

**DSAC Sub-committee on the Medical Implications of Less-lethal Weapons (DOMILL).**

**Statement on the medical implications of use of the Incremental Public-Order Reaction System.**

**Background**

1. The DSAC<sup>1</sup> Sub-committee on the Medical Implications of Less-lethal Weapons (DOMILL) was requested by MOD to prepare this statement on the medical implications surrounding use of the Incremental Public-Order Reaction System (IPORS), which is a suite of less-lethal options enabling UK forces to control public-order disturbances in Op TELIC. It is intended that IPORS will be made available to all operational patrol vehicles and, in this way, provide a range of self-protection measures to address evolving public-order disturbances and to help assure the safety of UK forces by allowing them to maintain distance from persons having hostile intent.
2. There are two elements to IPORS:
  - a. **Short range:** This involves removal of the threat posed by hostile persons located within 30 metres of UK personnel. This part of the system is intended to produce a near instantaneous effect on specifically targeted subjects.
  - b. **Long range:** Control and dispersal of hostile persons within 40-100 metres of a military baseline formed in response to a public-order disturbance. The system is intended to act rapidly on a group of people.
3. The proposed technologies comprise four separate delivery systems for the sensory irritant, *o*-chlorobenzylidene malononitrile (CS), a baton (truncheon), and baton rounds:
  - a. L13A1, Jet Spray, Hand Held, Irritant containing 5% CS in methyl isobutyl ketone (MIBK) solvent (1-2 metres optimum range);
  - b. L98A1 Grenade, Hand, Anti-Riot, Irritant comprising 16 sub-munitions of CS composition (10-30 metres range);
  - c. L37A1 Cartridge, 37 mm, Anti-Riot, Irritant, fired from the L104A1 gun, and comprising four sub-munitions of CS composition (75-100 metres range);
  - d. L2A1 (CS), Discharger, Hand-Held, One Shot, Irritant discharging 24 sub-munitions of CS composition (nominal 50-70 metres range);
  - e. 26-inch ASP expandable baton with Federal Grip and Leverage Cap (<2 metres);
  - f. L104A1/L21A1 Baton Round system (20-40 metres range).

Item (a) dispenses CS in solution, while items (b)-(d) generate CS pyrotechnically.

**Scope of the statement**

4. This statement offers opinion on the medical implications of use of the individual systems by UK military personnel in Iraq within the policy and guidance provided to DOMILL. It is based on technical information provided to DOMILL by the Defence Science and Technology Laboratory (Dstl).

**Guidance**

5. **L13A1 CS Jet Spray:** When operated, the device produces a liquid stream containing 5% CS irritant having a maximum range of 2-3 metres. It is capable of maintaining optimal

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<sup>1</sup> Defence Scientific Advisory Council – a non-departmental public body that provides independent advice to the Secretary of State for Defence on matters of concern to the Ministry of Defence.

performance for up to six seconds in a single continuous discharge. For a similar spray device used by police in UK, operators are advised that the spray “*should not be used at a distance of less than 1 metre unless the nature of the risk to the officer is such that this cannot be avoided*”.<sup>2</sup> DOMILL and Dstl have not been provided with guidance specifying the normal minimum range for use of the L13A1 by UK service personnel in OP Telic. Similarly, the IPORS Infantry Training Pamphlet<sup>3</sup> does not provide this important information.

6. **26-inch ASP baton:** CARD E in the UK Manual of National Rules of Engagement<sup>4</sup> addresses the use of batons.
7. **L98A1 Grenade, L37A1 Cartridge 37 mm, L2A1 (CS), Discharger:** CARD D in the UK Manual of National Rules of Engagement<sup>5</sup> considers use of pyrotechnically generated CS (“CS Smoke”) by unspecified stores.
8. **L104A1/L21A1 Baton Round:** CARD D in the UK Manual of National Rules of Engagement addresses the use of baton rounds.

