Faculty of Forensic & Legal Medicine

Irritant sprays: clinical effects and management

Recommendations for Healthcare Professionals (Forensic Physicians, Custody Nurses and Paramedics)

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Introduction

Irritant spray effects and management

Irritant (previously known as 'incapacitant') sprays augment the range of 'less-lethal' tactical options available to police officers confronted by potentially aggressive or violent individuals or those with acute behavioural disturbance. Worldwide they may be referred to as tear gas and pepper spray but represent a group of heterogeneous agents sometimes named as riot control agents, harassing agents, incapacitating agents, or lacrimators.

Irritant sprays is the terminology currently used for CS (o-chlorobenzylidenemalononitrile) & PAVA (nonivamide) sprays approved for deployment by police and secure-setting (prisons and young offenders institutions) personnel. Irritant sprays are in the United Kingdom. Irritant spray is the terminology used in these recommendations.

The agents currently used by police and secure setting services in the UK are:

- **CS**
- **PAVA**

There is no consistency in their deployment. Concerns have been raised about their use in some settings. They are intended to be used to spray the face of a person at a distance of up to 3-4 metres, delivering the active chemical to the eyes, nose, mouth, and skin. This can cause injury to the eyes, respiratory tract, and skin. Individuals affected by chronic morbidities may be at higher risk of experiencing complications. Published data are very limited with respect to the incidence and persistence of such complications.

In many cases the symptoms and signs are short-lived, requiring little or no medical intervention although some individuals may experience effects for 2.5 hours or more. Longer exposure or exposure in confined spaces may result in enhanced or prolonged effects.

The broad principles of effect, treatment and management are the same for both CS spray and PAVA spray according to published clinical studies comparing the nature and incidence of their different effects.

Chemical irritants can cause severe injury, permanent disabilities, and in rare cases, death. The true incidence of morbidity (and possible mortality) of irritant spray remains unknown in the absence of prospective clinical studies of appropriate statistical power.

Secondary contamination of those treating or deploying irritant sprays is recognised and management of those so exposed should be the same as for those at whom the irritant spray was deployed.

CS is a solid at room temperature but is dissolved in an organic solvent to be used as a liquid aerosol. The solvent evaporates leaving the CS particles to give their effects.

CS irritant spray

Chemical Name CS o-chlorbenzylidene malonitrile, 5% solution

Solvent Methyl Isobutyl Ketone (MIBK)

Propellant Nitrogen for hand held spray

Formulation used Liquid spray

PAVA is a synthetic variant of capsaicin (the active ingredient of natural pepper).

PAVA irritant spray

Chemical Name Pelargonic acid vanillylamide, 0.3% solution (nonivamide)

Solvent Monopropylene glycol, ethanol, water

Propellant Nitrogen

Formulation used Liquid spray

CS and PAVA fail to affect about 10% of people exposed to spray. The reasons for this are varied and may include intoxication with other drugs or alcohol; mental health issues; or other causes of acute behavioural disturbance. Agitation may impede initial decontamination and increase the risks of secondary contamination of self or others.

General Advice

In many cases the symptoms and signs are short-lived, requiring little or no medical intervention although some individuals may experience effects for 2.5 hours or more.

It is very important to reassure the affected individual that the effects will decrease after initial exposure.

General principles of minimising risks of death and harm after restraint and control must be observed and restraint in the prone position must be avoided after exposure. If restrained, breathing must be monitored constantly.

Spithoods (spit guards) have the potential to increase the risk of morbidity and mortality in these settings particularly if there is contamination within the spithood.

Any effects that last for > 6 hours should generally be referred by the treating clinician for relevant specialist assessment.

- The most important action is to stop continued exposure by removal of the affected individual from the contaminated environment to a well-ventilated area with a free flow of air (enhanced by the use of electric fans), and removal of contaminated clothing (which should be placed in sealed plastic bags as it has the potential for secondary contamination of others).
- Advise the patient not to rub their eyes. Water should not be used in the first 2 – 3 hours to attempt to remove residue as it will exacerbate symptoms or cause symptom relapse.
- If an individual cannot open their eyes after 30 minutes, they should be referred to the Emergency Department where formal ophthalmic review can be undertaken. Those dealing with the contaminated individual should wear gloves and eye protection to avoid cross contamination.
- Care should be taken to avoid irritant spray entering air conditioning or ventilation systems.
- The patient must be fully assessed by an appropriately skilled healthcare professional, with particular reference to eyes, oral and nasal cavity, respiratory system and skin.
- Advice must be sought from an appropriate specialist for patients with any signs or symptoms that do not resolve after 6 hours.
- Persons exposed to CS or PAVA sprays must be advised to contact their general practitioner or attend their Emergency Department with a copy of these guidelines if problems develop once they have been released from custody, or if complete resolution of signs and symptoms does not occur.
- Normal machine washing will decontaminate clothing but it may take several washes to be fully successful.

