Biological Incident Response & Environmental Sampling

- a European Guideline on Principles of Field Investigation

EU Commission, DG Health and Consumer Protection, Health Threats Unit

October 2006

Preface

This Guideline describes the principles of response in the initial phases of a biological incident where the goal is to identify what has happened in order to initiate appropriate countermeasures. The Guideline was prepared by the Danish National Centre for Biological Defence and tested in a field exercise and workshop in May 2006 with participation of 16 EU member states. The EU Health Security Committee composed of senior representatives of the EU Health Ministers and of the EU Commission approved the Guideline on 3 October 2006.

Contents

1 Objectives of Field Investigation

Biological security threats pose unique challenges to the preparedness and response capabilities of any nation. A biological security threat differs from a natural hazard in the overall sense that there are human intention and planning involved, and while this poses new challenges, it also creates new opportunities to intervene and counter the threat.

1.1 Attack stages

Bioterrorism may be defined as the use of a biological agent to create illness, and possibly death among humans. In this document, terrorist attacks with biological agents against economic targets (e.g. agroterrorism) will be excluded. A biological attack requires planning, specific technical know-how, a biological agent, production equipment, a delivery system, and access to the target. Thus, there are several stages in the pre-attack phase in which intervention is possible.

Stages in a biological attack

Preparation----------->Weaponization----------->Execution

Planning	**Equipment**	**Production**	**Assembly**	**Deployment**	**Attack**	**Exploitation**
Motive-objective	Hardware	Methods	Delivery device	Reconnaissance	Access	Extraction
Know-how	Precursors	Validation	Testing	Transport	Co-ordination	Media & PR
Financing	Consumables	Storage		Communication	Release	Protection
Facility	Containment	Protection				

While a biological attack may be performed covertly with no immediate indications that it has taken place (e.g. aerial spray or food contamination), in some situations the attack may be suspected or detected either through technical monitoring systems or simply by the observation of the delivery device or weaponized agent (e.g. spraying device or powdery letter). These pre-attack or attack incidents are termed type 1 incidents.

After an attack - delivery of the biological agent on the target – some time will elapse before the consequences in the form of illness begin to appear. This incubation time varies according to agent from hours (toxins) to days or even weeks, and even for a specific agent incubation time will differ among exposed individuals depending both on individual susceptibility and on the dose received. Low doses result in longer incubation times, and in principle, no threshold dose exists in which there is no risk of developing illness. Post-attack outbreak of disease without prior warning is termed a type 2 incident.

1.2 Biological agents and delivery devices

Biological weapons are based on viruses, bacteria or biological toxins which have been produced and formulated to facilitate their use in a weapon. Production may include modification so that the agent has non-natural characteristics, and the formulation of the agent (weaponization) seeks to control the physical properties (e.g. particle size and stability) to optimize the delivery of the agent. For dispersal of a biological agent as an aerosol to be inhaled through respiration, a particle size of 1-5 micrometer is preferred, and after dispersal such an aerosol cloud is invisible and airborne over long distances.

Choice of agent depends on accessibility, technical know-how and capacity, and intended purpose. Many toxins and microorganisms could potentially be used for terroristic purposes with generally small numbers of casualties, but biological agents suitable for warfare purposes with mass casualty potential are presently limited to a relatively small number of agents (10-20). Only a few of these agents have the potential to create epidemics and thus expanding the effect of an attack to a wider population than those initially exposed. Developments in biotechnology are, however, both increasing the possibilities to modify biological agents and bringing production capability within the reach of sub-state actors. Thus, it is not possible to create a fixed list of biological agents.

Equipment for large scale production of high quality biological warfare agent requires a procurement process and physical installations which are difficult to keep clandestine for a terrorist group. Small scale production, using improvised tools and equipment, is, however, possible, and can result in significant quantities of biological agent, suitable for terrorist attacks.

Delivery devices and -methods for biological agents range from passive delivery of small amounts (e.g. food contamination or powdery letters) to various spraying devices for aerosolized agent in dry form or as slurry to large, military scale bombs and missiles. Improvised delivery devices (IDD) with fairly effective dissemination of significant amounts of biological agent can be constructed from commonly used and freely accessible hardware goods. The effectiveness of IDD’s depends on the target (indoors/outdoors) and its physical properties. In general, most biological agents decompose within hours or days after primary delivery, and re-aerosolization with secondary exposure hazard is a limited problem. There are, however, important exceptions to this general rule of which anthrax poses a serious challenge.

1.3 Incident types

Biological incidents related to bioterrorism are rarely clear at the outset but start with a suspicious event, whether it is the security services finding a shopping list and some laboratory equipment in suspicious circumstances, the police getting a call about a letter spilling powder in an office, or a doctor finding an outbreak of disease highly unusual. Procedures to evaluate such a suspicion in order to determine whether the suspicion is unfounded, or that further investigation is needed, fall outside the scope of this guideline, but in general the evaluation includes a combination of intelligence information about current terrorist threats and a specific technical threat assessment. The technical threat assessment requires expert knowledge about biological weapons, agents and delivery systems, forensic epidemiology, microbiology and infectious diseases, and application of this expertise to the information available concerning the specific manifestations of the event. With a solid threat assessment most of the hoaxes in recent years with powdery letters could probably be identified as hoaxes and the disturbance of public order resulting from these hoaxes, and full-blown incident responses on the scene, could be reduced.

