PRIMARY RESPONSE INCIDENT SCENE MANAGEMENT (PRISM) GUIDANCE for CHEMICAL INCIDENTS

VOLUME 2: TACTICAL GUIDANCE FOR MASS CASUALTY DISROBE AND DECONTAMINATION

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PRISM GUIDANCE FOR CHEMICAL INCIDENTS

VOLUME 2

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Foreword

The Primary Response Incident Scene Management (PRISM) series was written to provide authoritative, evidence-based guidance on mass casualty disrobe and decontamination during a chemical incident. The PRISM documentation comprises three volumes:

Volume 1: Strategic Guidance

Presents a review of best practices, collates available evidence and identifies areas that require further investigation. The document is relevant to senior incident responders (e.g. Chief Officers) and those responsible for emergency planning and civil contingencies, as it describes the supporting technical information which underpins the rationale for each stage of disrobe and decontamination and highlights potential challenges.

Volume 2: Tactical Guidance

The second volume provides an overview of the processes involved in mass casualty disrobe and decontamination and the rationale which underpins each process. The document does not include supporting technical information or potential challenges. Volume 2 has particular application in the training and exercising of first responders and officials involved with domestic preparedness and emergency management.

Volume 3: Operational Guidance

The salient features of mass casualty disrobe and decontamination are presented in Volume 3. The purpose of Volume 3 is to provide all Federal, State or Tribal first responders with a simple and readily accessible guide to the critical aspects of the initial incident response process.

The underpinning basis of the PRISM guidance documentation is scientific evidence accrued from a recent program of research sponsored by the Biomedical Advanced Research Development Agency (BARDA), the aim of which was to ensure that all casualties exposed to potentially hazardous chemicals receive the most effective treatment possible during the initial stages of an incident.

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Introduction

The purpose of this document is to provide evidence-based guidance on best practice during the initial response phase of an incident involving potential exposure of civilians to hazardous materials. The initial response can be divided into six main elements:

Evacuation

Prompt, orderly movement away from hazardous areas is a key component of the initial response. Inappropriate or delayed evacuation may worsen exposure to hazardous materials and have an adverse effect on subsequent operations.

Disrobe

The effectiveness of rapidly removing contaminated clothing in a safe manner cannot be overemphasized and is a process that requires good communication to facilitate casualty compliance.

Decontamination

Whilst disrobe will remove the vast majority of contamination, exposed areas will require decontamination to remove hazardous material from the skin and hair. The process of decontamination can be divided into three forms; improvised, gross and technical. Improvised decontamination is the immediate removal of contamination using any available means and can be divided into "dry" and "wet". Dry improvised decontamination is performed by blotting exposed skin and hair with any available absorbent material and should be the *default option* for improvised decontamination. Wet improvised decontamination should only be used when the contaminant is caustic (e.g. provokes immediate skin irritation) or particulate in nature. Gross decontamination involves the "ladder pipe system" whereby two fire tenders are used to produce a corridor through which casualties may be sprayed with large volumes of water mist. Technical (or "thorough") decontamination requires the use of bespoke decontamination units and associated resources that need to be transported to and deployed at the scene of an incident. The delayed availability of technical decontamination is compensated for by the use of improvised and gross decontamination.

Active drying

The act of drying the skin after showering is a key step in removing contaminants from the skin surface. It is important that this simple but effective process is performed in an appropriate manner to prevent any further spread of contamination.

Communication and casualty management

Good communication is key to acquiring the trust and cooperation of casualties and will maximize the overall efficiency of the initial response phase. Failure to adequately interact with casualties may lead to unnecessary anxiety, non-compliance and security issues at the scene of an incident.

Special Requirements (identifying and decontaminating vulnerable and at-risk casualties)

Casualties may be unable to comply with instructions issued by emergency responders due to mental impairment, physical disability or simply an inability to understand the spoken language. In order to maintain operational efficiency, casualties who are unable to comply with instructions will need to be rapidly identified and provided with appropriate assistance.

These six process elements are summarized in Figure 1. The incident recognition and post-initial response phases are outside the scope of this guidance document. The operational guidance provided in this document is based on prior evidence, recent studies (see Technical References section) and best practices identified from previous guidance documents (see Bibliography section).

