

## PUBLIC HEALTH

## The health impact of crowd-control agents

Some observers say that the civil disobedience demonstrated in Quebec City this April and in Seattle 2 years ago represents merely the first wave of a grassroots movement that is emerging to support the casualties of capitalism and globalization. If such demonstrations erupt locally, physicians should be prepared to deal with the clinical effects of crowd-control agents such as tear gas; more than 5000 of these canisters were used against demonstrators in Quebec City during the Summit of the Americas.

**Epidemiology:** Data on injury patterns during social protests are scarce, since the fervour of protest can escalate rapidly and unexpectedly, making premeditated, systematic data collection difficult. Some insights can be gleaned from data collated by the National Poison Information Service in England. In 1997 it received 597 enquiries from physi-

cians seeking advice about the management of patients who had been exposed to crowd-control agents.<sup>1</sup> Most enquiries concerned ocular (irritation, lacrimation, corneal abrasions), dermal (rash, erythematous dermatitis, blisters, bullae, eczema, edema), respiratory (coughing, dyspnea), neurologic (headache, drowsiness), cardiac (tachypnea, hypotension, chest pain) and gastrointestinal (buccal irritation, vomiting) symptoms.

Fifty-four people with dermal symptoms who presented within 6 hours after exposure had erythema and irritation, whereas 203 people with these symptoms who sought treatment 6 hours or more after exposure had blisters, bullae, eczema and edema. This difference suggests that there may be delayed adverse dermal effects to tear-gas exposure.

The agents most commonly used in tear gas are *o*-chlorobenzylidene malonitrile (CS),  $\omega$ -chloroacetophe-

none (CN) and dibenzoxazepine (CR).<sup>2</sup> At normal daily temperatures and pressure these agents form solid white crystals; when used for riot control they are dispersed as microparticulate clouds by pyrotechnic devices. To deploy them as sprays, the use of propellants and nonaqueous solvents, such as the industrial degreaser methyl isobutyl ketone, is required. Exposure to such solvents can by itself cause dermal scaling, peeling and blistering as well as irritation of the eyes and respiratory tract.<sup>3</sup>

**Clinical management:** CS, CN and CR gases irritate the skin, eyes and upper respiratory tract. They have been described as chemical barbs<sup>4</sup> that cling to moist mucous membranes. They cause lacrimation, excruciating pain, blepharospasm and conjunctival erythema upon eye exposure. Rhinorrhea and nasal discomfort are common, as is a stinging sensation in the mouth, accom-

panied by nausea and vomiting. These symptoms may be accompanied by a sore throat, sneezing, coughing, chest tightness and increased salivation.<sup>2</sup>

Symptom onset occurs within 20 to 30 seconds after exposure and usually stops in 10 to 30 minutes if the exposed individual stays outside, ideally facing the wind, and removes all conta-



Canapress/Ryan Remiorz

**Demonstrator kicks tear-gas canister toward police during April clashes in Quebec City**

minated clothing.<sup>4</sup> The ocular irritation typically lasts only 15 minutes but may persist up to 3 days. If the charge of tear gas is fired at close range, powder infiltration of the conjunctiva, corneas and sclera may occur. Reported complications include symblepharon, infective keratitis, hyphema and vitreous hemorrhage.<sup>5</sup> Delayed dermal effects have also been reported. CS gas can cause erythematous dermatitis and contact dermatitis with blisters, vesicles and crusts. This is often accompanied by marked edema; onset takes place between 12 hours and 3 days after exposure. Skin that is exposed to CR gas may become extremely painful upon contact with water for up to 48 hours. CN gas may sensitize the skin and can produce allergic contact dermatitis within 72 hours after exposure.<sup>2</sup>

If a person has been exposed to tear gas, contaminated clothing should be removed and sealed in a plastic bag to prevent secondary contamination; medical staff should wear gloves and goggles when providing treatment. Washing with soap and water is not recommended unless symptoms persist, because the chemical agents can dissolve in water and exacerbate symptoms or contaminate other surfaces. Hot water may cause any residual particles to vaporize and give rise to secondary contamination.<sup>6</sup>

Recommendations for treating eyes contaminated with CS vary. Some suggest blowing dry air with a fan over the eyes to vaporize the CS particles; the

area downwind of the fan should be vacant to avoid secondary contamination. Others recommend irrigation with normal saline. Persistent ocular irritation is usually the result of a particle of CS embedded in the surface, so a thorough slit-lamp examination should be conducted.

**Prevention:** Current evidence suggests that tear-gas exposure is not dangerous to most people.<sup>4</sup> Exposure may trigger laryngospasm or bronchospasm in people with pre-existing respiratory disease, such as asthma or bronchitis, and they are best advised to avoid voluntary exposure. Allergic contact dermatitis from repeated exposure to chemical-based control agents has been identified in both law-enforcement officers and demonstrators at protests.<sup>7</sup> Susceptible individuals should avoid repeated exposure. — *Erica Weir, CMAJ*

#### References

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