Once the suspicion of a bioterrorism incident has reached a level where it must be taken seriously, the goal is to investigate the incident and counter any potential consequences of the threat. The primary purpose of the investigation is to initiate efficient countermeasures to mitigate or entirely avoid the consequences of the threat or actual attack. The secondary purpose is to identify the perpetrator. While the former purpose is evidently of the utmost importance, it is also important to recognize that the threat of a biological attack, which, in the worst case, could threaten a significant part of the population, and national security as such, could well have implications beyond criminal prosecution of an individual perpetrator.

Obviously, the best chances of avoiding any consequences of a biological incident are if nobody has been exposed (pre-attack stage) and the incident response will mainly have the characteristics of a crime-scene search for evidence with subsequent judicial follow-up. Depending on the circumstances, the incident response on site could, however, involve environmental sampling for traces of biological agents and assessment of material and equipment, both of which require the highly specialized expertise of a Field Investigation Team (FIT). At the same time, the procedures on site must ensure that no inadvertent release of biological agent takes place, and limited capabilities to render safe any potential hazard should also be available.

When an attack or a release of biological agent in a specific location is suspected, the time factor is of utmost importance in relation to the people who have potentially been exposed. At the end of the

incubation time those exposed will fall ill, and if it is caused by a contagious agent their contacts will be infected and an epidemic could break out. Identifying the agent and the people exposed before symptomatic disease occurs will give these people the best chance to be treated effectively and if necessary will allow isolation and quarantine measures to be implemented before any risk of secondary spread of infection occurs. Giving the public authorities responsible for crisis management and implementation of countermeasures a solid prognosis with an identification of the agent, amount, number and location of exposed, expected time-course and possible treatment options as early as possible, and ideally no more than 24-48 hours after the attack took place, has thus the potential to negate the major part of the consequences of an attack. Establishing such a prognosis within a few hours after an attack or release requires three main interdependent components: A dispersal assessment system, FIT, and a diagnostic laboratory. This Guideline outlines the various requirements and tasks for FIT, while the requirements for dispersal assessment systems, diagnostic laboratories and decontamination procedures have been, or should be, addressed in other documents and working groups.

Biological weapons are well suited for covert attacks on unprotected populations. Such a covert attack will result in an outbreak of disease which may have suspicious characteristics (sudden influx of patients with perhaps exotic disease symptoms) indicating a biological attack, or the characteristics may be such that a biological attack is not immediately suspected, especially if routine microbiological examination identifies a naturally occurring microorganism. In any case, the method of delivery needs to be identified. If suspicion is raised and the alert goes off relatively early in the outbreak while the majority of those exposed are still in their incubation phase, identification of the area of attack or the source of agent could still allow pre-symptomatic treatment of at least some of the exposed individuals with a greater chance of therapeutic success. Secondly, definite identification of a disease outbreak as a result of a deliberate attack would in most cases require unambiguous demonstration of the presence of a relevant biological agent in the environment, i.e. the area of attack, and in some cases forensic analysis of a biological agent from environmental samples rather than from clinical samples may be the best or even the only way to identify it (e.g. ricin or recombinant agents). In a bioterrorism related disease outbreak, it is the task of FIT, in close collaboration with dispersal assessment experts and laboratories with expertise in forensic microbiology, to ensure identification of the area of attack, the agent present, and the method of delivery.

1.4 Field Investigation

FIT is a key component in a robust preparedness and response capability to handle biological incidents and counter such threats. The FIT component is, however, only one of several components in the entire investigative response capability, and among other components with specialized competence in biological weapons, also intelligence assessment, disease surveillance, diagnostic laboratory, and dispersal assessment capabilities are critical in establishing an informed basis for implementing relevant countermeasures. To collect and synthesize these data into a consolidated plan of action, a coordinating capability with a high degree of expertise in biological weapons is necessary.

The results of the entire investigation of a biological incident should include the following elements in a timely report to the authority responsible for implementing relevant countermeasures:

Situation	Prognosis	Recommendation
What	With/without intervention	Cordon sanitaire
- Intelligence	Time course	Personal Protection
- Clinical/lab analysis	Casualty estimate	Quarantaine
When		Isolation
- Intelligence		Prophylaxis
- Incubation time		Treatment
Where		Information
- Amounts/time		Recovery
- Dispersal assessment		
- Area of attack/risk		

If the results of the incident investigation are to be effective in countering an attack or release, it is of course essential that relevant medical countermeasures, and a crisis management system with clear chains of command to coordinate the entire incident response are established. Only to the extent that all of these components are in place and working together, can a biological attack be met with a certain degree of confidence.

2 Mission planning

2.1 Pre-mission briefing

Before FIT is deployed to a scene, the team should be given a pre-mission briefing that includes the following elements:

- Intelligence background and any specific information concerning the incident
- Medical intelligence assessment, i.e. disease, agent or delivery indications
- Estimated time of release
- Estimated number of exposed persons
- Meteorological data, maps and a preliminary hazard area based on default dispersal assessment

Based on this information, a route to the object and location of a FIT command post, decontamination point, cordon sanitaire, and location of other response units (police, rescue, etc.), are decided.