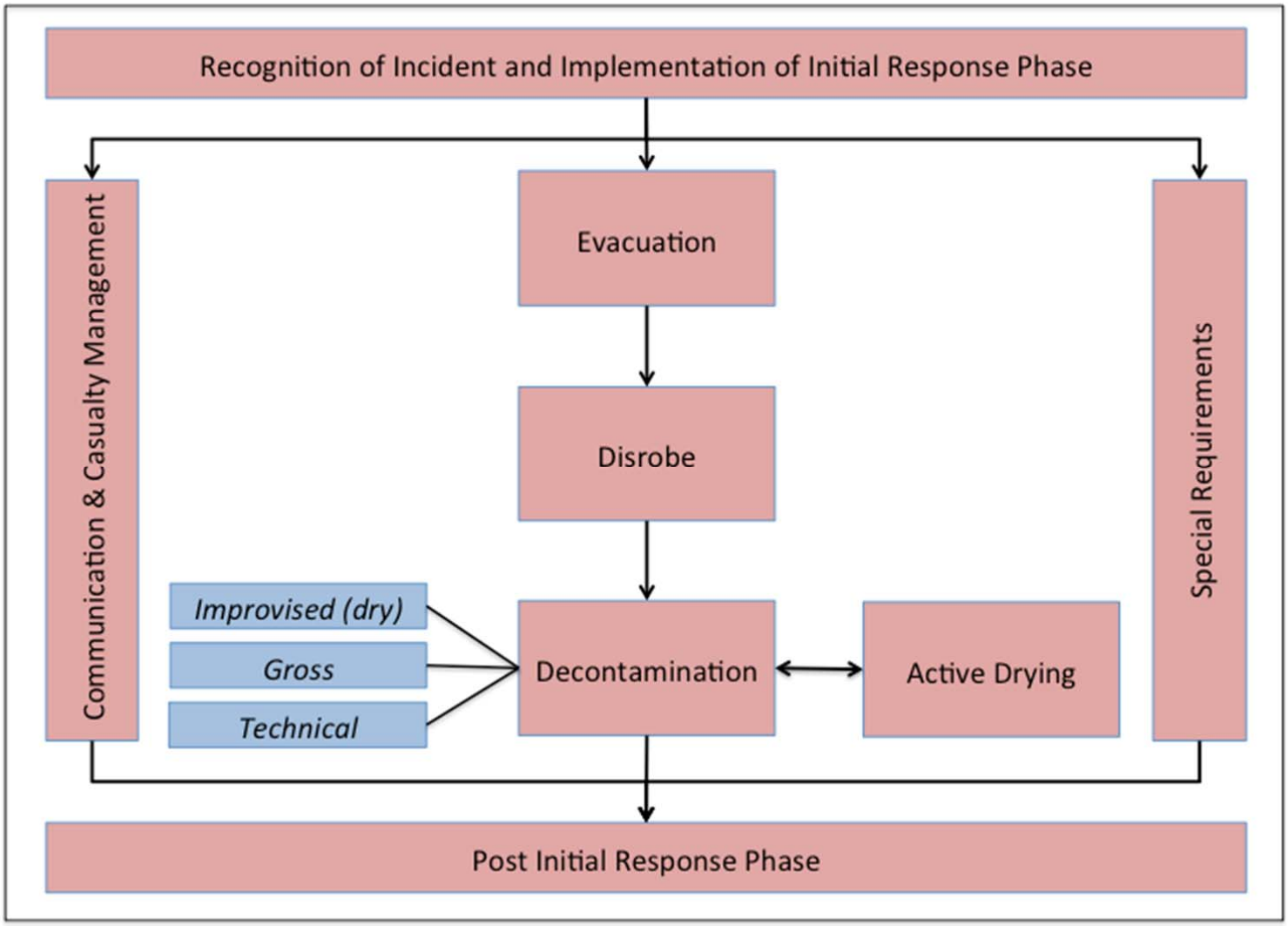

Figure 1: Constituent elements of the initial response phase.

Primary Response Processes

The main objective of the primary response is to save the lives of casualties potentially exposed to hazardous materials. The secondary objective is to prevent the spread of contamination in order to protect responders, associated equipment and facilities (such as hospitals), unaffected members of the general public and to limit the time and cost of returning the scene back to normal.

An overview of the primary response is presented in Figure 2: the individual actions are outlined in sections A – F of this document. It is important to note that communication (Section G) should run in parallel to these actions and that the need to accommodate special requirements (Section H) should be identified at the earliest opportunity. Where appropriate, explanatory notes (numerically ordered) are provided to expand upon or provide relevant detail on the significance of specific actions.

