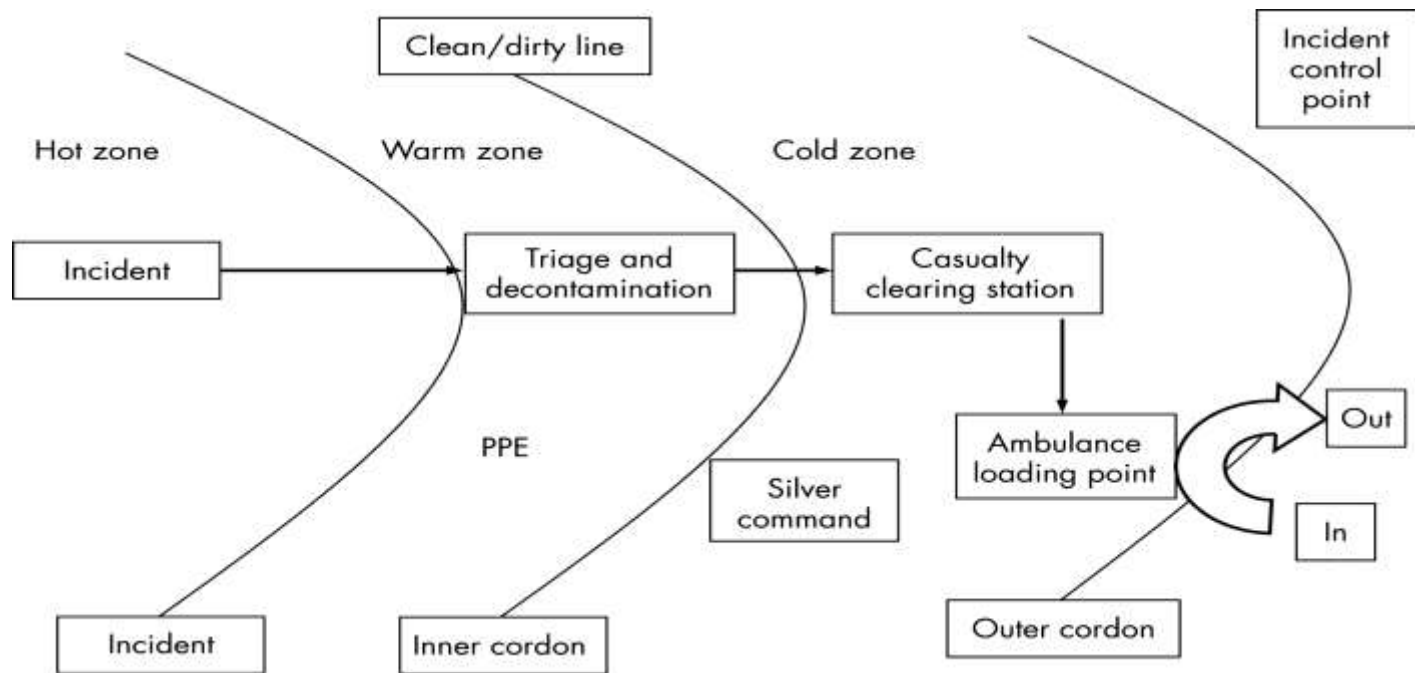




How well equipped are the Emergency Services?



## Medical HAZMAT site plan.





Treatment of a chemical, biological, radiological and nuclear (CBRN) incident in the “Hot Zone”.

CBRN emergency trauma management

M – control of massive haemorrhage

A – airway and antidote

R – respiratory protection and oxygen

C – circulatory system management

H – head (CNS assessment AVPU and pupils)

# LEVELS OF CONSCIOUSNESS

A

Alert



V

Verbal  
Stimuli



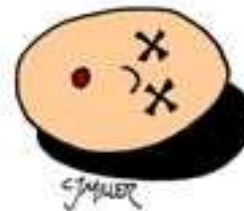
P

Painful  
Stimuli



U

Unresponsive







**A**

**The patient  
is awake.**

**V**

**The patient responds  
to verbal stimulation.**

**P**

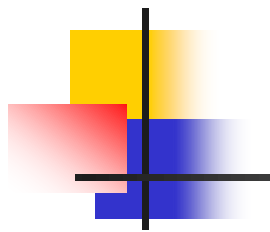
**The patient responds  
to painful stimulation.**

