

The First 30 minutes of a disaster

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Be · S · E · Di · M

BELGIAN SOCIETY OF EMERGENCY
AND DISASTER MEDICINE

The First 30 minutes of a disaster

LT Kris SEGERINK (Fire Dept.)

Security & Safety Chain



BANG-theory

Left of Bang

Bang

Right of Bang



PROACTION- PREVENTION - PREPARATION

Emergency planning

ZH, MIP, PSIP, PRIMA & SIP

Intervention Strategie (Extra- & Intramuros)

Pattern recognition & Behavior analysis
(Situational) Awareness

SAFETY SAFETY SAFETY

REPRESSION

AFTER-CARE & Multi-debriefing

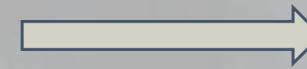


BANG & BANG

Left of Bang

Bang

Right of Bang



SECONDARY ATTACK!!

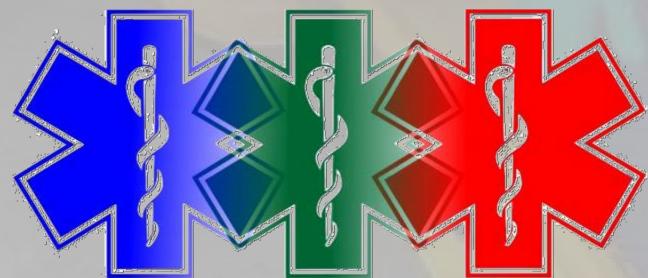


Right of BANG



discipline 1

BIP



discipline 2

MIP

PSIP / PRIMA / SIP



discipline 3

PIP

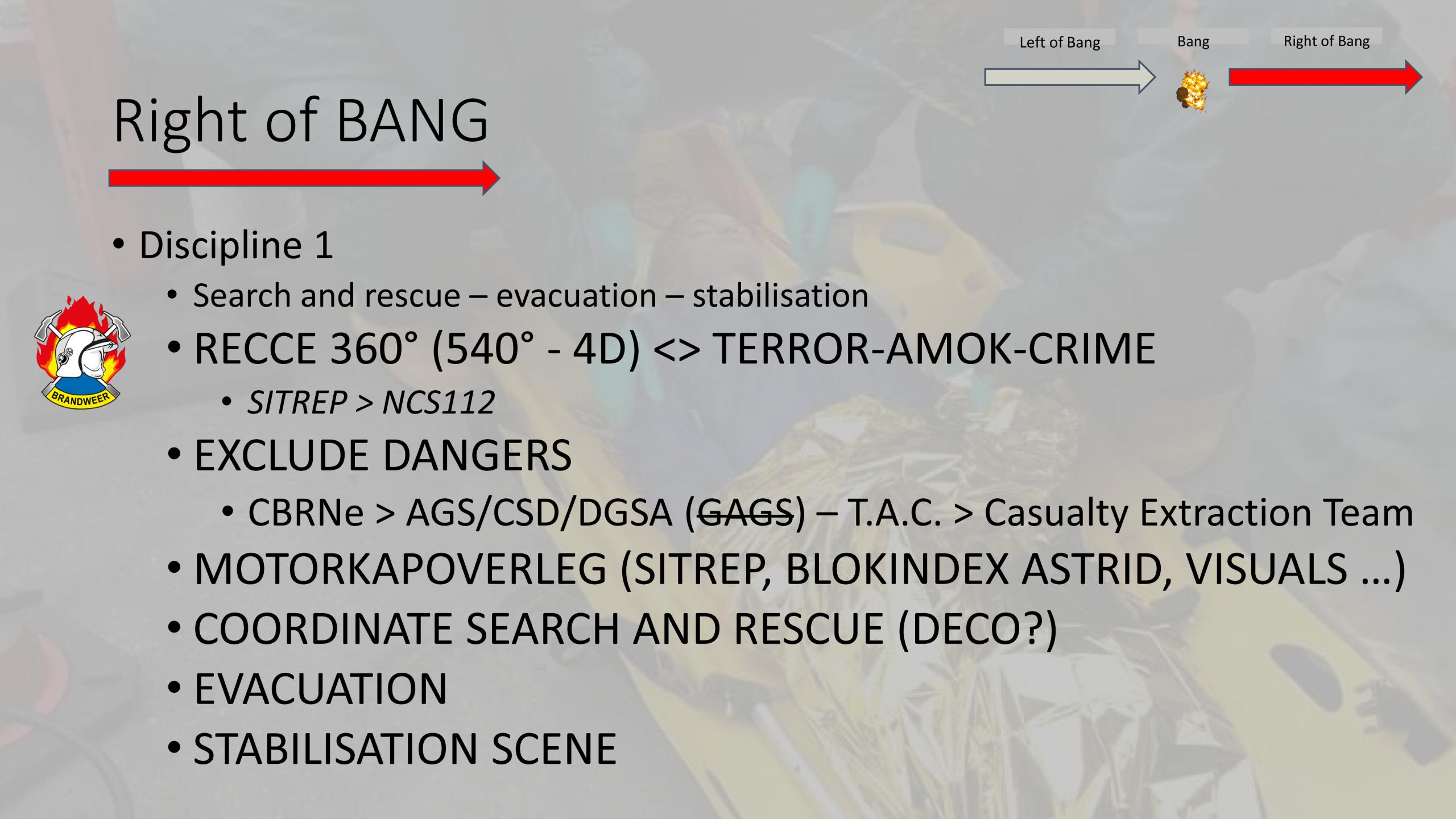


discipline 4

LIP



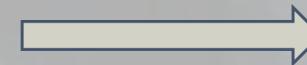
discipline 5

A faint background image of a firefighter wearing a helmet and gear, standing in a field. The firefighter is looking towards the right side of the frame.

Left of Bang

Bang

Right of Bang



Right of BANG



- Discipline 1
 - Search and rescue – evacuation – stabilisation
 - RECCE 360° (540° - 4D) <> TERROR-AMOK-CRIME
 - SITREP > NCS112
 - EXCLUDE DANGERS
 - CBRNe > AGS/CSD/DGSA (~~GAGS~~) – T.A.C. > Casualty Extraction Team
 - MOTORKAPOVERLEG (SITREP, BLOKINDEX ASTRID, VISUALS ...)
 - COORDINATE SEARCH AND RESCUE (DECO?)
 - EVACUATION
 - STABILISATION SCENE

Right of BANG

- Discipline 2 – MUG/SMUR 1st on SCENE
 - WHERE DO U GO & ARE U FIT TO GO?
 - PBM/PPE – COMMS – ROUTE ≈ METEO
 - SITREP > NCS 112!
 - MOTORKAPOVERLEG – CONCERTATION MULTI (RECOGN)
 - FIND THIS PERSON >>
 - SAFETY: (RE)THINK PPE & PEB/PPD/P1D
 - DRAW CIRCLES & LOCATE STRUCTURES
 - OVP/POINT RELAIS – VMP/PMA
 - METEO & DISTANCE!