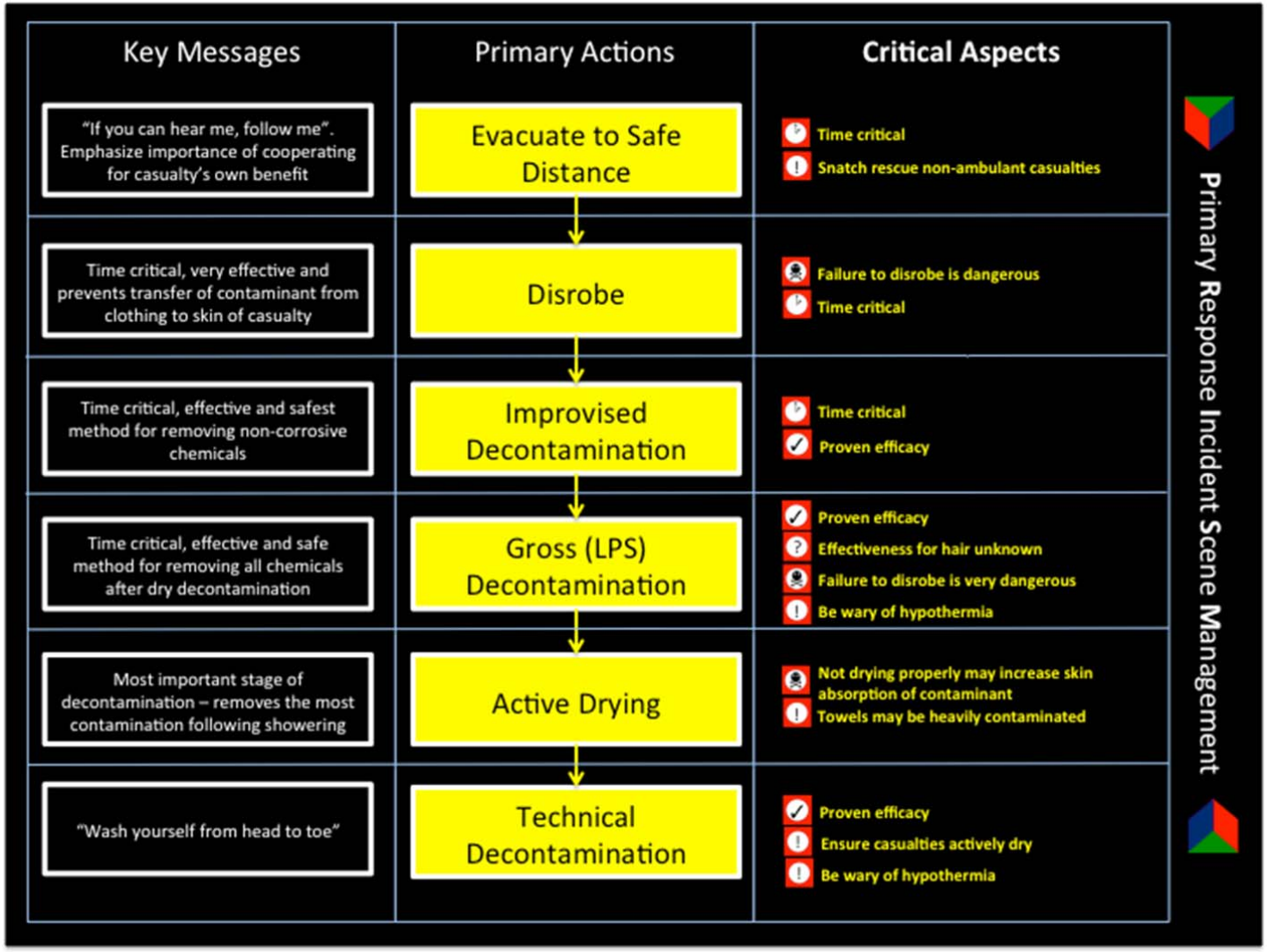

Figure 2: Overview of the Primary Response Incident Scene Management (PRISM) actions, indicating critical aspects and key messages.