It is important to realize that an aerosolized biological warfare agent penetrates closed buildings and has a huge dispersal potential. Even with the wind in the back, a safety distance of 100 meters or more from the hotline to the object is necessary, and down-wind safety distances could easily be many kilometers. The pre-mission briefing concludes with a run through of the mission objectives:

- Obtain information about the hazard through on-site assessment
- Obtain samples for subsequent laboratory and forensic analysis
- Render safe any potential hazard

All of which must be concluded in time for a prognosis to be made available to the incident commander before the end of an incubation period. As a rule of thumb, FIT missions from arrival on scene to departure with relevant samples take about four hours, which in a worst case situation leaves less than 20 hours for confirmatory laboratory analysis and establishment of countermeasures.

Before leaving for the scene with prepacked FIT equipment, the channels of communication to reach-back supporting expertise (dispersal assessment unit and laboratory), as well as to the coordinating crisis management authority, should be established and tested.

2.2 Arrival on scene

On arrival at the scene, the FIT Leader should establish contact with the incident commander on site and get an update on the situation. This includes making contact with other response units (e.g. Explosive Ordnance Disposal (EOD), Public Health officer, rescue service etc.). If EOD expert advisory capacity is not part of FIT, it must be considered if EOD should clear the object for potential explosives prior to FIT entering the area.

Exposed persons should have been evacuated by the rescue service from the immediate area of attack, cleaned, and brought to a holding area for FIT to interview and examine persons as deemed necessary.

Based on the information updated on site, FIT should review the mission objectives and prepare a sampling strategy (see below) and assure that every team member has a clear understanding of his particular tasks within the overall mission strategy. While the composition of FIT may vary from nation to nation, the following requirements should be met by one or more of the team members:

- CBRN trained medical expertise
- Microbiological laboratory training
- Operational training
- Render safe and IDD-training
- Communication & Documentation training

Finally, before the team collects the sampling equipment relevant to the particular mission and suits up in protective gear, extraction procedures of the team from the hot zone must be reviewed. A decontamination point for the team members, samples and equipment must be in place, and emergency procedures for extracting team members from the hot zone must be clarified.