Specific effects and management

The need for specialist referral will be determined by a full clinical assessment, based on the existing signs and symptoms and not on the irritant agent used.

Eyes

Clinical effects (generally expected duration of most intense effects)

- lacrimation (tears) (<15 mins)
- pain (<30 mins)
- blepharospasm (eyelids closed) (<30 mins)
- conjunctival erythema (redness) (<30 mins)
- reduced visual acuity (blurred vision) (<30 mins)
- photophobia (sensitivity to light) (<60 mins)
- periorbital oedema (swelling around the eye)
- damage to the ocular surface from the direct trauma of a high-pressure jet
- iritis may develop as a non-specific response
- conjunctivitis
- corneal abrasions due to rubbing the eyes.

Management

- exposure to external air/wind.
- air can be blown with a fan directly onto the eyes to encourage evaporation.
- if eye symptoms persist for more than one hour irrigate eyes with sterile normal saline solution (this may temporarily exacerbate symptoms as the vapour passes into solution), prior to seeking ophthalmic advice.
- contact lenses should be removed as soon as possible and either discarded (soft) or cleaned with 10 washes and soaks. It may take several weeks for the eye to settle down enough to allow a return to contact lens wear (persistent symptoms must be reviewed by an ophthalmologist).
- if eye symptoms do not resolve after 6 hours or corneal abrasion is identified refer for formal ophthalmic assessment.

Mouth

Clinical effects

- stinging of burning sensation
- nausea and vomiting (rare)

Management

- symptomatic, based on clinical findings.

Respiratory Tract

Clinical effects

- nasal discomfort, pain & rhinorrhoea (<30 mins)
- sneezing, coughing, sore throat
- sore throat
- shortness of breath
- bronchospasm (rare)
- laryngospasm (rare)
- tracheitis
- bronchitis (rare)
- pulmonary oedema may develop 12 to 24 hours after excessive exposure (rare)
- Patients with pre-existing respiratory disease, such as asthma or bronchitis, are at greater risk of severe effects.

Management

- The majority of respiratory tract symptoms and signs (e.g. cough, dyspnoea and chest tightness) should settle within 15 – 30 minutes after exposure.

- If there is evidence of bronchospasm that does not respond to simple bronchodilation refer urgently to hospital for assessment and treatment.
- Longer-term respiratory symptoms necessitate review by a respiratory physician.

Skin

Clinical effects

- burning sensation & erythema (<24 hrs)
- chemical burns, blistering
- allergic contact dermatitis (rare - but law enforcement personnel regularly exposed to irritant spray may require changes in work practice – referral to Occupational Health teams should be made)
- leukoderma (rare)
- initiation or exacerbation of seborrheic dermatitis (rare)
- aggravation of rosacea (rare).

Management

- exposure to air and fan
- exposure to fresh air will normally result in a significant recovery within 15 – 20 minutes
- if reactions do persist beyond this period then copious amounts of cool tap water should be used to flush remaining irritant from the face and skin
- under no circumstances should warm water be used as this can reactivate irritants
- treat chemical burns as thermal burns
- topical steroids can be used for contact dermatitis
- delayed skin irritation (due to MIBK), occurring 8 to 16 hours after exposure, is seen in a significant number; these symptoms can take up to one week to resolve
- persistence of new skin conditions or aggravation of chronic conditions beyond 48 hours should be assessed by the person's GP and review by a dermatologist may be required.

Cardiovascular effects

Clinical effects

- Pre-existing cardiac problems may be exacerbated by exposure
- Angina may be precipitated in those with pre-existing cardiac conditions

Management

- Symptomatic treatment e.g. glyceryl trinitrate
- Refer to hospital if any concerns at examination (e.g. persistent tachycardia, persistent chest pain, arrhythmias, hypertension, hypotension).

Other

Psychological effects

- Studies have shown that some patients exposed to CS spray were subsequently diagnosed with Post Traumatic Stress Disorder; a past psychiatric history associated with post-traumatic morbidity.

Management

- Consideration should be given to psychological intervention if the individual is perceived to be at risk.

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