A. Evacuation

- **Casualties should be evacuated from the scene of a hazardous chemical release as soon as possible.**
- **Responders should direct casualties to self-evacuate if possible.**
- **Only trained responders wearing appropriate protective equipment should enter the hot zone to evacuate casualties. Decontamination should take place in the warm zone to avoid the risk of further exposure to the contaminant during the decontamination process.** 1
- **The warm zone should ideally be uphill and upwind from the hot zone. The distance between the warm zone and the hot zone should be as long as possible without incurring a delay of more than 5 minutes to the decontamination process.** 2
- **Where evacuation is not possible, people remaining in the hot zone should be encouraged to take shelter, close doors and windows, and keep themselves as far removed from the contaminant as possible.** 3
- **Whether instructing casualties to evacuate or to shelter in place, it is vital that emergency responders use an effective communication strategy, whereby the importance of the action is explained to the casualty in terms of their health.**
- **Responders should also adopt an effective communication strategy to explain to casualties why self-evacuation may be harmful and to discourage casualties from leaving the hot zone without undergoing decontamination.**

B. Disrobe

- **Disrobing should be carried out as quickly as possible following exposure (ideally within 10 mins) in order to limit transfer of contaminant from clothing onto skin and to prevent secondary contamination through off-gassing of clothing.** 4
- **Disrobing should be carried out prior to showering to prevent contaminants being washed from clothing to the underlying skin.**
- **If possible, clothing should be cut off rather than pulled over the head to prevent contaminant coming into contact with casualties' face. If appropriate cutting instruments are not available, casualties should be advised to hold their breath when removing clothes over their heads.** 5
- **The benefits of disrobing should be explained to help casualties understand why removal of clothing is necessary.**
- **Individuals refusing to disrobe should be asked to stand aside to prevent any delay in assisting cooperative casualties.** 6
    - **Further effort should be made to communicate with non-cooperative casualties, but this should not delay others.**
- **Responders should use any means available to provide casualties with temporary clean clothing. For example, foil blankets, linen, opaque plastic sheets, blankets, etc.** 7

C. Improvised Decontamination

- **Improvised decontamination should be carried out as quickly as possible using any readily available materials.**
- **Improvised DRY decontamination should be the DEFAULT OPTION, particularly if the contaminant is a non-caustic liquid or water-reactive chemical.** [9]
- **Improvised wet decontamination should be carried out if the contaminant is caustic or particulate in nature.** [10]
- **Improvised decontamination should be carried out from head to toe, concentrating on exposed areas such as the scalp (hair), face, neck, arms and hands.**
- **A decision to follow improvised decontamination with gross or technical decontamination will need to be based on a dynamic risk assessment carried out by responders at the scene. Factors to consider include:**
  - **Nature of the contaminant.**
  - **Availability of resources.**
  - **Extent of casualties' initial contamination.**
  - **Continued or worsening presence of signs and symptoms.**
  - **Requests from casualties to receive further decontamination.** [11]

D. Gross Decontamination (Ladder-Pipe System)

- **It is critical that gross decontamination is performed as soon as practically possible after exposure, ideally following improvised (dry) decontamination.** [8]
- **Gross decontamination should not be carried out if the contaminant is water-reactive or if the ambient temperature is below 36 ˚F (2˚C).** [12]
- **Gross decontamination should not be delayed by improvised (dry) decontamination when casualties are experiencing immediate distress from the contaminant (e.g. due to contact with caustic substances).** [13]
- **Gross decontamination will be most effective if casualties are asked to assist by actively washing themselves and occasionally turning through 90˚ whilst going through the shower.**
- **If possible, use warm water but do not delay decontamination if only cold water is available.** [14]
- **A high volume, low-pressure mist of water should be used to decontaminate casualties.** [15]
- **The duration of showering should not exceed 90 seconds.** [16]
- **Soap or mild detergent solution may be used but do not delay decontamination to find a source.**

E. Active Drying

- **The provision of towels should be included in any incident response plan.**
- **Casualties should dry using a towel or other suitable material following any form of wet decontamination.**
- **In the absence of dry decontamination or active washing, towel drying represents a key stage in the decontamination process and so it is essential that towels or other suitable materials be made available to casualties following wet decontamination.**
- **Used towels should be treated as contaminated waste and the towelling stage should be considered to be within the warm zone (which may require local procedures to be revised accordingly).**

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F. Technical Decontamination

- **Planning should include the provision of resources that will optimise the decontamination process (e.g. disrobe and re-robe kits, washing implements, detergent etc.).**
- **If disrobing has not already taken place, casualties should be provided with a disrobe pack and instructions on how to disrobe.**
- **Technical decontamination focuses on thoroughness rather than speed and should therefore be carried out following improvised and/or gross decontamination.**
- **The optimised parameters for technical decontamination include a shower water temperature of 35°C, duration of 60 - 90 seconds, addition of mild detergent to the shower water and the provision of a washcloth for each casualty.** 19
- **Casualties should be instructed to wash from head to toe while going through the shower.**
- **Washcloths will be a potential source of secondary contamination, and should therefore be treated and disposed of as contaminated waste.** 20