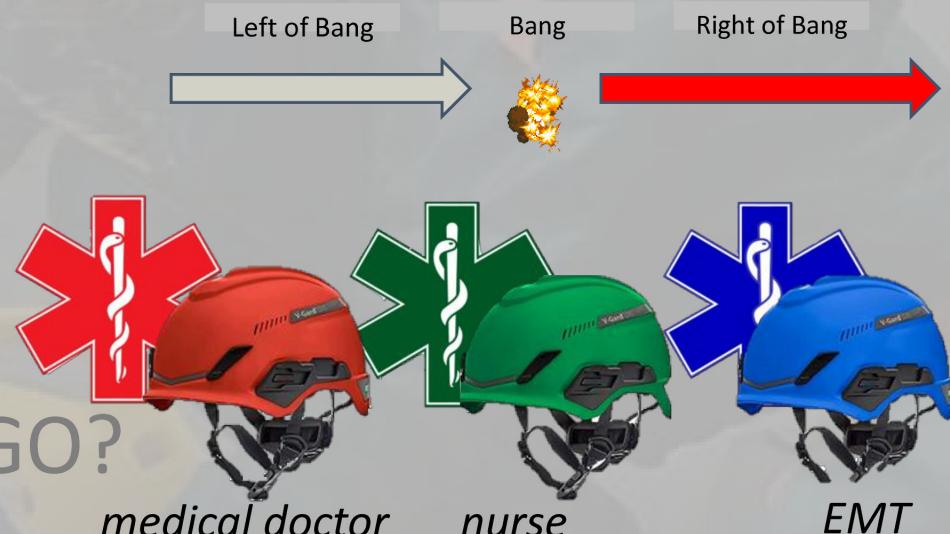
Every incident is different BUT action cards are usefull



Right of BANG

- Discipline 2 – MUG/SMUR 1st on SCENE
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Every incident is different BUT action cards are useful



Right



ACTIEKAART C3

Coördinerend

DIRECTEUR MEDISCHE HULPVERLENING
1^E MUG ARTS TER PLAATSE
DIR MED



Herkenbaarheid :

Draag kazuifel DIR MED.

Ontvangt instructies van :

CP Ops, (adj.) FGI.

Rapporteer aan :

CP Ops, (adj.) FGI.

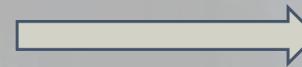
Taakomschrijving :

1. Denk aan uw EIGEN veiligheid.
2. Neem de draagbare radio mee op de 100 frequentie.
3. Neem de leiding over de organisatie van de medische hulpverlening.
4. Bepaal wie gaat zetelen in de CP Ops:
 - DIR MED in CP Ops (zie punt 7)
 - DIR MED op het terrein (zie punt 8)
5. Contacteer samen met de verpleegkundige (ADJ DIR MED) onmiddellijk de DIR BW of DIR CP Ops en vraag tot waar het veilig is.
6. Indien u afgelost wordt door een andere DIR MED brengt deze op de hoogte van de al gedane acties en voer de taak uit die deze u opdraagt. (zie betreffende actiekaart)

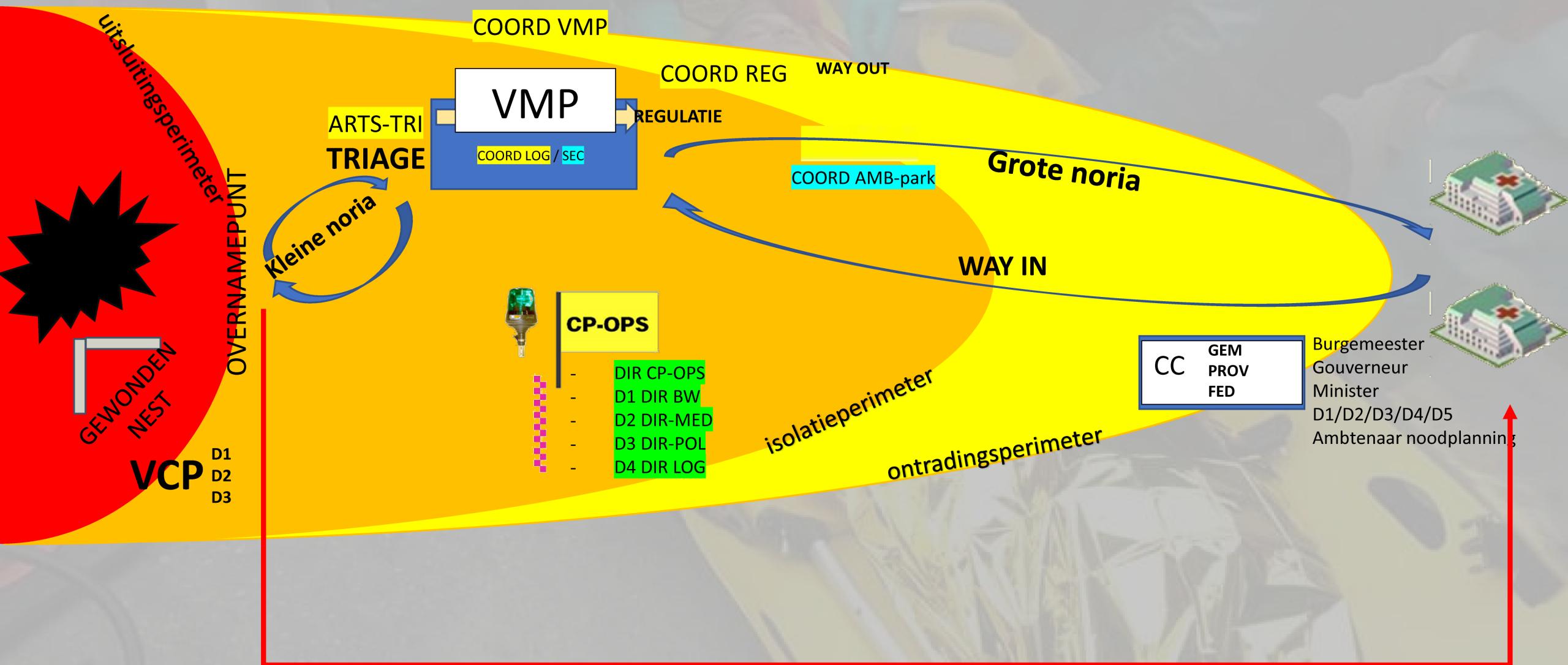
Left of Bang

Bang

Right of Bang



Right of BANG



DREIGINGSNIVEAU

4

3

2

1

ERNSTIG

DREIGING IS MOGELIJK EN WAARSCHIJNLIJK

MAATREGELEN

- PERSOONSIDENTIFICATIE + HERKENBAARHEID
- TOEGANGEN KAZERNES GESLOTEN HOUDEN
- VOERTUIGEN BEWAAKT OF SLOTVAST
- ZIEKENWAGENS = MOTORLOOPPAS

ZIE JE IETS
ZEG IETS

VERDACHTE ACTIE?

VERWITTIG DISP. OF ① 101

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0476 65 31 84

Officier brandweer – Expert Terror, AMOK & CET

SOFT TARGETS

- ZIEKENHUIZEN
- SCHOLEN
- OPENBARE INSTELLINGEN
- BRANDWEERKAZERNES

PREPARATIE

- TERROR-KITS VOERTUIGEN
- BACKUP MATERIAALWAGENS
- TERROR AWARENESS
- UPDATE TECC



Med CBRNe : Medical Countermeasures < 30 minutes



■ Agenda

- 1** Introduction CBRN - CoC
- 2** DIM + situational awareness
- 3** Toxidromes
- 4** Medical Countermeasures - R³ + MARCHE²
- 5** CBRNe Medical Team
- 6** Key Takeaways



■ 1. Introduction - CBRN

- Chemical substances
 - Toxic chemicals (TIC)
 - Chemical Warfare Agents (CWA)
- Biological agents
- Radiological and Nuclear materials





■ Introduction - CBRN? CBRNe? CBRNE?