#### Extant medical statements

9. There are no extant DSAC medical statements on use of the L13A1 CS Jet Spray – it is a newly developed military store. The L13A1 is manufactured to the standards promulgated by the Home Office Scientific Development Branch (HOSDB) for police sprays.<sup>6</sup> However, CS manufactured to a Defence Standard will be used in the L13A1.<sup>7</sup>
10. In September 1999, at the request of the Home Office, a Department of Health (DoH) advisory committee issued a statement on the toxicology of CS and use of the CS spray (with MIBK solvent) employed by UK police forces.<sup>8</sup> In 2006, the DoH committee was further requested by the Home Office to advise on the potential effects of exposure to both CS and pelargonic acid vanillylamide (PAVA), the latter being another sensory irritant used by some police forces.<sup>9</sup> This statement made recommendations on the medical audit of CS spray use in UK.<sup>10</sup>
11. DOMILL is not aware of any previous DSAC statements considering the medical risks of the L98A1 Grenade and L37A1 Cartridge 37 mm, even though they are MOD developed stores. There are no DSAC medical statements addressing the L2A1 (CS), Discharger, Hand Held (a commercially available device) or the 26-inch ASP baton (or, for that matter, the current wooden baton).
12. The L21A1 Baton Round was the predecessor to the L60A1 Attenuating Energy Projectile (AEP) currently used by the police and army in the UK. Three medical statements have been provided previously to Ministers on the injury potential of the L21A1/L104A1 system:
  - a. The comparative injury potential of the L5A7 Baton Round fired from the L104A1 employing battle-sights, was compared with the L21A1 Baton Round fired using the L18A1 sight<sup>11</sup> (August 2000). This statement addressed use of the system at 20 metres and beyond,

<sup>2</sup> Personal Safety Manual of Guidance, 2007. ACPO Notes for Guidance on Police Use. Incapacitant Sprays.

<sup>3</sup> Infantry Training. Volume III. Skill at Arms (Section and Platoon Weapons). Provisional Pamphlet. Incremental Public-order Reaction System (IPORS). First Edition. February 2008.

<sup>4</sup> JSP 398 (2004). United Kingdom Manual of National Rules of Engagement. CARD E – Guidance for service personnel authorized to use batons.

<sup>5</sup> JSP 398 (2004). United Kingdom Manual of National Rules of Engagement. CARD D – Guidance for service personnel authorized to use public-order control equipment.

<sup>6</sup> HOSDB standard for CS and PAVA sprays for operational police use. Publication No. 36/05.

<sup>7</sup> Chemical Agent, CS, Def Stan 07-43 Issue 1

<sup>8</sup> Committee on Toxicity, Mutagenicity and Carcinogenicity of Chemicals in Food, Consumer Products and the Environment. Statement on 2-Chlorobenzylidene Malononitrile (CS) and CS spray. (<http://www.advisorybodies.doh.gov.uk/pub/docs/doh/csgas.pdf>)

<sup>9</sup> Comparison of CS and PAVA: Operational and toxicological aspects. HOSDB report no. 88/04.

<sup>10</sup> Committee on Toxicity of Chemicals in Food Consumer Products and the Environment. Statement on combined exposure to 2-chlorobenzylidene malonitrile (CS) and PAVA (nonivamide) sprays. COT/06/4 dated January 2006. The Metropolitan Police are currently developing the audit system. (<http://www.advisorybodies.doh.gov.uk/pdfs/cspava06.pdf>)

<sup>11</sup> Defence Scientific Advisory Council. Statement on the comparative injury potential of the L5A7 Baton Round fired from the L104 Anti-riot gun using the battle-sights, and the L21A1 Baton Round fired using the XL18E3 optical sight. 21 August 2000.

principally in public-order disturbances.<sup>12</sup>

- b. A second statement<sup>13</sup> in May 2002 on the L104A1/L21A1 system considered its use at ranges from 1-20 metres. This arose from an operational decision to use the weapon as a less-lethal alternative to conventional firearms, which would normally involve engagement at closer ranges than public-order.
- c. DOMILL issued a statement commenting on a review by MOD of the operational use in the UK from June 2001 to May 2003 of the L21A1 Baton Round fired from the L104A1.<sup>14</sup>

#### Technical approach

13. On behalf of DOMILL, Dstl undertook a comprehensive review of the toxicology of CS, including the acute clinical effects. The DoH statements on the police CS spray were also reviewed. Dstl has previously advised the Home Office on the toxicological aspects of the MIBK solvent. The Home Office also provided information on use of a CS spray by police in the UK.
14. Hazards and risks associated with baton and baton round use were reviewed, and the Home Office provided reports on tests undertaken on police batons, and audit of baton use.
15. Although DOMILL was provided with information on the CS quantities in the various stores, no information on the cloud dynamics and local concentrations of the pyrotechnically-generated CS was supplied.