G. Communication and Casualty Management

- **What to communicate?**
  - **Provide health-focused information about why decontamination is necessary.** 21
  - **Explain the benefits of undergoing decontamination, in terms of protecting oneself and others.** 22
  - **Explain that failure to undergo decontamination can result in secondary contamination of other people and places, including home and family.**
  - **Communicate openly and honestly about the nature of the incident and any actions that are being taken.** 23
  - **Provide sufficient practical information to enable members of the public to successfully undergo mass decontamination and so improve the speed and efficiency of the overall process.**
- **How to communicate?** 24
  - **Loudspeaker.**
  - **Pre-recorded or pre-scripted messages.**
  - **Practical demonstration.**
  - **Pictorial instructions.**

H. Special Requirements

- **Identify and prioritise all individuals with special requirements. These include but are not limited to individuals who are:**
    - **Young, elderly, pregnant, physically or mentally impaired, demonstrating signs of exposure to hazardous materials, known to have come into contact with or close proximity to the hazardous material, unable to understand verbal instructions or are otherwise unable to perform decontamination unaided.**
- **Disrobe and decontamination should not be delayed for the arrival of specialist resources.**
- **Following disrobe, use any available equipment or items to carry casualties with special requirements through the decontamination corridor.** [25]
- **Good communication (verbal, signage, or body language) is vital to reassure and instruct the casualties.**
- **Consider whether medical devices (e.g. walking sticks, eyeglasses, hearing aids, etc) can be decontaminated; if so, allow casualties to retain these items during decontamination.**
    - **Some supportive aids (e.g. certain types of prosthetic limbs) may not be amenable to decontamination.**
- **Implement a buddy system wherever possible.**
- **Families and groups of individuals who speak the same language should undergo decontamination together (if possible).** [26] [27]

Explanatory Notes

1. Prior to the arrival of specialist assets, responders with self-contained breathing apparatus or other OSHA/NIOSH/NFPA-approved respiratory protection may enter contaminated areas in direct line of sight if deemed safe. This action may allow snatch rescues and controlled evacuation of an incident scene with minimal delay.

2. The balance here is in achieving the minimal distance for travel (between the hot and warm zone) against the need to achieve a safe evacuation distance. The nature of the contaminant (such as toxicity, volatility and amount) will be a major factor in setting the evacuation distance.

3. The decision to shelter in place or evacuate will need to be made on a case-by-case basis using a dynamic risk assessment in accordance with local procedures.

4. Disrobing is undoubtedly the most effective initial action that can be readily undertaken and it is absolutely critical that this is done as soon as practically possible. Good communication will be required to gain the trust and cooperation of casualties. The aim should be to remove as much clothing as the casualties are comfortable with. Consider commandeering any available material such as blankets or opaque plastic sheets for use by individuals to allay modesty/privacy concerns (see note 7). Those that are not willing to disrobe should be encouraged to remove at least their outer clothes, although the adverse consequences of undergoing decontamination whilst wearing contaminated clothing should be strongly emphasized (see note 5, below).

5. It is absolutely vital to undertake disrobe before any form of wet decontamination in order to prevent the transfer of contamination from clothing to the underlying skin. Performing gross decontamination on clothed individuals <u>will</u> result in the transfer of contaminant. This is a good point to communicate to non-cooperative individuals.

7. Try to explain the personal and community health benefits of disrobing, but not allow non-cooperative casualties to cause a delay in processing other casualties.

6. Think outside the box: are there any emergency vehicles in attendance that may have foil blankets? Are there any retail outlets nearby where makeshift items such as blankets, bed sheeting, black plastic sheets (e.g. trash-can liners) or clean clothing could be commandeered?

8. The rapidity with which decontamination needs to be started cannot be overemphasized as the clinical benefit of decontamination can decrease by half within the first 20 minutes of exposure.

9. Dry decontamination avoids a phenomenon known as the "wash-in" effect, where showering or cleansing with water can enhance the skin absorption of toxic materials and thus increase the adverse health effects of exposure.

10. Only use wet improvised decontamination if the contaminant is clearly causing immediate burning, stinging or other immediate signs of skin toxicity or is visibly in powder/granular form.