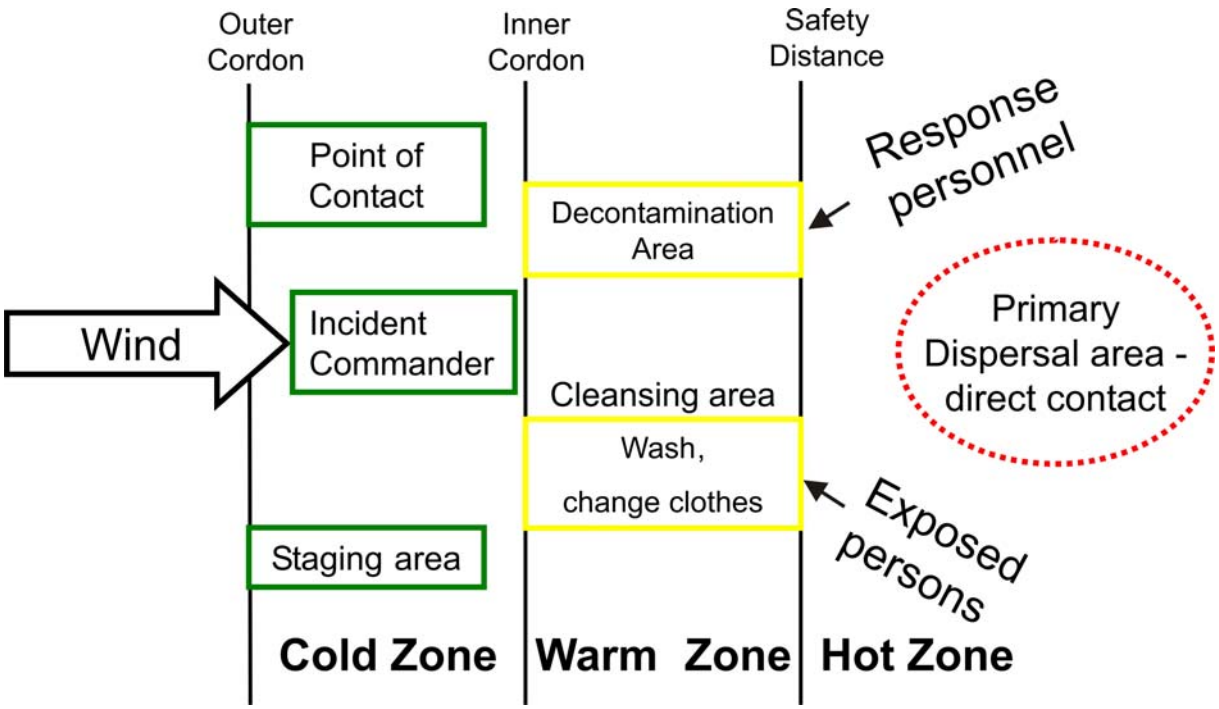


Figure shows organisation of crime scene

3 Sampling strategy

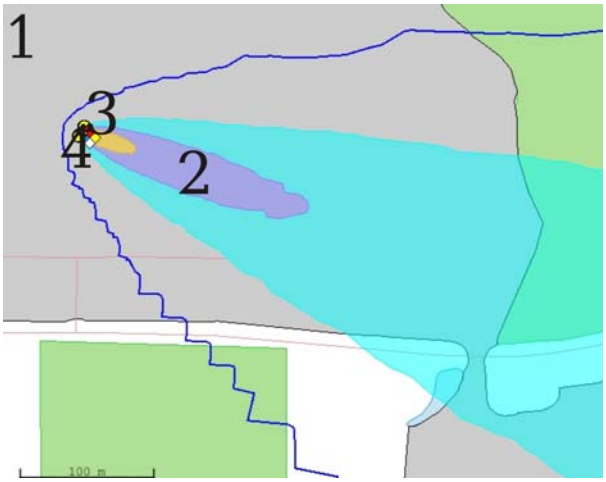
When finalizing the sampling strategy before crossing the hotline the main objectives of the entire incident response must be kept in mind: To identify any agent, determine whether it is contained, and if not contained, how far it has spread, and who has been exposed. If people have been exposed in the immediate area of attack with an airborne agent, it can be useful to interview and examine these persons for any clinical symptoms and obtain nasal swabs, as the nose is a protected environment and functions as a mobile air sampler.

The sampling strategy then rests on the following principles:

- Going from lowest to highest concentration of agent (reduce risk of cross contamination)
- Obtain dual sets of any sample (second laboratory confirmation if necessary)
- Obtain control samples outside the area of attack (safeguard against false positive laboratory results)
- Obtain samples from outside and from within the area of contamination predicted by the dispersal assessment (validation of area of contamination and persons exposed)

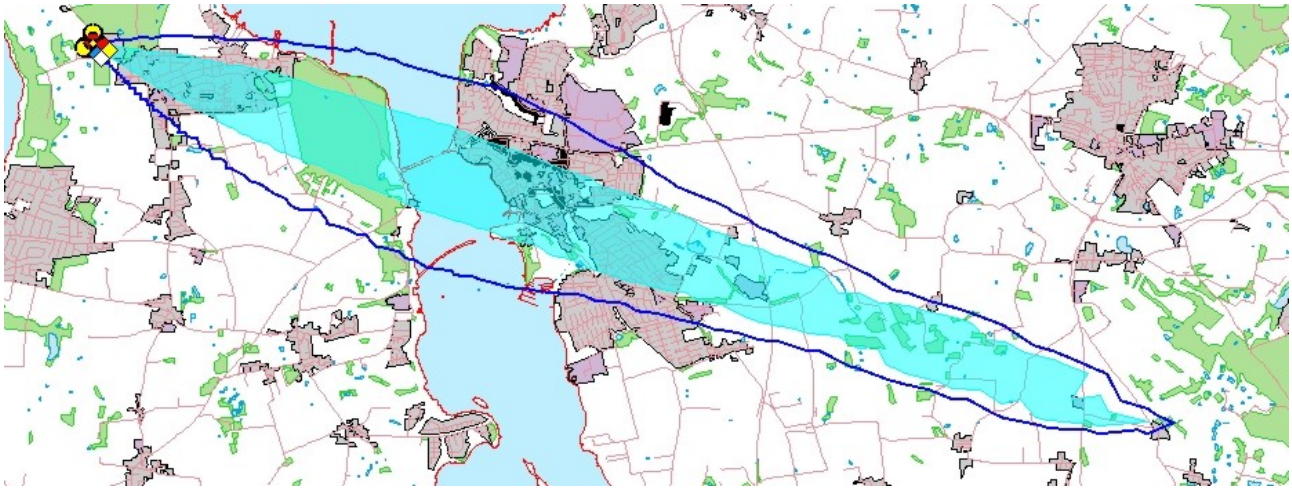
- Prioritization of samples

Keeping the wind direction in mind and with a – perhaps updated – dispersal assessment the sampling strategy should then be briefed to the entire team preferably on a map indicating the intended sampling locations and types.



Sampling Strategy for Exercise 4 at Biotect 2006:

1. Nasal swabs from exposed persons
2. Vegetation or earth sample to confirm Dispersal Assessment
3. Surface swab and Air Sample from building to confirm dispersal within building through the ventilation system
4. Dry powder sample from delivery site - source



Dispersal Assessment for Exercise 4 at Biotect 2006

While planning the sampling, it is important to keep in mind that for practical reasons, only a limited number and amount of samples can be taken through the decontamination process and transported to and analyzed by the diagnostic laboratory.

4 Safety

There are two overall safety considerations in a FIT mission. The first is to stop further dispersal of biological agent, and the second is to ensure the safety of FIT.

4.1 Environmental safety

If the release has taken place inside a building it is important that doors, windows and ventilation systems are shut down as soon as a release is suspected. Although this may not completely eliminate release to the surrounding environment, particularly if the biological agent has been professionally weaponized, such simple procedures will reduce the amounts expelled.

Similar procedures should also be followed by FIT during the assessment and sampling mission, and any on-site source of biological agent with risk of further release should be rendered safe to the extent possible (e.g. deactivation of a dispersal device) without, however, interfering with timely accomplishment of the FIT mission objectives. Full site decontamination and recovery of normal function is not a FIT task, but should await laboratory analysis and a final definition of the area of contamination.

Glove bag for reduction of aerosol dispersal

If visible amounts of dry biological agent are present, all procedures should take care not to disturb the material unnecessarily. Manipulations e.g. during sampling can easily create secondary aerosols and further dissemination of agent.