#### Conclusions

16. **CS:** The toxicology of CS is well understood and documented.<sup>15,16,17</sup> CS is a sensory irritant posing a very low risk of serious injury and has a very wide margin between effective dose and the dose estimated to produce lethality. There have been no verified instances of death from CS exposure, despite its very widespread use internationally.
17. Pyrotechnically generated CS in the open air will present a very low risk of serious injury for normal individuals, despite the acute (but short-lasting) sensory irritancy. Persons more susceptible to the effects of CS and at greater risk from adverse effects are the very young, the elderly, pregnant women, and those suffering from cardiac and pulmonary disease, particularly bronchitis and asthma.
18. In common with other sensory irritants, CS is not without risk, particularly for exposure at high concentrations for extended periods of time. In particular, its use in confined spaces presents higher risks, not only from the sensory irritant *per se*, but also from the combustion products of the pyrotechnic composition.
19. **MIBK:** If the L13A1 spray is used at distances of less than about one metre, the MIBK solvent employed in the spray may not evaporate and may consequently contaminate the skin and eyes. MIBK could produce a number of delayed symptoms commencing 6 hours after exposure and lasting up to several days. These include reddening of the skin, flaking and peeling of the skin, and possibly blistering. Beyond about one metre, the potential for clinically significant skin reactions from MIBK is low.
20. **ASP baton:** Any baton used inappropriately is capable of producing serious injury and death. The principal anatomical areas vulnerable to baton use are the head, neck, spine, precordium

<sup>12</sup> An additional statement in May 2003 addressed the risks associated with the ricochet of L21A1 rounds.

<sup>13</sup> Defence Scientific Advisory Council. Statement on the use of the L21A1 Baton Round at ranges less than 20m. 13 May 2002.

<sup>14</sup> DSAC Sub-committee on the Medical Implications of Less-lethal Weapons (DOMILL). Statement on the review by MOD of medical issues arising from use of the L21A1 Baton Round from June 2001- May 2003.

<sup>15</sup> Ballantyne B. 2006. Medical management of the traumatic consequences of civil unrest incidents: causation, clinical approaches, needs and advanced planning criteria. *Toxicol Rev*, 25(3), pp.155-197.

<sup>16</sup> Olajos EJ, Salem H. 2001. Riot control agents: pharmacology, toxicology, biochemistry and chemistry. *J Appl Toxicol*, 21(5), pp.355-391.

<sup>17</sup> Rice P and Jugg B. 1994. A review of the toxicology of the riot control agent *O*-Chlorobenzylidene Malononitrile (CS gas). Contract Report IT4900, CBDE Porton.

and abdomen overlying the kidneys. From a biomechanical perspective, the ASP is likely to be more hazardous than a conventional police short wooden truncheon. It is imperative that the ASP is used appropriately according to extant guidance; refresher training is likely to reduce the risk of inappropriate use. When used appropriately, the risk of serious injury from the ASP baton is low.

21. **L21A1 Baton Round:** The existing DSAC statements on the L21A1 Baton Round fired from the L104A1 gun (with an optical sight) compared the system with the L5A7 Baton Round fired from the same gun with battle-sights. It was concluded that, because of the greater accuracy of the L21A1 system, there would be an increase the incidence of injuries that are not normally life-threatening such as soft tissue contusions and simple bone fractures in limbs. However, the L21A1 would reduce the overall frequency of serious, life-threatening head injuries – the principal cause of death and serious injury from Baton Rounds noted historically. Subsequently, audits of the operational use of the system in public-order incidents in Northern Ireland, and use by police in Great Britain as an alternative to lethal force, resulted in a DSAC statement advising Ministers that there was no reason to amend the extant statements on the system.<sup>14</sup> The risk of serious injury or death from the L21A1/L104A1 system is low.

### Recommendations

22. The CARD D guidance and IPORS Instructors' Guide should specify a normal minimum operating range for the L13A1 Jet Spray. It is recommended that the guidance on minimum range for police use of irritant sprays should be adopted.
23. Users should be trained in the simple first-aid measures required to alleviate sensory irritation by CS, and the nature of the sub-populations more susceptible to the effects of CS (and consequently at greater risk from any adverse effects). DOMILL agrees with the advice in the IPORS Instructors' Guide that CS should not be used in a confined, unventilated space from which escape may be difficult or impossible.
24. The Instructors' Guide should highlight that the precordium (the anterior chest overlying the heart) and the all areas of the skull overlying the brain are high risk areas with respect to blows from an ASP.
25. Guidance should be available in theatre on the risks from MIBK exposure, the clinical consequences of contamination, and medical management approaches.
26. Guidance should also be available in theatre on the effects of exposure to sensory irritants, the clinical consequences of contamination, and medical management approaches.
27. An audit should be undertaken of the first year of operational use of the IPORS system in Iraq. The audit should address the frequency and circumstances of use of each component, when used alone or in combination with other IPORS components, and any minor injuries, serious injuries or deaths should be reported. DOMILL should be advised immediately of any deaths or serious injuries.
28. DOMILL should be advised of any changes in:
- the design, specification or performance of any components of the IPORS system;
  - the theatre of use of the IPORS system;
  - the guidance to users and training practices;
  - the policy and practice of deployment, use and audit.

*[signed on original]*

Chairman, DOMILL.