11. The decision to proceed to gross or technical decontamination should made by, or at least in conjunction with, a medically qualified person.

12 During very cold weather, try to find indoor or sheltered public areas if possible. Be aware of the onset of hypothermia at all times, even in warm weather.

13 Caustic substances include acids, alkalis, bleaching agents and strong oxidizing agents. These should be subject to immediate wet interim or gross decontamination (if immediately available). For all other materials, dry interim decontamination is the default option, followed by gross decontamination.

14 The use of warm water is for the comfort and safety of the casualties. Recent research has shown that there is no significant difference in the performance of decontamination between shower water temperatures of 50 and 86°F (10 to 30°C).

15 It is the large volume of water that contributes to the effectiveness of the ladder pipe system of decontamination. Alternative methods of wet decontamination (for example, use of a bucket and sponge) may not produce a sufficient flow of water to be as effective.

16 There are two reasons for limiting shower duration. Firstly, short duration showering reduces the "wash-in" effect where contact with water may increase skin absorption of toxic materials. Secondly, the temperature of water drawn from hydrants to supply ladder pipe systems is unlikely to exceed 50°F (10°C) even in hot weather and so short shower durations will reduce (but not eliminate) the risk of hypothermia. Studies have demonstrated that short shower durations are just as effective as longer durations.

17 Studies have demonstrated that, in the absence of active washing, towel drying is the point during decontamination where most of a contaminant is removed from the skin surface. Although seemingly counterintuitive, this effect can be readily observed at home by examining used hand towels.

18 Towels should be considered contaminated for the reason outlined above (note 17).

19 These optimal showering parameters are known as the "ORCHIDS protocol" and have been thoroughly researched.

20 Washcloths or other physical washing aids will remove contamination during the decontamination process (rather than at the toweling stage) and so help contain the contaminant within the warm zone.

21 Explaining that immediate disrobe and decontamination are essential for preventing or reducing ill health will improve casualty compliance as well as reducing the likelihood of casualties leaving the incident scene to seek medical assistance elsewhere.

22 In particular, it is essential that casualties know how important it is to disrobe and that even partial removal (outer clothing) provides significant health benefits.

23 Do not wait until all the facts are known before initiating communication with members of the public; studies have shown that it is better to communicate that there is uncertainty than to communicate false information or not to communicate at all.

24 Pre-prepared materials should be incorporated into local incident plans.

25 Transportation methods include stretchers and wheelchairs.

26 A buddy system has been shown to be effective for helping individuals who have difficulty undergoing decontamination to successfully complete the process. Casualties are likely to be willing to help others and engage in a buddy system, provided they have received effective communication about the importance of undergoing decontamination and practical instructions on how to do so.

27 Allowing families to remain together during decontamination is likely to have both physical benefits (in terms of improving the speed and efficiency of decontamination, particularly for children), and psychological benefits (in terms of reduced anxiety). Allowing speakers of the same language to go through the process together will facilitate improved understanding of the process (those with knowledge of English can translate instructions for those who do not speak English) and so may provide reassurance.

Summary

If the above processes are followed then there should be a corresponding decrease in contamination of each casualty approximated by the rule of ten (Figure 3).