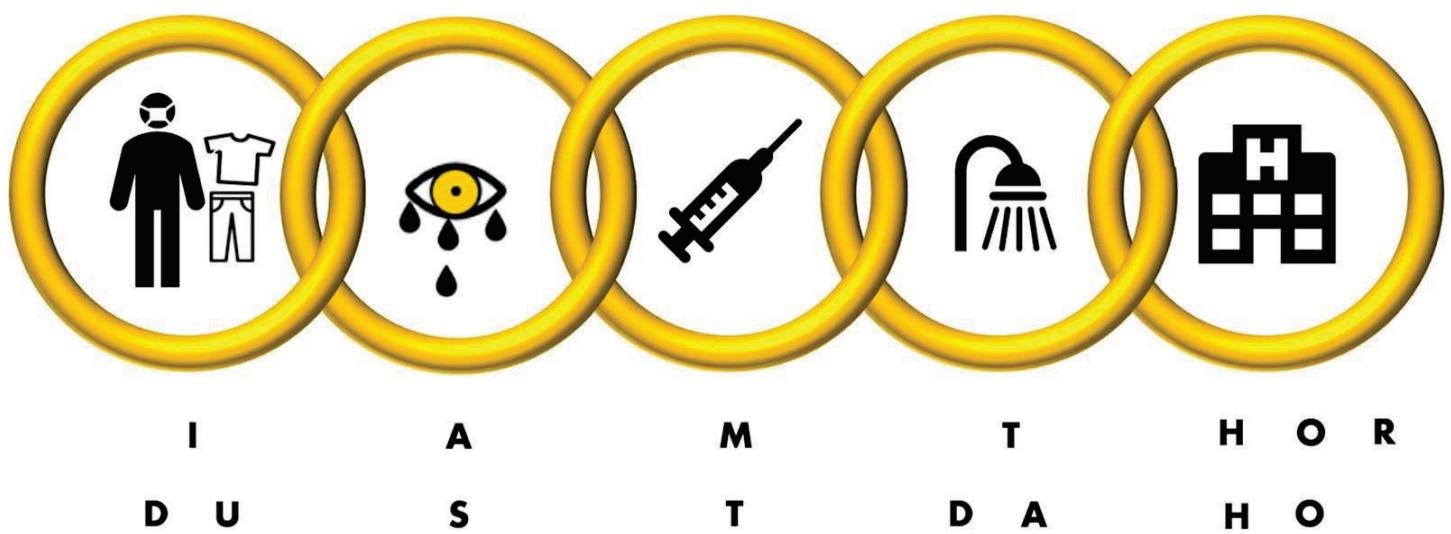
- CBRNe: explosives as a mean of dispersal to CBRN substances
- CBRNE: explosives are used as the primary weapon itself



5



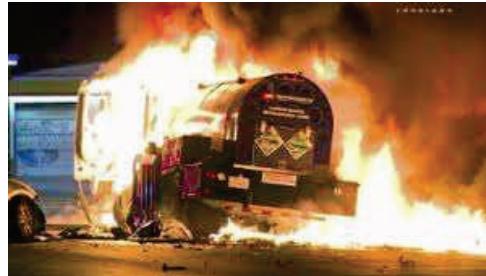
I AM THOR - DUST DAHO



5



2. DIM - What's happening...





QBRNe awareness - Medical concerns

Tokyo 20 March 1995 – GB (Sarin)



MASSACRE BY POISON GAS



Many die, 1,200 collapse in Tokyo Tube attack

- ❑ 13 killed by CWA Sarin (GB)
- ❑ Aum Shinrikyo
- ❑ 50 heavily injured
- ❑ >5000 people with temporary visual problems
- ❑ Secondary contaminations (cross contamination by Med Pers)



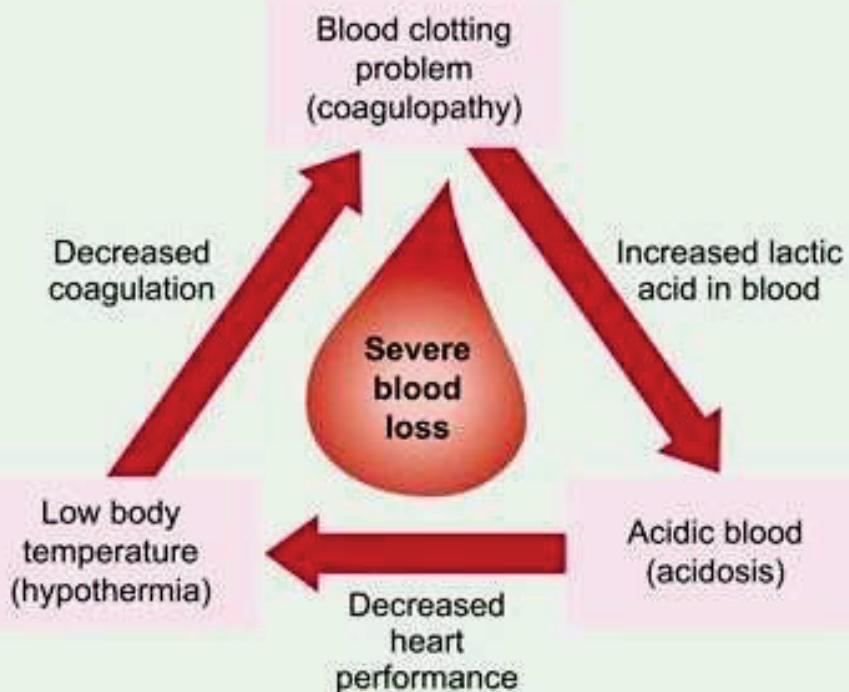
DEFENCE

Awareness...is the key word

- “rupture of normality”
 - Death birds, animals, unconscious,...
- 1-2-3 rule
 - 1 unconscious → possible
 - 2 unconscious → ??
 - 3 unconscious → CBRN
- Toxicodromes (same symptoms)
 - unconscious, respiratory distress, sweating, blurred vision, convulsions, pinpoints, hypersalivation, tearing eyes,...
- Sensitive locations
 - Schools, stations, airports, closed spaces, cinema, NATO/EU buildings, ...
(crowded places)



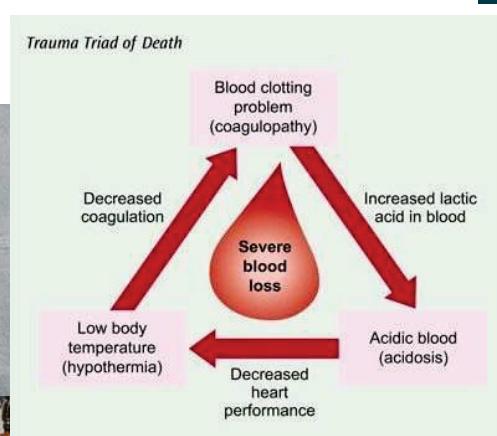
Trauma Triad of Death



CBRNe awareness - Medical concerns



Concept “SAVING TRIAD”