**U**

**The patient is completely  
unresponsive.**

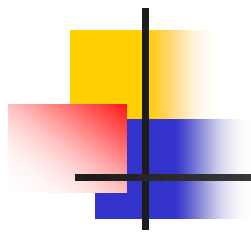


## Proposed “Hot Zone” treatment plan.

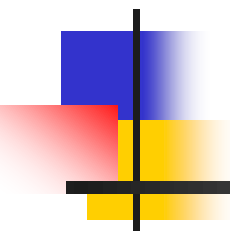


Hot zone	Warm zone		Cold zone clean/dirty line
<div>Medical recce Triage MARCH IV/IO antidote</div>	Triage  Essential trauma interventions with antidote (oxygen atropine diazepam amyl nitrite)	Decontamination  Continued medical care with antidote	Continued medical care  and  transfer to definitive care

## 5. Chemical disaster procedures



- ❑ Ambulances and other vehicles removing the injured require decontamination procedures.
- ❑ Hospitals require a triage area, a separate decontamination area, and separate entrance.
- ❑ Transport vehicles may require placards to indicate the type of chemical contamination involved.
- ❑ Mass evacuation of the population should be considered.



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# **Prevention and control measures**



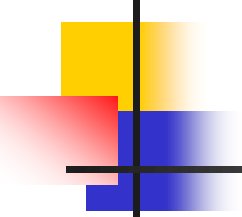
# 1. Hazard identification

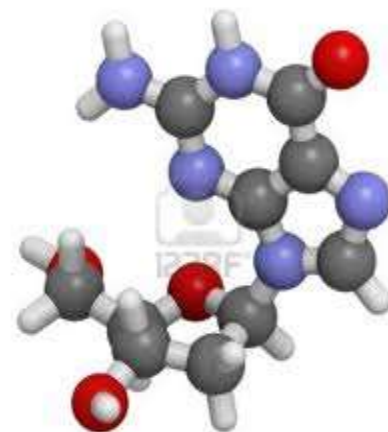
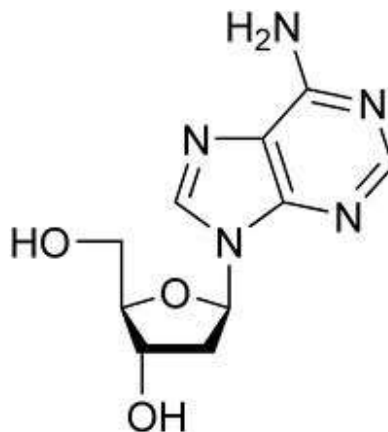
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This process, called **hazard identification**, requires **identifying all chemical products** that are **stored, manufactured or transported** by local industry and that might affect the community in the event of an industrial disaster.

**It is necessary to detail:**

- the **physical characteristics** of the chemical agent;
- the **expected health effect** associated with human exposure;
- the **information** on **chemical reactions** and **hazard-neutralization strategies**.

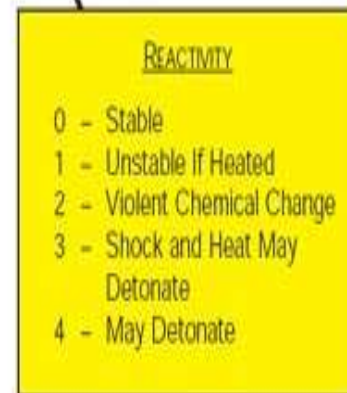
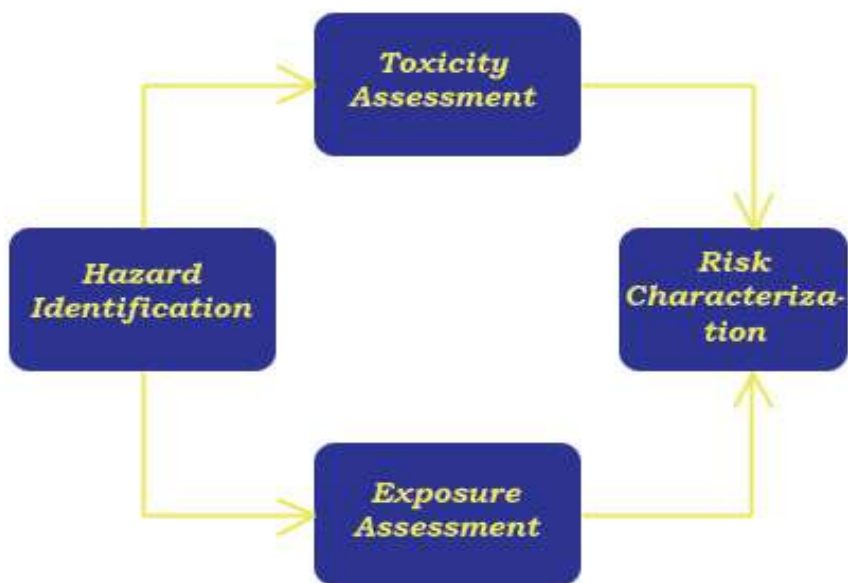
- 
- A chemical substance is a material with a definite chemical composition.
  - New chemicals are being discovered daily & at last count there are about 30 million chemical compounds