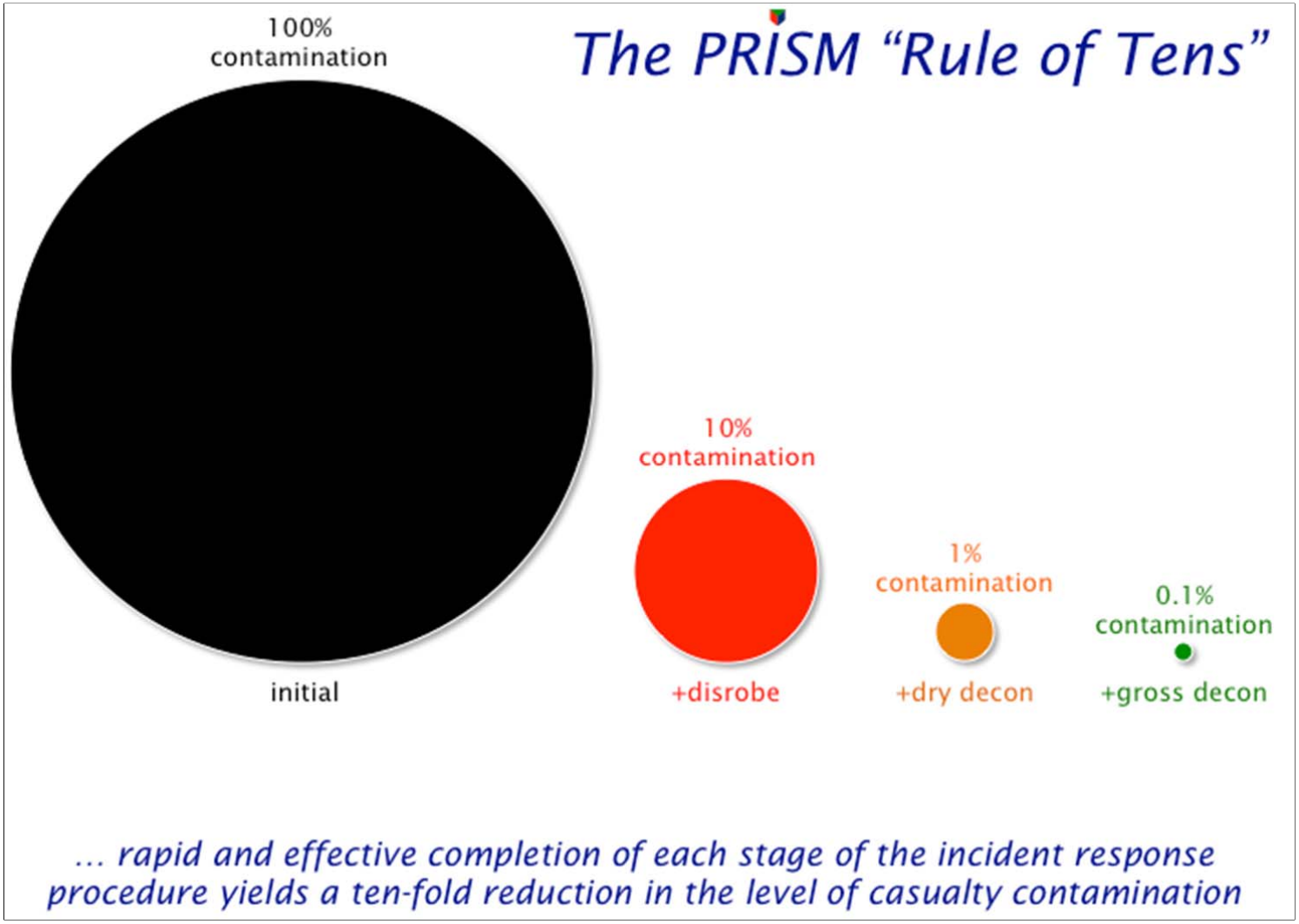

Figure 3: Theoretical reduction in the level of casualty contamination following primary response incident scene management (PRISM). This figure is for guidance only: the actual amount of contaminant removed at each stage will be incident-dependent.

Technical References

H. Matar, K.L. Atkinson, S. Kansagra, S. Townend, R. Amlôt, R.P. Chilcott, Advanced Studies of Mass Decontamination Additional Report: Effects of Disrobing, Hydrodynamics, Delays and Detergents on the Effectiveness of the Ladder Pipe Decontamination System. In Vitro Studies with Cyanide. Report No: TDDT-15-04B, University of Hertfordshire, 2015.

H. Matar, K.L. Atkinson, S. Kansagra, S. Townend, J. Larner, R. Amlôt, R.P. Chilcott, Advanced Studies of Mass Decontamination Additional Report: Effects of Hydrodynamics, Disrobing and Delays on the Effectiveness of the Ladder Pipe Decontamination System. In Vitro Studies with CW Agents HD and VX. Report No: TDDT-15-05A, University of Hertfordshire, 2015.

S. Power, C. Symons, E. Jones, R. Amlôt, J. Larner, H. Matar, R.P. Chilcott, Advanced Studies of Mass Decontamination Additional Report: Mass Casualty Decontamination in the United States – An Online Survey of Current Practice. Report No: TDDT-15-02A, University of Hertfordshire, 2015.

D. Zimerman-Wochenmark, R. Amlôt, R.P. Chilcott, Advanced Studies of Mass Decontamination Milestone 3: Current Decontamination Practices, Special Populations and Guidance Mapping. Report No: TDDT-13-09C, University of Hertfordshire, 2013.

