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 lachrymators.

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

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

There is no consistency in their deployment and concerns have been raised about their use in some settings.

These agents 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.

Chemical irritants can cause severe injury, permanent disabilities, and in rare cases, death. Individuals affected by chronic health conditions may be at higher risk of complications. The true incidence of morbidity (and possible mortality) of irritant spray remains unknown in the absence of prospective clinical studies of appropriate statistical power.

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

Secondary contamination of those treating or deploying irritant sprays is recognised and management should be the same for any individual affected.

CS irritant spray

Chemical Name	CS o-chlorobenzylidene malononitrile, 5% solution
Solvent	Methyl Isobutyl Ketone (MIBK)
Propellant	Nitrogen for hand held spray
Formulation used	Liquid spray

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.

PAVA irritant spray

Chemical Name	Pelargonic acid vanillylamide, 0.3% solution (nonivamide)
Solvent	Monopropylene glycol, ethanol, water
Propellant	Nitrogen
Formulation used	Liquid spray

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

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

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.

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 and removal of contaminated clothing (which should be placed in sealed plastic bags as it has the potential for secondary contamination of others).

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

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 variable enhanced or prolonged effects. Care should be taken to avoid irritant spray entering air conditioning or ventilation systems.

Normal machine washing will decontaminate clothing, but it may take several washes to be fully successful.

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. 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.

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 determined by the irritant agent used. Specialist advice should be sought if symptoms persist for more than six hours, or if problems develop following release from custody. In this instance the patient should be advised to attend an Emergency Department or their General Practitioner with a copy of these guidelines.

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)
- Physical 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

- Initially, exposure to external air or fan and advise the patient not to rub their eyes.
- 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 copious cold water or normal saline solution (this may temporarily, briefly 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 six hours or corneal abrasion is identified refer for formal ophthalmic assessment.

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 or pulmonary oedema refer urgently to hospital for assessment and treatment.
- Longer-term respiratory symptoms will necessitate review by a respiratory physician.

Mouth

Clinical effects

- Stinging or burning sensation
- Nausea and vomiting (rare)

Management

- Symptomatic, based on clinical findings

Skin

Clinical effects

- Burning sensation and 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 30 minutes
- If reactions do persist beyond this period then copious amounts of cold water should be used to flush remaining irritant from the face and skin
- Treat chemical burns as thermal burns
- Topical steroids can be used for contact dermatitis
- Delayed skin irritation (due to MIBK), occurring more than 8 hours after exposure, is seen in a significant number; these symptoms can take up to one week to resolve and should be reviewed by a dermatologist
- 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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