



## Recommendations

# Incapacitant Sprays: Clinical Effects and Management

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

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### Introduction

#### CS & PAVA incapacitant spray effects and management

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.

The agents currently used by police forces in the UK are:

- CS Spray
- PAVA

They are intended to be used to spray the face of a person from up to 3-4 metres, delivering the active chemical to the moist areas of the eyes, nose and mouth. This causes irritation to the eyes, upper respiratory tract and skin.

In most cases the symptoms and signs are short-lived, resolving over 15 to 30 minutes and requiring little or no medical intervention. More problems may be seen following exposure to high concentrations in confined spaces.

The broad principles of effect, treatment and management are similar for both CS spray and PAVA spray.

#### CS Incapacitant Spray

<b>Chemical name</b>	CS O-chlorbenzylidene malonitrile, 5% solution
<b>Solvent</b>	Methyl Isobutyl Ketone (MIBK)
<b>Propellant</b>	Nitrogen for hand held spray. Pyrotechnic compound for canister or grenade
<b>Formulation used</b>	Fine dust aerosol, or super-saturated solution as particulate mist

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

CS fails to incapacitate about 10% of people sprayed. The reasons for this are unclear but some of those intoxicated with

other drugs or alcohol or with mental health issues or other acute behavioural disturbance, may fail to respond. Agitation may impede initial decontamination and increase the risks of secondary contamination of self or others.

#### PAVA Incapacitant Spray

<b>Chemical name</b>	Pelargonic acid vanillylamide, 0.3% solution
<b>Solvent</b>	Aqueous ethanol
<b>Propellant</b>	Nitrogen
<b>Formulation used</b>	Liquid spray

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

#### General Advice

In the majority of cases the incapacity effects pass off after 15 to 30 minutes and medical intervention is not required, although a substantial minority will remain symptomatic for an hour or more.

It is very important to reassure the affected individual.

Restraint in the prone position must be avoided after exposure. If restrained, breathing must be monitored constantly.

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

- The most important action is to stop continued exposure by removal of the effected individual from the contaminated environment to a well-ventilated area, preferably with a free flow of air (enhanced by the use of electric fans), and careful removal of contaminated clothing (which should be placed in sealed plastic bags).
- Water should **not** be used at an early stage to attempt to remove residue as it will exacerbate symptoms or cause symptom relapse.
- Avoid rubbing the eyes. If an individual cannot open their eyes after 15-20 minutes, then copious amounts of cool tap water should be used to flush remaining incapacitant from

the skin of the face (sterile normal saline should be used to treat eyes – see below). Contact lenses should be removed as soon as possible. Depending on type they may not be re-usable. Under **no** circumstances should warm water be used to irrigate as this can reactivate the irritants.

- Those dealing with the contaminated individual should wear gloves and eye protection to avoid cross contamination
- Care should be taken to avoid CS entering air conditioning or ventilation systems.
- Each individual should be fully examined by an appropriately skilled and trained healthcare professional, with particular reference to eyes, oral and nasal cavity, respiratory system and skin.
- Subjects with any persistent signs or symptoms may need hospital assessment
- Persons sprayed or contaminated with CS or PAVA should be advised to contact their general practitioner if problems develop once they have been released from custody.
- Normal machine washing will decontaminate clothing but it may take several washes to be fully successful.

## Specific Effects and Management

Determination on whether specialist referral is required will generally be based on the findings of the medical assessment and not on the agent used.

### Eyes

#### Clinical Effects (expected duration)

- lachrymation (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

- air could be blown with a fan directly onto the eyes to encourage evaporation
- or exposure to external air/wind;

- 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 hospital referral;
- contact lenses should be removed 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 (advice may be appropriately sought from an optometrist);
- prophylactic antibiotics have no role;
- if eye symptoms persist or corneal abrasion identified refer for formal ophthalmic assessment.

### Mouth

#### Clinical Effects

- stinging or burning sensation;
- possible nausea and vomiting (rare).

#### Management

- nil specific – symptomatic, based on clinical findings

### Respiratory Tract

#### Clinical Effects

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

#### Management

- The majority of respiratory tract symptoms and signs (e.g. dyspnoea, chest tightness and irregular breathing) should settle within 10 minutes of the exposure;
- if there is evidence of continuing bronchospasm treat with bronchodilator and consider referral to hospital for ongoing observations and treatment. Humidified oxygen may provide some relief;
- occasionally upper respiratory tract symptoms may last for 2 weeks (in one reported case a cough and wheeze lasted for several years).

## Skin

### Clinical Effects

- burning sensation & erythema (<24 hrs);
- chemical burns, blistering;
- allergic contact dermatitis (rare - but if in a police officer regularly exposed to CS may require changes in work practice);
- leukoderma (rare);
- initiation or exacerbation of seborrhoeic 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 incapacitant 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.

## Cardiovascular Effects

### Clinical Effects

- pre-existing cardiac problems can be worsened and hypertension exacerbated after exposure. For example, angina attacks may develop.

### Management

- symptomatic treatment e.g. glyceryl trinitrate;
- refer to hospital if any concerns at examination (e.g. persistent tachycardia, arrhythmias, hypertension, hypotension).

## Other

### Psychological Effects

- in one study, one quarter of those exposed to CS spray were diagnosed with Post Traumatic Stress Disorder;
- a past psychiatric history and a more external locus of control was associated with post-traumatic morbidity.

### Management

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

## References

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