2



3



SARIN attack - Subway Tokyo 20th March 1995



Japanese study published by Tokuda in Resuscitation in 2006, 10 years after the sarin gas attacks advocates early management in three parts:

Emergency decontamination

Respiratory resuscitation

Antidotes

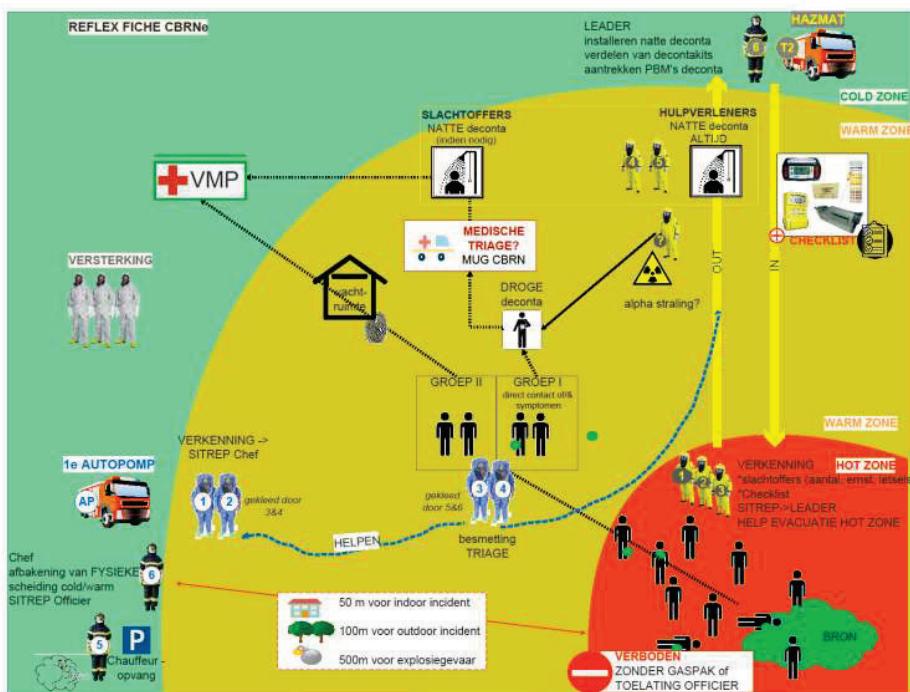
→ lead to increase the victims' chances of survival

Prehospital management of sarin nerve gas terrorism in urban settings: 10 years of progress after Tokyo subway attack.

Y. Tokuda and al. Resuscitation (2006) 68, 193-202



Reflex fiche CBRN : hot -warm - cold zone



METHANE



METHANE

M	Major Incident DECLARED at 19:13 on 8/Sept/2015
E	Exact Location: Incident: SG 1225 9543.
T	Type of Incident
H	Hazards: Fuel Spill,
A	Access to Scene
N	Number of Casualties: 4 , made up of: 1 trapped,
E	Emergency Services: Police Required: 1 Police Armed Response Required: Multiple Present: Multiple

Exact Location

Incident: SG 1225 9543.

Insert Current Location

GRID LAT LONG STREET

Hazards

Fuel Spill,

Biological	Chemical	Confined Space
Fire	Flowing Water	Fuel Spill
Gas Leak	Hostages taken	Ice
IED (Improvised Explosive Device)	Landslide	Marauding attackers





■ On site - C4

- Command - Control - Coordination - Communication
- RV punt → upwind (PEB !)
- SitRep & scaling up (NC 112) → METHANE
- CP-Ops - assessment (MKO)
 - specific plan of action
 - D1 - D2 - D3 - D4 - D5
 - AGS
 - Decontamination? (Civil Protection)
 - ICMS (Paragon)
- PPE
 - If No PPE → STAY OUT