A strict rule should be enforced that no material is taken out of the hot zone without being decontaminated, see appendix 1, Decontamination procedures and solutions, below.

Persons exposed to visible amounts of biological agent must be cleaned during evacuation from the hot zone. This is not a FIT responsibility but is usually performed by a rescue service. The cleaning process should include a complete change of clothing (contaminated clothing to be discarded) and a thorough wash with soap and water. During this cleaning process it is important not to create secondary aerosols of water-vapor and biological agent. While this cleaning may not reduce the risk of illness for an exposed person, it will allow him to come into contact with un-exposed persons without risk of cross-contamination. After cleaning, an exposed person may be in the incubation period, but for the presently known biological agents there is no risk of transmission before the incubation period has ended and symptoms appear.

When extracting FIT, samples, and material from the hot zone, a thorough decontamination must be done with active chlorine or a similar substance that has been shown to inactivate even the sturdiest biological agents (Appendix 1). Preferably, single-use suits and sampling utensils should be used and discarded after the mission, while expensive re-usable equipment that may have been contaminated should be kept in plastic bags, decontaminated on the outside and kept in quarantine until laboratory analysis of the samples has defined the agent and the hazard. Samples obtained by FIT in the hot zone must be double-bagged in sealed plastic bags and decontaminated at the hotline before being packaged in safety containers and transported to the analytical laboratory.

4.2 FIT safety

Guarding the safety of the FIT members starts before a mission.

It is important that the team members are mentally fit as the psychological demands during a mission can be substantial. Frequent training and a thorough familiarity with equipment and procedures reduce the stress-level during a real mission. Team members should also be physically fit as the working environment may be uncomfortable and especially heat problems can arise when working in protective suits. The environmental conditions (e.g. ambient temperature) and potential physical constraints should therefore be taken into consideration when planning the mission.

Effective protection against a number of potential biological threat agents is possible by means of vaccination and chemoprophylaxis. This will help in safeguarding team members against accidents and enhance the overall level of protection since Personal Protective Equipment (PPE) does not provide an impenetrable barrier in all circumstances. Consequently, protection of FIT before any mission may also include vaccination as guided by a medical intelligence assessment of current

threats, and this could be supplemented with pre- or postexposure chemoprophylaxis, either as a standard procedure, or as warranted by the specific circumstances of a particular mission.

Before the FIT mission starts, the security of the area should be ensured by relevant authorities (police, military), and if necessary, the scene should be cleared for explosive hazards by an EOD team. During a FIT mission it is deemed good practice to monitor for chemical and especially radioactive hazards using validated portable detection devices. In general, if people have been exposed to a suspicious substance and no immediate symptoms occur, the substance is unlikely to be a chemical hazard, but it could still be a biological or radioactive hazard or even a combination of the two.

When working in the hot zone, every FIT Member must use PPE and well-established procedures. When choosing the PPE for a biological mission, the critical concern is to safeguard against respiratory exposure as no biological agent can penetrate intact skin. Masks with self sufficient air supply can eliminate any risk of airborne exposure; however, with present technology this reduces mission time (20 min) to a degree that accomplishment of mission objectives may be compromised. Therefore, masks with filtrators, or a combination of filtrators and fresh air supply, are often used.

The PPE must ensure that no biological agent gets inside the suit and contaminates a team member. This allows the team member to be extracted un-exposed after decontamination of the suit. Since unknown hazards may arise during a FIT mission, the suit, boots and gloves should also provide at least temporary splash protection against chemical hazards, and continous monitoring of radiation levels will warn the team of radioactive substances.

When choosing PPE and other equipment it is important to keep in mind that it must not interfere with mission objectives and it should therefore not be too heavy or cumbersome and it should be as cool and light as possible.

While in the hot zone, team members must be able to communicate with each other and with other units outside the hotzone. While this is necessary in order to pass assessment information to the incident commander, dispersal assessment unit etc., it is also important in order to be able to acquire emergency assistance in case of accidents. For that reason, as a general rule, the team should not split up inside the hot zone, and under no circumstances should any team member work in isolation.

5 Assessment & crime scene search

The purpose of a field investigation of a biological incident is to extract all information from the scene helpful to identify the hazard, the contaminated area, people exposed, and the perpetrator. Depending on the specifics on the scene such information may be obtained from visual inspection of the site itself, suspicious substances, delivery devices or other equipment relevant to a biological incident (e.g. laboratory equipment, books, notes, computers, phones). Other clues could also be dead animals or even humans. With the right expertise and sufficient experience in biological warfare and terrorism, assessment of such information could result in a preliminary identification on-site of the hazard (agent, amount, area etc.) and the perpetrator. Real-time communication from the FIT team on site to reach-back capabilities and the incident commander should be available preferably through an interactive video link.

If a release has taken place and people have been exposed, the time factor may be critical and an assessment based on the on-site investigation could be sufficient to allow countermeasures to be activated. In most cases, the on-site investigation will provide important information for the dispersal assessment unit (e.g. amount released) and for the subsequent laboratory analysis, even though an assessment based only on the on-site investigation itself may not be sufficient to identify the agent. Therefore, forensic examination of samples from the scene will in most cases be necessary to identify the hazard conclusively. For practical reasons, samples will be of limited number and quantity and a prioritization must be done by FIT, based on the overall mission objectives and the specific findings at the scene. In general, however, biological samples are of the highest priority as they are necessary to identify any agent through laboratory analysis, which will guide the choice of medical countermeasures.