# SAFETY RESPONSIBILITY



DEPENDS ON EVERYONE





# Chemical Agent Detection

- Some can be seen
- Some can be smelled
- Some can be tasted
- Most can be felt (e.g. burning sensation, choking)
- *All can be detected by appropriate instruments*





# Types of Chemical Agents

*Some chemical agents are persistent,  
many are not persistent*

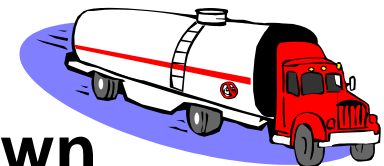
## Persistent chemicals

- remain on surfaces without evaporating or breaking down for more than 24 hours
- can remain for days to weeks



## Non-persistent chemicals

- quickly evaporate and break down
- carried in bulk on commercial carriers





# Types of Chemical Agents

*Chemical agents are commonly classified by the type of harm they cause.*

1. Nerve Agents – **disrupt nervous system, causes paralysis, fatal quickly**
2. Blister Agents – **destroy skin and tissues, cause blindness, may be fatal**
3. Choking Agents – **lung fills with fluid, cause choking, quick or delayed fatality**
4. Blood Agents – **interferes with oxygen at the cellular level, fatal quickly**
5. Riot-Control Agents – **skin and breathing irritations, rarely fatal**



# Exposure Pathways

*Typical exposure path varies with chemical type*

**++** Typical path

**+** Possible path

**--** Unlikely path

Chemical Agent	Pathway		
	Inhalation	Ingestion	Skin or Eye Contact
Nerve	++	+	++
Blister	+	--	++
Choking	++	--	+
Blood	++	--	--
Riot-Control	++	--	++

## 2. Vulnerability analysis and risk assessment

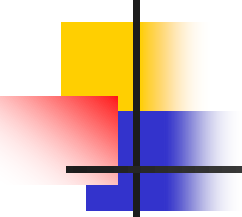


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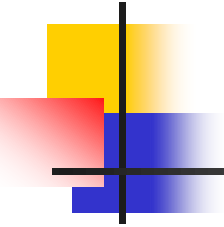
**Vulnerable populations** may be:

- **people with disabilities;**
- **children** attending school;
- **patients and medical personnel** working in nearby hospitals.

### 3. Emergency preparedness includes:

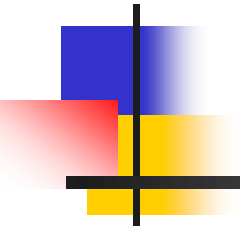
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- 
- **arranging medical care and proper referral destination** for patients exposed to hazardous materials
  - establishing **warning systems to alert** nearby communities of a chemical release
  - **determining minimal threshold concentrations** of toxic chemicals that would require the community **to evacuate** in the event of a chemical release
    - An **accurate and timely information** is also necessary regarding to:
  - **physical properties of chemical agents and their clinical effects**
  - **information on proper chemical neutralization and plume-dispersion estimation models**
  - **appropriate antidotes for victims and their proper administration**

### 3. Emergency preparedness

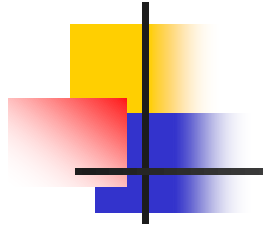


- **To protect industrial workers and emergency responders it is necessary to require:**
  - **personal protective equipment**
  - **respirator to protect the airway**
  - **protective measures for the skin and the eyes**
- **For entering an environment where the extent of the chemical hazards is not fully known is generally recommended:**
  - **chemical-resistant clothing, boot and hood**
  - **double-layered chemical-resistant gloves**
  - **positive-pressure self-contained breathing apparatus**





# **RESCUE SERVICES OF THE COMMUNITY**



The relief during disaster is organized at **local, regional and national levels.**

The services of **local and regional level** are:

- ❑ **the fire brigades**
- ❑ **the Polices**
- ❑ **the health services**
- ❑ **the major industries**

At **national level** operate:

- ❑ **Red Cross**
- ❑ **The National Police Force**
- ❑ **The Civil Defense**





The **Ministry of Health**, the **Armed Forces** also play important role. The purpose of the **Civil Defense** organization is to conduct activities in **prewar and wartime**, but it may also be called upon in **major disasters** during peacetime.

At higher level there are international **relief organizations** such as:

- ❑ **The International Civil Defense Organization**
- ❑ **The United Nations Disaster Relief Organization**
- ❑ **The International Committee of the Red Cross and Red Crescent**
- ❑ **The World Health Organization**