■ Anti-poison centre

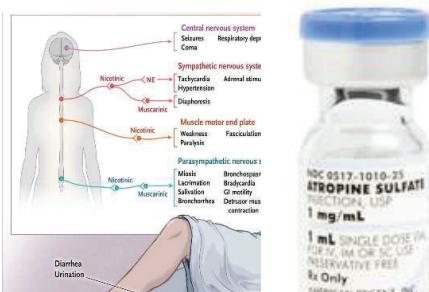


www.antigifcentrum.be





3. Major toxicodromes



Organophosphates

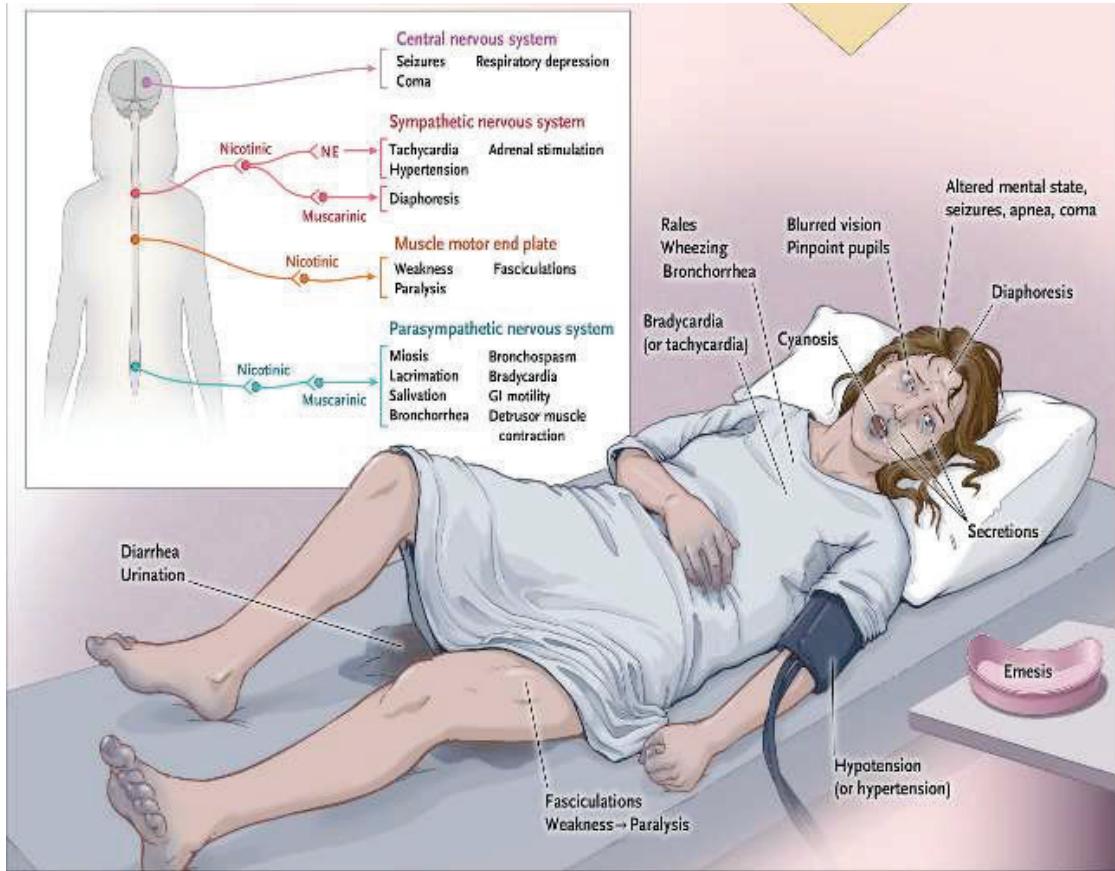


Opioids

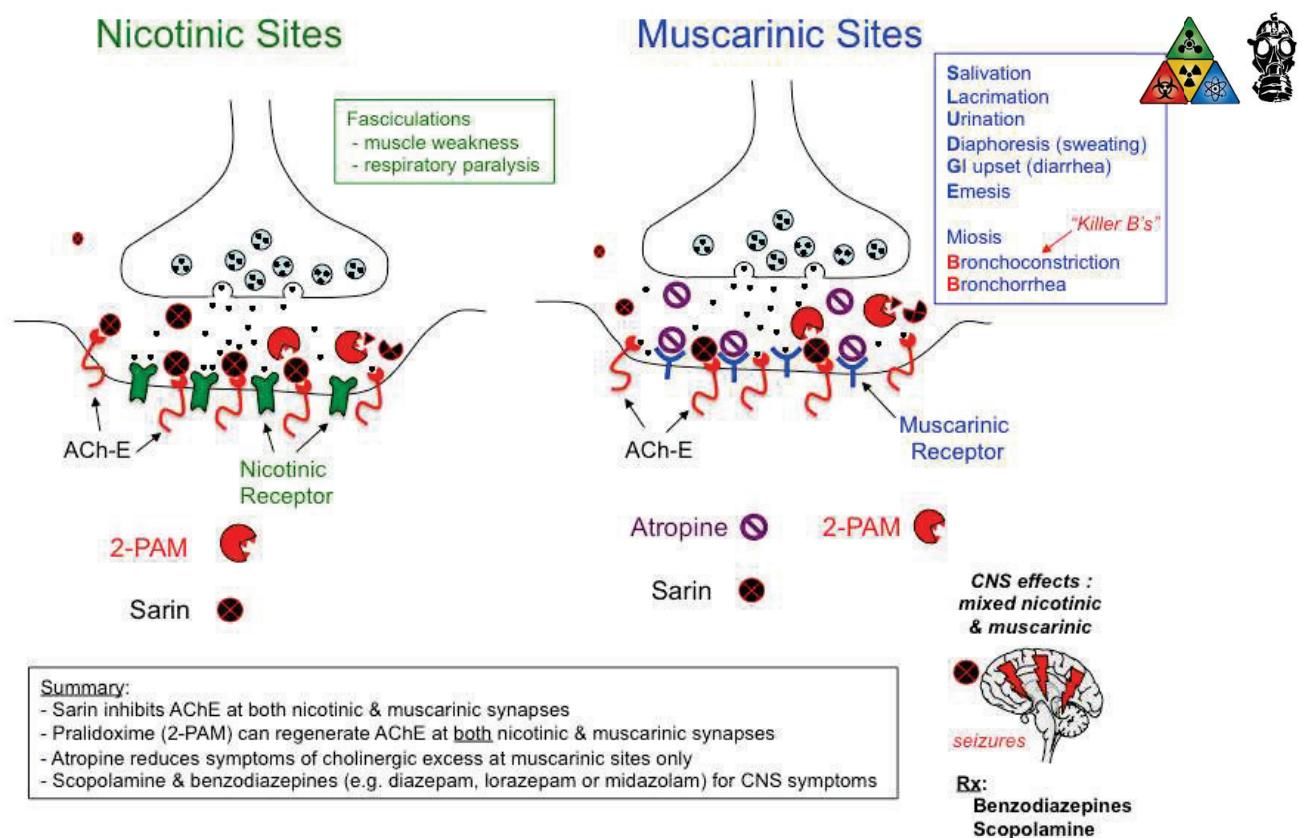


Cyanides





BRNe awareness - Medical concerns



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CBRN Toxidromes

Cholinergic (organophosphate) toxidrome:

Toxicity levels (LD₅₀):

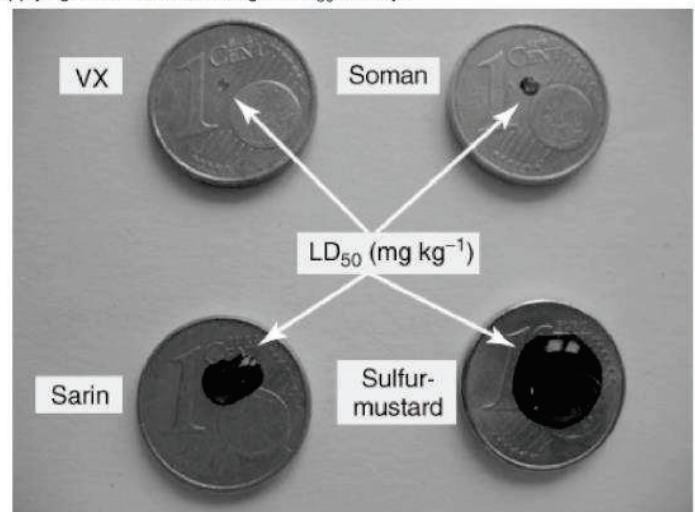
- Liquids

- VX: LD₅₀ < 10-15 mg (1 mg = 1 µL) → 1/5 drop
- Sarin: LD₅₀ < 1,7 g (1,7 mL)

- Vapors:

- Sarin: CtLD₅₀ = 70 mg·min/m³

Figure 3.2 Comparison of the amount of indicated chemical warfare agent, applying skin contact effecting an LD₅₀-toxicity.







Sarin attack - Khan Cheikhoun (Syria) - 87 people were killed



 DEFENCE



4. Current situation within the Bel MC

Treatment protocols

- ❖ RRR protocol
- ❖ Introduction MARCHE²



TCCC		CBRN	
Massive Bleeding	M	Mask casualty	
Airway	A	Antidotes	
Respiration	R	Rapid Spot Decontamination	
Circulation	C	Countermeasures	
Hypothermia/ Head Injury	H	Hypothermia from decon/ AMS – head injury or agent?	
Everything else	E	Extraction	





Specific Chemical Countermeasures

Auto-injectors

- Treatment of **Nerve Agent** intoxication (Self-aid/Buddy-aid)

- DUODOTE (Atropine + Pralidoxime)
- RAFA (Midazolam)



- Treatment of **Opioid** intoxication (morphine-derivates)

- Naloxone auto-injector (*pending*)



C R E S S		Nerve agent	Cyanide	Opiate (Morphine)	Atropine	Sepsis	Heat stroke
C	Consciousness	Convulsions	Unconscious / Convulsions	Reduced → unconscious	Agitated / Confused	Normal, reduced or altered	Altered
R	Respiration	Increased or reduced → stopped	Increased or stopped	Reduced → stopped	Increased	Increased	Increased
E	Eyes	Pinpoint pupils*	Normal / Large pupils	Pinpoint pupils	Large pupils / Blurred vision	Normal	Normal / Large pupils
S	Secretions	Increased*	Normal	Normal	Dry mouth / Thirsty	Normal / Sputum	Normal
S	Skin	Sweaty	Pink → blue	Normal / Blue	Flushed / Dry	Warm → pale Non-blanching rash	Varied
Other features		Vomiting Incontinence Slow pulse	Sudden onset		Fast pulse	Fast pulse Fever (>38.3°C) Bio-syndrome* No radial pulse	High temperature (>38°C)

* Pinpoint pupils (and/or increased secretions) may be delayed if skin absorption or eye protection worn.