As the scene of a biological incident is a crime scene with potential judicial ramifications, the procedures of FIT should comply with police investigation procedures. Basically, this means that the scene should be undisturbed to preserve the integrity of the scene, and that all procedures must be documented (see below).

6 Sampling techniques

Unlike chemical or radioactive hazards, there are at present no portable devices that can reliably identify biological agents on the scene. To confirm the on-site assessment and identify any agent and its dispersal area, biological samples must be obtained and sent to a diagnostic laboratory with experience in identification of biological warfare agents from environmental and clinical samples.

The sampling is performed on the basis of the sampling strategy (see above) and with the following principles in mind:

- Sterile handling techniques must be used to avoid cross-contamination of samples
- Samples must be obtained and preserved during the entire mission, including transport to the laboratory in such a way that live agents are not inactivated (e.g. keep cool, airtight containers)
- Two sets of samples are necessary for confirmatory second analysis
- Clear labeling on all sample containers

As biological agents are not visible after dispersal, the sampling techniques and handling procedures used should be validated on live biological simulants with subsequent laboratory analysis. Although suspicious source material may in some cases be present in visible amounts (e.g. powdery letters), the critically important question of whether a release has been contained, and, if not, to which extent it has been dispersed, cannot be answered without valid sampling from areas with no visible contamination.

The types of equipment used for sampling vary according to the substrate, although in all cases single-use utensils should be preferred. The types of samples include:

- Solids
- Air
- Soil
- Liquids
- Vegetation

- Whole animals and insects
- Nasal swabs
- Body fluids (blood, cerebrospinal)
- Tissue (lung, liver, intestine)

The most commonly used sample types are surface swabs and air samples, and though the variety in potential sample substrates is large, it is rarely, if ever, needed to bring all types of sampling equipment into the hot zone in a specific incident.

Some of the sampling techniques are fairly simple (e.g. scooping up a spoonful of soil), while others are more complex (e.g. excising a lump of lung tissue) and may not in all cases be practical to perform on-site. However, in order for the subsequent laboratory analysis to correctly identify the agent, all sampling techniques require specialized training in how, and especially from where, to obtain the samples.

There is a time constraint if a release of a biological agent has occurred which generally would make it too late to come back for a second sampling mission. It is therefore critical that the sampling priorities and procedures are not compromised by expediency which could result in a false negative laboratory result.

6.1 Quality Assurance

The importance of valid and reproducible sampling techniques used by FIT cannot be overestimated, since the entire response and especially the validity of the laboratory analysis is heavily influenced by the sampling. Sampling techniques should be reliable and reproducible, and as with the laboratory analysis they should also live up to internationally accepted standards.

Relevant chapters in the following standards should be considered when planning studies that verify or validate sampling techniques:

CEN – ISO 17025
CEN – ISO 9001
OECD – Series on Principles of GLP and Compliance Monitoring
National guidelines of interest might be:
FBI – Quality Assurance Guidelines for Laboratories Performing Microbial Forensic Work

7 Documentation & communication

The FIT mission should be documented rather rigorously. First of all to be able to keep track of what samples are taken from where, and secondly because of the judicial requirements and the potential need to present the findings in a court of law.

The entire site should be photographed before any disturbances are made, and individual members of FIT should also be identified. Any particular piece of equipment or evidence should be recorded, and depending on the reach-back support available (e.g. external experts), it might be relevant to transmit this information during the mission to enhance the assessment on-site.

The samples should be uniquely, and clearly labeled and the specific sampling site must be linked to the sample with photographs or video recording. Concomitantly, a written log of what has been done by whom and where should also be kept.

When transporting the samples from the site, it is important to record the chain of custody from the initial sampling through the transport chain until it reaches a laboratory official.

All communication from the team to outside authorities - and especially assessments and analytical results - should follow the chain of command and be adequately safeguarded against non-authorized access. Classified channels of communication would be preferable as the information obtained could be highly sensitive and a breach of confidentiality could have severe consequences especially by interfering with public order and timely implementation of countermeasures.

Although FIT rarely would be responsible for press contact, and should actually be shielded from public exposure, a media strategy outlining the roles and responsibilities during, and especially after a FIT mission, should be prepared beforehand.

8 Interoperability

The principles of field investigation outlined above must be transformed into detailed Standard Operating Procedures (SOP) which will vary among nations. This is not necessarily a critical problem as several methods, procedures and equipment types will allow an adequate investigation result. Therefore, it may not be essential that the specific SOPs among EU member states have full interoperability at the tactical level. It is, however, critical that interoperability exists at the strategic level, i.e. that the requirements are indeed met, irrespective of the means. Interoperability at the

strategic level will ensure confidence among nations that biological threats, wherever they may occur, are countered and contained as quickly and as locally as possible so that the risk of major, transnational, or even Union-scale consequences, is reduced.