H. Matar, K.L. Atkinson, S. Kansagra, J. Larner, R. Amlôt, R.P. Chilcott, Advanced Studies of Mass Decontamination Milestone M4: Effects of Hydrodynamics, Detergents and Delays on the Effectiveness of the Ladder Pipe Decontamination System - Studies with Methyl Salicylate and Curcumin-Methyl Salicylate Mixture. Report No: TDDT-14-07A, University of Hertfordshire, 2014.

R. Amlôt, C. Symons, E. Jones, S. Bredbere, B. Cavell, H. Carter, J. Larner, V.A. Viegas, S.S. Shetage, R.P. Chilcott, Advanced Studies of Mass Decontamination Milestone M5: Effects of Hydrodynamics and Disrobing on the Effectiveness of the Ladder Pipe Decontamination System. Human Volunteer Studies with a CW Agent Simulant. Report No: TDDT-15-08A, University of Hertfordshire, 2015.

C. Symons, E. Jones, S.C. Bredbere, B, R. Amlôt, J. Larner, S.S. Shetage, V.A. Viegas, R.P. Chilcott, Advanced Studies of Mass Decontamination Milestone M6: Effects of Delays on the Effectiveness of the Ladder Pipe Decontamination System. Human Volunteer Studies with a CW Agent Simulant. Report No: TDDT-15-07A, University of Hertfordshire, 2015.

H. Matar, K.L. Atkinson, S. Kansagra, R. Amlôt, R.P. Chilcott, Advanced Studies of Mass Decontamination Milestone M7: Effects of Hydrodynamics, Detergents and Delays on the Effectiveness of the Ladder Pipe Decontamination System. In Vitro Studies with radiolabelled Diethyl Malonate and Phorate. Report No: TDDT-14-10A, Univesity of Hertfordshire, 2014.

C. Symons, E. Jones, S. Bredbere, B. Cavell, R. Amlôt, J. Larner, S.S. Shetage, V.A. Viegas, R.P. Chilcott, Advanced Studies of Mass Decontamination Milestone M8: Effects of Detergents on the

Effectiveness of the Ladder Pipe Decontamination System. Human Volunteer Studies with a CW Agent Simulant. Report No: TDDT-15-07B, University of Hertfordshire, 2015.

H. Matar, J. Larner, C. Symons, E. Jones, H. Carter, D. Weston, S. Kansagra, V.A. Viegas, S.S. Shetage, R. Amlôt, R.P. Chilcott, Advanced Studies of Mass Decontamination Milestone M10: Exercise PROTEUS. Report No: TDDT-15-07C, University of Hertfordshire, 2015.

J. Larner, H. Matar, D. Zimerman, E. Jones, R. Amlôt, R.P. Chilcott, Advanced Studies of Mass Decontamination: US Mass Casualty Decontaminations Procedures – Report on Site Visits in Los Angles and Boston. Report No: TDDT-13-04A, University of Hertfordshire, 2013.

Bibliography

Department for Communities and Local Goverment [DCLG]. Fire and Rescue Service: Operational Guidance incidents involving hazardous materials, The Stationery Office, Norwich, 2012.

Edgewood Chemical Biological Center [ECBC]. Guidelines for mass casualty decontamination during an hazmat/weapons of mass destruction incident: Volumes I and II, Edgewood Chemical Biological Center, Aberdeen Proving Ground, 2013.

Harvard School of Public Health. Strategies for first receiver decontamination: A collection of tactics to assist hospitals address common challenges associated with all-hazards decontamination of patients, Harvard School of Public Health, Massachusetts, 2013.

Health Protection Agency. Generic Incident Managemnt, Health Protection Agency, London, 2008.

Home Office. Guidance for the United Kingdom emergency services on decontamination of people exposed to hazardous chemical, biological or radiological substances, Home Office, London, 2013.

National Ambulance Resillence Unit [NARU]. National Ambulance Service CBRNE/HAZMAT guidance - OFFICAL, NARU, Oldbury, UK, 2014.

National Health Service Scotland. Guidance for hospitals on surface decontamination of self-presenting persons potentially exposed to hazardous chemical, biological or radiological substances, 2012.

National Health Service. NHS emergency planning guidance: The ambulance service guidance on dealing with radiological incidents and emergencies, National Health Service, London, 2010.

United States Department of Homeland Security [USDHS]. Patient decontamination in a mass chemical exposure incident: National planning guidance for communities, United States Department of Homeland Security, Washington DC, 2014.

USACBRNS. Guidelines for military mass casualty decontamination operations during a domestic HAZMAT/Weapon of mass destruction incident, 2011.

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