* 'Bio-syndromes' include: respiratory, cutaneous (skin), lymphadenopathy, haemorrhagic, gastrointestinal, and neurological (central & peripheral).

Project R1 CBRNe



 DEFENCE



 DEFENCE



5. CBRNe Medical Team

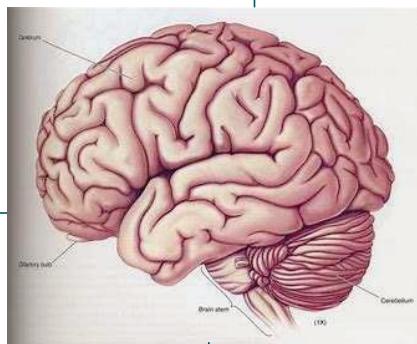
- Entire Belgian territory (future **5** CBRN Medical Teams...)
- 24/7 available via EMD/Noodcentrale 112 BXL (DGH)
- MUG + Ambulance
 - 01 emergency physician
 - 01 emergency nurse
 - 03 EMT
- Treatment of **20 patients** with antidotes within 4 hours
- Regulation to (future) predefined hospitals (14)
- Transfer of Knowledge Med CBRN
- TTT Med CBRN awareness
 - BASIC & ADVANCED i.c.c.w. Min of health is planned



Key takeaways

Keep Toxicology in The Back of Your Head

Own safety &
safety
colleagues



Which Toxidrome Fits?

Is There an Antidote?

**NO PPE
STAY OUT**



DEFENCE



*Altough September 11 was
horrible
It didn't threaten the survival of
the human race
Like nuclear weapons do*

- Stephen Hawking -

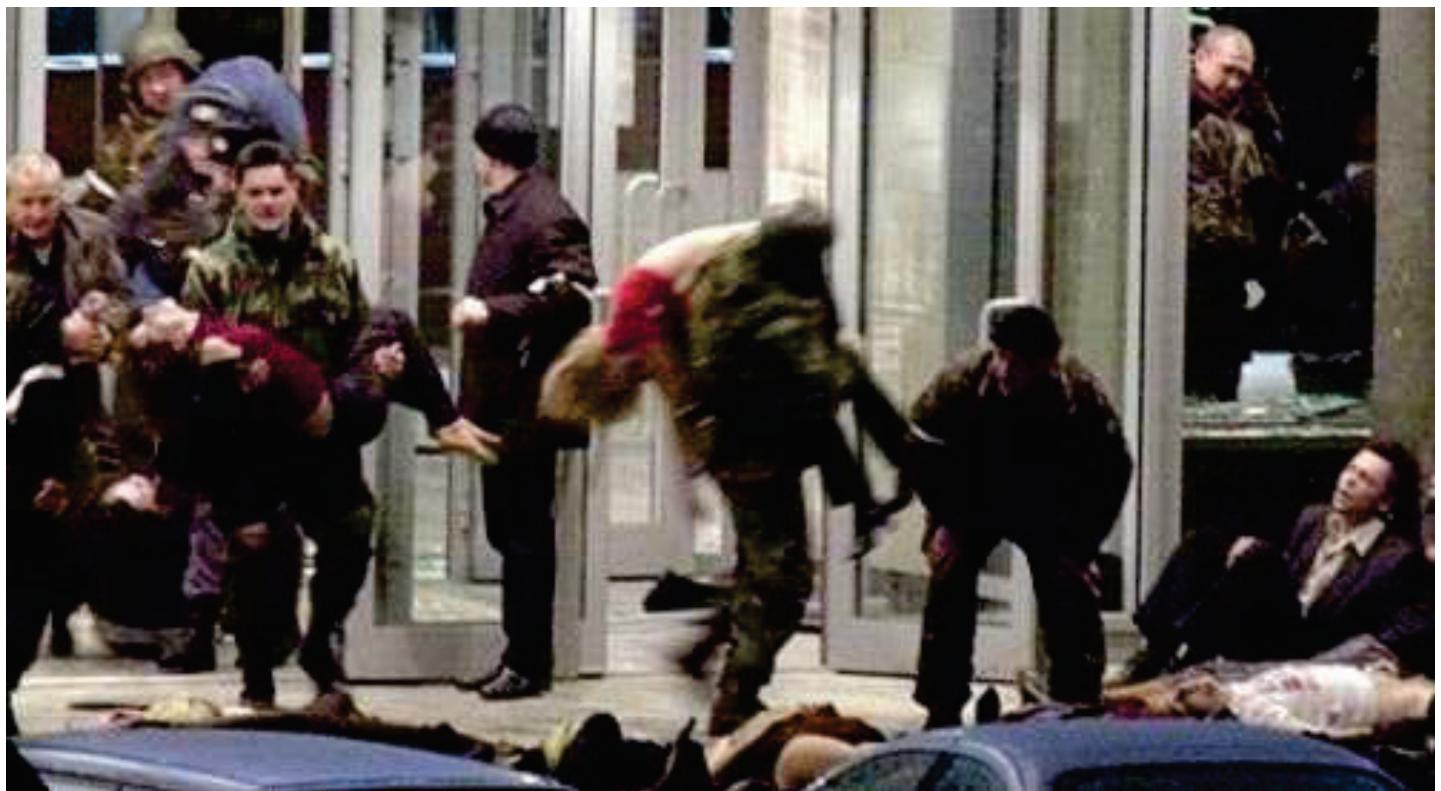
Patient Management of the acrylonitrile-disaster in Wetteren

Ignace Demeyer
Burns Center MHQA Brussels

C-disaster experience?

- H2S accident port of Antwerp (4 victims)
- CO intox (15 children dressing room soccer club)
- CO intox (party at anesthetist home...)

Moskow, Doebrøvkatheater, Oct 23, 2002



This presentation only reflects the author's personal opinion and neither the official report nor public authority

Not every presentation is successful



Definitions

- Disaster
- Disaster Relief Team
 - Tasks of medical task force
- CP- Ops

Disaster ?

- Starts with the ‘perception’ of a disaster
- Retrospective view of the event(s)

The Dendermonde day care center ‘Fabeltjesland’ assault
(jan 29, 2009)

- 10 victims
- But 5 medical teams at the scene < 20 min

Wetteren



Disaster or not?

“An occurrence of a natural catastrophe, technological accident, or human caused event that has resulted in severe property damage, deaths, and/or multiple injuries.”

USA Federal Emergency Management Agency (FEMA)

NO: 1 death and 1 severely injured victim

Disaster or not?

“The result of a vast ecological breakdown in the relations between man and his environment, a serious and sudden (or slow, as in drought) disruption on such a scale that the stricken community needs extraordinary efforts to cope with it, often with outside help or international aid.”

WHO definition

Wetteren case a Disaster?

YES

Disaster Relief Team in Belgium

Team	Discipline 1: Fire Dept
	Discipline 2: Medical Dept
	Discipline 3: Police Services
	Discipline 4: Technical Support Services
	Discipline 5: Communication Services

Disaster Relief Team in Belgium

Discipline 2

East Flanders

Medical Dept.