While persistent training is essential to develop SOPs and ensure that a credible response capability against biological threats is maintained, such training should not only include local or national assets, but should also in the future include Union-wide participation. Not only will this allow for mutual assistance to be given in a crisis, but strategic interoperability will be served and international confidence will be strengthened. As with the European BSL-4 laboratories whose analytical preparedness capability is shared among several nations, similar sharing of other response components (e.g. FIT, dispersal assessment) in a biological incident response capability may also be possible. This would be in concordance with the aim of enhancing EU-solidarity in the field of civil protection, and the integrated EU arrangement for crisis management with cross-border effects (EU-ICMA) which are practical, operational arrangements to support and facilitate co-operation between member states in the case of an emergency. Future exercises should also address this possibility.

In any case, the biological threat is evolving as new technologies are continuously being developed. As a consequence, the security environment and the challenges to national and European security are not constant. The need for an updated and flexible response capability will therefore continue to exist in the future.

Appendix 1: Example of decontamination procedures and solutions

Decontamination Area

In Denmark, the Decontamination Area (DA) is set-up and served by personnel from the Danish Emergency Management Agency (DEMA).

The DA is placed upwind from the object with a distance of at least 150 meters.

The level of contamination within the DA decreases from the Hot Zone (red) to the Cold Zone (green) due to wind direction, decontamination and removal of suit, boots, gloves and gasmask (colored line in the drawing indicates the gradient of contamination within the decontamination area).

The decontamination area consists of four sub areas (see drawing on a following page).

Sub area 1 serves as Spraying Area

Sub area 2 serves as spacer between Hot Zone and Cold Zone.

In case of exposure to chemical warfare agents (CWA), the team is checked for CWA in Sub area 2.

Sub area 3 serves as an undressing area.

Sub area 4 serves as manoeuvre area for the decontamination personnel.

Sub area 1

First, the samples and the digital camera used for documentation are submerged in decontamination solution just outside sub area 1.

Then, before entering sub area 1, FIT Members stand in a basin with decontamination solution and decontaminate their boots using a brush. Thereafter, the gloves are being decontaminated by washing them in decontamination solution in a second basin.

The Team Leader from FIT enters sub area 1, takes the samples and packs them in an IATA approved transportation container. He then brings both transportation container and camera with him through the decontamination process.

FIT is then sprayed with decontamination solution in sub area 1 by a private from DEMA, standing in sub area 4 wearing a chemical safety suit and gas mask.

After being sprayed FIT waits for 20 min.

The following materials should be present in the Hot Zone just outside Sub area 1:

3 basins with decontamination solution for gloves (FIT personnel), boots and samples.

Sub area 2

In case of CWA exposure, FIT is checked for the presence of CWA after decontamination by the teamleader from DEMA, wearing a chemical safety suit and gas mask.

In case of a positive result, FIT returns to Sub Area 1 for additional decontamination.

Sub area 3

The undressing of FIT is done in sub area 3 by the Team Leader from DEMA, wearing a chemical safety suit and gas mask.

To avoid cross-contamination from the outside of the suit to the inside of the suit, the undressing is done in a manner so that the person inside the suit only touches the suit on the inside. In the same manner, the Team Leader from DEMA, doing the undressing, only touches the outside of the suit.

The following materials should be present in sub area 3:

2 basins with decontamination solution for gas masks and gloves (DEMA personnel)

1 garbage bag (clear plastic)

Sub area 4

Manoeuvre area for the DEMA-personnel.

All equipment from FIT, as well as the DA, is placed in two containers and left in quarantine until the results from the laboratory analysis are available.

The following equipment should be present in sub area 4:

3 sprayers containing decontamination solution

CWA detectors in case of CWA being detected by FIT in the Hot Zone

2 containers for all equipment

Decontamination Solution

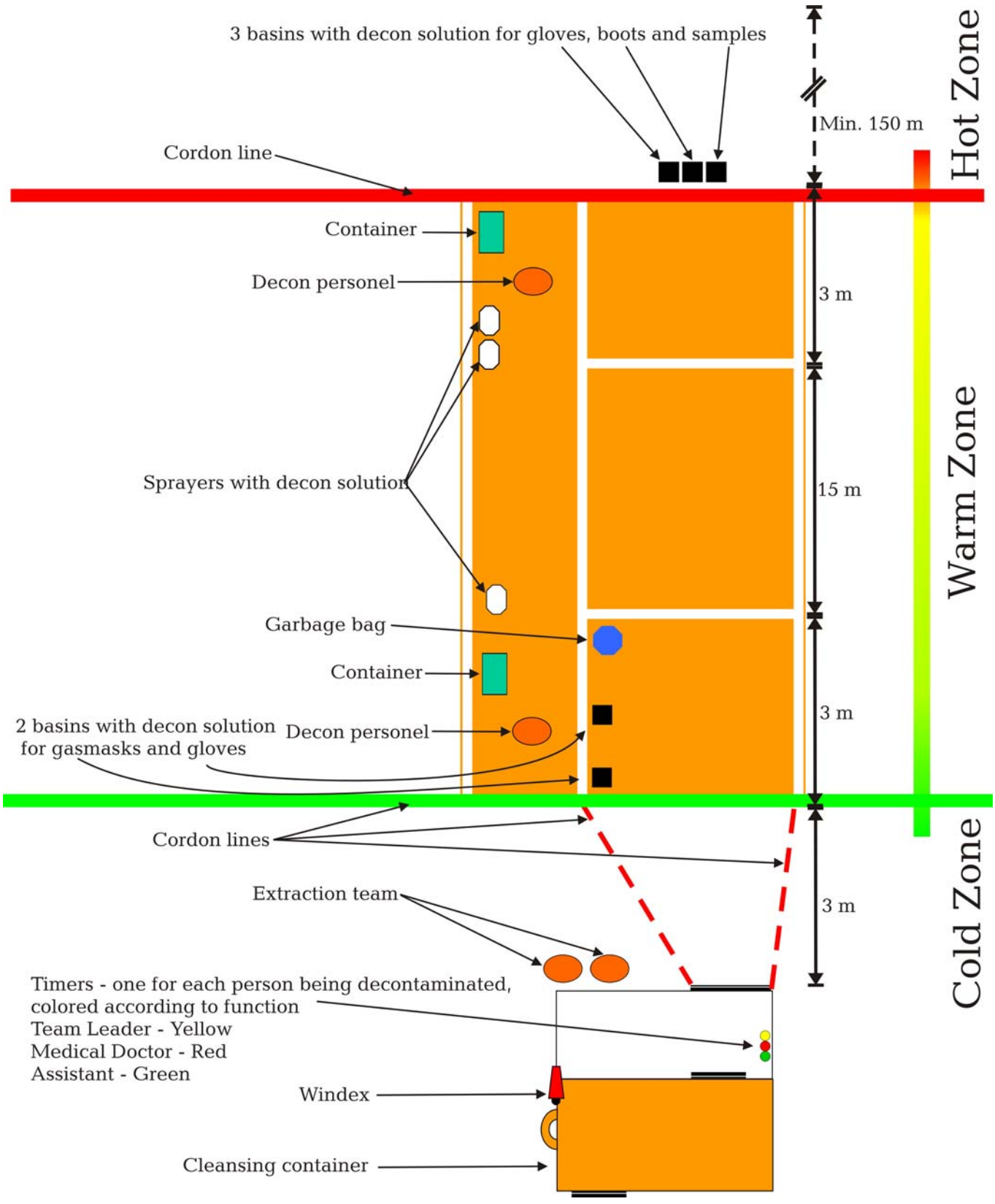
1.5 L of commercially available bleach (4,8% at pH 13) is diluted by 7.5 L tap water.

1 L of acidified soap (pH 1, containing phosphorous acid) is added under constant stirring.

The resulting pH should be 7.

The ingredients must be added as indicated in order to avoid development of chlorine gas.

The final solution should not be left for more than 1 hour.


3 basins with decon solution for gloves, boots and samples
Min. 150 m
Hot Zone
Cordon line
Container
Decon personel
3 m
Sprayers with decon solution
15 m
Warm Zone
Garbage bag
Container
3 m
2 basins with decon solution
for gasmasks and gloves
Decon personel
Cordon lines
Extraction team
3 m
Cold Zone
Timers - one for each person being decontaminated,
colored according to function
Team Leader - Yellow
Medical Doctor - Red
Assistant - Green
Windex
Cleansing container

Appendix 2: Response sequence

1. Suspicious material or illness
   - Awareness raising education of postal workers and security personnel at high risk objects should be considered as well as for Emergency Room personnel.
2. Threat Analysis
   - An expert in biological incidents performs a threat analysis in cooperation with the local police and the intelligence services.
   - The threat analysis concludes whether the threat is credible or not and the proper actions are decided thereupon.
   - FIT is then requested if the threat is credible
3. FIT call-up
   - FIT members decide route to FIT Operation Centre (OC) based upon own origin, wind direction and incident location.
4. Pre-mission preparations at OC
   - Premission briefing including:
     a. Situation
     b. Mission objectives
     c. Preliminary Sampling Strategy
     d. Communication
     e. Timeline
     f. Other units
   - Equipment
   - Medication
   - Transport to Crime Scene
5. Arrival at Crime Scene
   - Contact to Incident Commander
   - Incident Response Plans for FIT and cooperating units are made
   - Witness questioning
6. Mission preparations
   - Update the situation
   - Review the objectives
   - Finalize Sampling Strategy
   - Prepare Equipment
   - Communication control
   - Dress up in PPE
7. Investigation
   - Crime Scene Search
   - Documentation
   - Sampling
8. Decontamination
9. Debriefing at Crime Scene
10. Transport of samples
    - International regulations should be followed:
      a. ADR
      b. ARR
      c. IATA
11. Debriefing at FIT OC

12. Reporting
    - A full report to all relevant authorities should include the following:
        a. Situation
            i. What
                1. Intelligence
                2. Witnesses
                3. Clinical Manifestations
                4. Other
            ii. When
                1. Intelligence
                2. Witnesses
                3. Clinical Manifestations
                4. Other
            iii. Where
                1. Amounts and Dispersal Methods
                2. Dispersal Period
                3. Dispersal Assesment
        b. Prognosis
            i. +/- Intervention
            ii. Timeline
            iii. Casualty Estimation
        c. Recommendations
            i. Cordon
            ii. Personal Protection Equipment
            iii. Quarantine or isolation
            iv. Prophylaxis
            v. Treatment
            vi. Information
            vii. Medication and vaccination procedures
13. Prepare for redeployment
    - Re-establish equipment inventory
    - Draw out Lessons Learned from Incident Mission