4 Medical Directors

16 Deputy Medical Directors

Discipline 2

Medical
Director

At the scene

CP-Ops: operational command center

Co-organiser of the disaster relief with specific attention towards the safety (mental & physical) of all rescueworkers, the care for the victims and the population ...

Reports to the Crisis Center (Provincial),
(representative of the Government Discipl 2)



12/06/2024

Wetteren case

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Discipline 2: Medical

Victims	Implicated, not wounded	Population Wetteren, Schellebelle, Serskamp, Wichelen, ...
		Rescue workers (fire dept., civil protection, police services ...)

Wounded

Victims

Duration & number	19 days (May 4 – 21) provincial phase
	1.979 evacuated civilians (May 18: “all – 1” habitants < 250 m back home)
	1 dead victim
	397 hospital visitors
	1 severely injured victim (case report)

Time Lines

May 4	2 a.m.: Derailment and fire of train
<hr/>	
May 7	9:42 a.m.: high values arylonitrile in sewer system

May 7	7 a.m.: High values acrylonitrile in sewer system miles away
-------	---

First communication

2:02 a.m. “Locomotive on fire”

2:08 a.m. 7 fire men at the scene

In the middle of nowhere: no access possible

Communication Cut the power transmission lines

Upscaling “fire dept.” zonal alert

Evacuation of neighborhood (150 m)

Arriving at the scene....

- First team that arrives:
 - Site report to the 112 dispatching required
 - Fixing meeting point with other rescue workers mandatory
 - Hood meeting

May 4, 2013 Wetteren by night



Wetteren by daylight





12/06/2024

Wetteren case

23

Victims

2:00 a.m. Evacuation perimeter 150 m

± 300 people (festival and fire station)

Based on? Explosion risk?

Toxic – chemical risk?

Gut feeling

2:45 a.m. Decision taken at “hood mutual agreement” (*discipl 1,2 &3*)

First Communication

Police: summons people to leave their house from door to door & P.A.

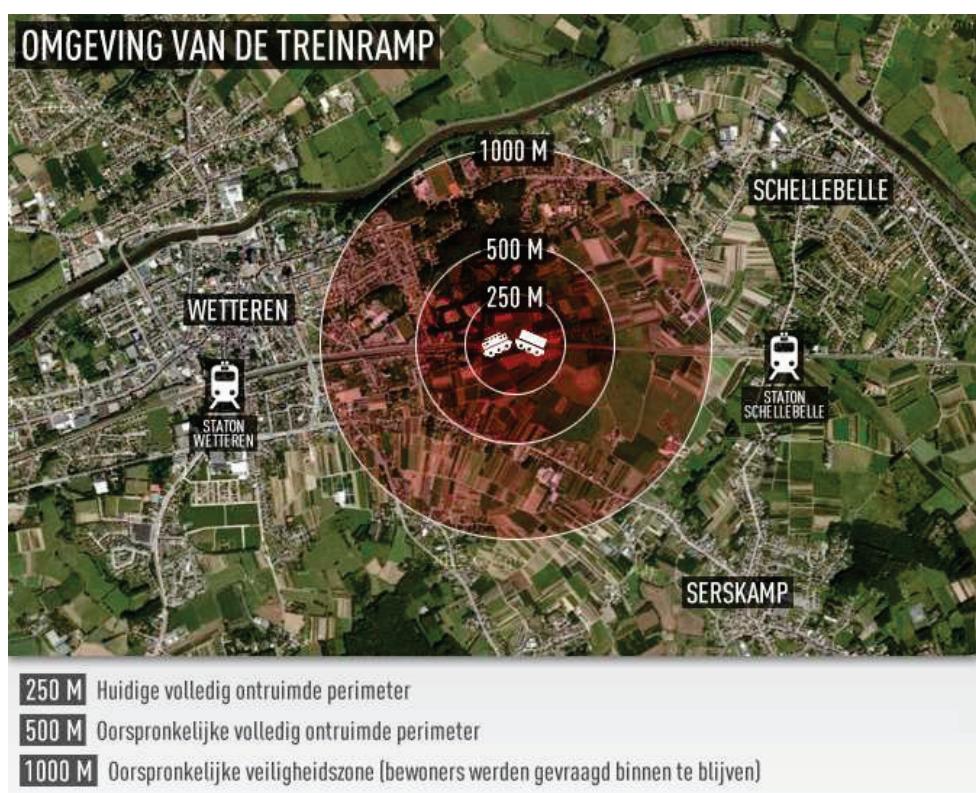
But

“feelings” within policemen

People refuse to leave their house!

Discussion vs. urgency

Safety circles



CP-Ops

Decision
making

Based on textbooks, databases,

Based on experience (Toxicologists!!)

Acrylonitrile: toxicity

Tri-Ethyl-Aluminium

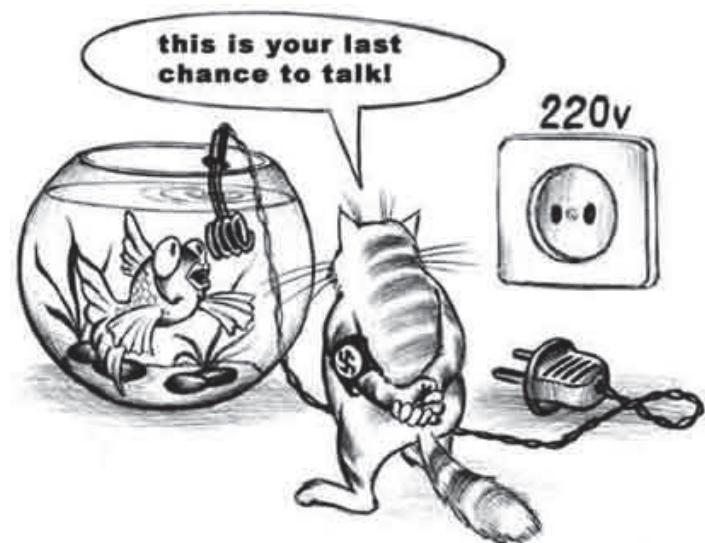
explosion risk

Ethylaluminiumdichloride

explosion risk



Communication !!!

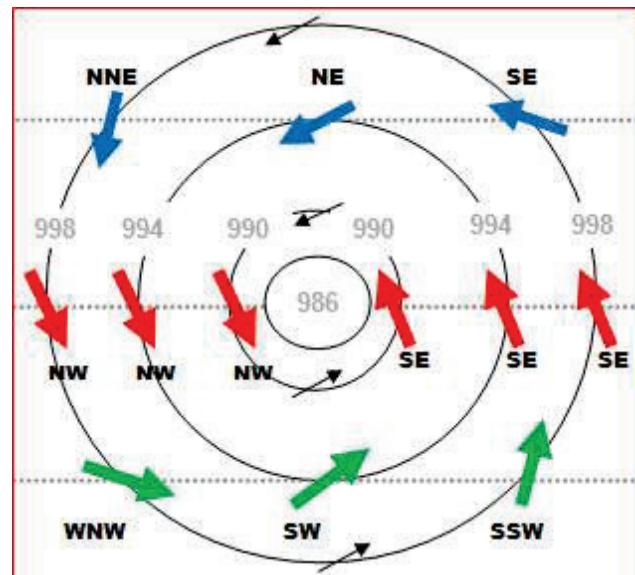
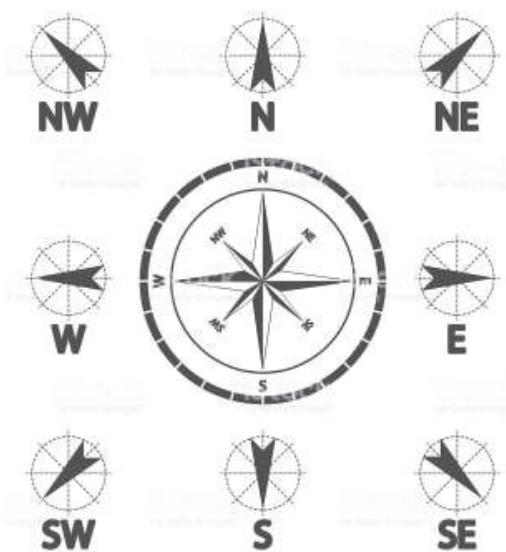


Communication

- Terminology
 - Police – fire dept – medical
 - Dedicated jargon, abbreviations, acronyms
- Map symbols
 - Army – fire dept – police
 - Wind direction?



Communication.. Wind direction



Risk analysis, situational awareness

- Hazards facing each individual organisation:
staff being harmed
- Wetteren: Acrylonitrile from train into the
sewage
 - Evacuation of 2000 people from the city

Evacuation.. How are you doing?



No panic..



Everything is fine..no worries



So far so good... but

**KNOWLEDGE IS KNOWING
A TOMATO IS A FRUIT.
WISDOM IS NOT PUTTING
IT INTO A FRUIT SALAD.**

Airway protection...



Importance relation CC - CpOps

- Commanders at the site vs politicians in CC
- Common sense commanders vs elections and politicians



Home or not?



Impact of the media on disaster relief

- Importance of discipline 5

Acrylonitrile

(monomere in polymereproduktion: lego)

At room temp: good water soluble

Mixture with air: highly explosive

Highly exothermic reaction during polymerisation

Density > air

Sewing system, waterholes, lowlands



12/06/2024

Wetteren case

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Acrylonitrile

Skin, inhaled

Short T 50% (20 min) quickly eliminated, metabolised to cyanide

Incomplete combustion HCN

Respiratory protection for rescue workers

Hazmat equipment

Urgent need for antidote (Cyanokit®)

Upscaling disaster planning

2:14 a.m. Medical Disaster Plan (MIP)

2:45 a.m. Council phase

3:40 a.m. Provincial phase

6:21 a.m. Telephone Information Centre

What kind of information?

Close doors, windows, stay inside, avoid
Wetteren centre

Information

Exchange info between Operational Centre and Crisis Centre

6 press communications between 3:40 and 9:38 a.m.

6 a.m. first press conference

Communication

Lack of “experience” Communication crisis & Operational centre

Disaster Time span, > 48 hrs vs 19 days

E 40: Gas leak pipeline rupture: 48 hrs
E 413: H2 gas transport collision: 48 hrs

Mass communication

Avoid highways during traffic jams

Decision making and political consequences

Use your brains...



Lessons learned (1)

PREPARE YOURSELF to deal with negative press/public comments

DOCUMENT / REPORT ALL EVENTS

TIME REGISTRATION

Lessons learned (2)

Inform your citizens a.s.a.p.

- Updates through website/Facebook/twitter/domino
 - Telephone Information Centre (TIC)
 - . Started at 06:21 a.m.!!!
 - . 3000 calls/day
-

Update your citizens

Give correct information

Lessons learned (3)

Towards Decision makers (Crisis center):

Don't take your whishes for real

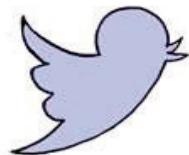
Message: return home

vs.

Message: Wait another day (May 9 – 12)

Local population “aggressive” towards the CP-Ops staff

MODERNE COMMUNICATIE
OVER GIFRAMP
WETTEREN



TWITTEREN



TWETTEREN



Home or not?



Lessons learned (4) – Case 1

“Acrylonitrile is carcinogenic”

TV news interviews Prof. XXX, MD, toxicologist at University XXX

“No carcinogenic effects retrieved from literature”

Toxicologists at different Universities & Industrial MDs (follow up > 20 yrs.)

Lessons learned (4) – Case 2

“Large numbers of dead fish washing up on the shores of the Schelde downstream of Wetteren”

TV broadcasts

“Not confirmed”

By river police: waste of money, time ...

How to handle this evil?

Deny first message of carcinogenic effect?

- My answer: don't do this
 - Public opinion: “they are hiding the truth”
-

CC is “running behind the facts”

- Inform the news broadcasting media
 - Provide them with experts able to explain “lay people” the risks
-

Where are we here?

- Vrasene
- Wetteren
-



Our female staff needs also restrooms



Lessons learned (5)

Beginners mistake: when you see a camera

- Think twice before expressing your “feelings”
-

Circumstances

- 3 days requesting for sanitary facilities, no feedback from the CC
 - May 8 visit from important politicians and the Mayors of the neighbouring villages: STOP of all activities... till 14 hrs: no decisions at the CC
-

Ongoing problems

Mr J. Haek, CEO, announces: “Infrabel will pay all costs: ship, cleaning, civilians...”

Blood collections/results: communicated “not clearly” to the public

Epidemiologic follow-up of the local population and rescue workers

Large evacuation planning

Cyanide intoxicatie

- Waterstofcyanide (HCN): acute cyanide intoxicatie
- Aanpak/Therapie?
 - Geen internationale richtlijnen
 - EuSEM:
 - pre & in-hospitaal richtlijnen
 - literatuurreview

HCN

- Polyurethaan
- Verf, acryl
- Nylon
- Plastiek
- Papier,hout, wol,katoen

epidemiologisch

- Cyanide zeer kort halfleven
- Bloedstalen? Hoe bewaren?
- CO en HCN gerelateerd
- HCN: snel werkend, sec- min.

CN-

- Inhibeert 40tal enzymesystemen
- Inhibeert oxidatieve fosforylatie
 - Bindt aan cytochroom aa₃ oxidase
 - Aeroob nr anaeroob metabolisme
 - Cellulair ATP tekort: lactaatacidose

HCN detoxificatie

- Conversie naar thiocyanaat
- Conversie naar cyanocobalamine (via hydroxycobalamine)

Diagnose HCN intox

- Vroeg: duizelig, verward, hoofdpijn, duizelig, braken, hartkloppingen
- Laat: epilepsie, hypotensie, bradycardie, coma, AH & Hartstilstand

biochemie

- Cyanideconcentratie in bloed correleert zeer goed met plasmalactaat
- Geen snelle detectietechniek voor HCN (bloed)

behandeling

- Bron wegnemen
- 100% O₂
- Ondersteunende maatregelen
- Antidoot:
 - Methaemoglobine vorming (nitraten, 4-DMAP)
 - Sulfaatdonoren (thiosulfaat)
 - Cobaltverbindingen (hydroxycobalamine)

hydroxycobalamin

- Chelator cyanide: vormt vit B 12 (cyanocobalamin), via nieren uitgescheiden
- Urticaria, huidverkleuring
- Bloeddrukstijging
- Lang halfleven (1 dosis genoeg)
- 70 mg/kg (5 gr)

lactaatbepaling

- Omweg om ernst HCN intox te bepalen

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QUESTIONS AND ANSWERS