



Tear gas used against demonstrators is a risk to public health and to biodiversity

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Since the first day of the mass demonstrations, 21 October 2024, the Mozambican police (PRM) have launched tear gas bombs or grenades directly against the public, whether or not they were involved in the demonstrations held in various parts of the country, in order to disperse them^{1,2,3}.

Tear gas was initially used as a chemical weapon by troops in the First World War. Currently it is used by law enforcement bodies as a measure to subdue combative individuals and to control crowds⁴.

¹ Mabunda, L. (2024, 3 November). ELEIÇÕES 2024: Boletim sobre o processo político em Moçambique. *CIP ELEIÇÕES*. <https://www.cipeleicoes.org/wp-content/uploads/2024/11/Boletim-das-eleicoes-331-1.pdf> [consulted on 4 November 2024].

² Muianga, A. (2024, 21 October). Polícia Dispara Granadas de Gás Lacrimogéneo para Interromper Conferência de Imprensa do Candidato Presidencial da Oposição. *The Mozambique Times*. <https://moztimes.com/blog/policia-dispara-granadas-de-gas-lacrimogeneo-para-interromper-conferencia-de-imprensa-do-candidato-presidencial-da-oposicao/> [consulted on 4 November 2024].

³ Álvaro, J. (2024, 4 November). Maputo: PRM usa gás lacrimogéneo para dispersar manifestação. <https://www.dw.com/pt-002/policia-usagás-lacrimogeneo-para-dispersar-manifestação-no-centro-de-maputo/a-70686496> [consulted on 4 November 2024].

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Schep, L. J., Slaughter, R. J. & McBride D. I. (2015). Riot control agents: the tear gases CN, CS and OC-a medical review. *J R Army Med Corps.* 161(2):94-9.

The samples of tear gas capsules collected from the streets of Maputo and Matola show that some of the tear gas grenades fired by the police against demonstrators had expired ten years ago.

The capsules bear labels with the following description: Tear Smoke Shell (CS), range: 135±10M, manufactured by TSU, BSF, TEKANPUR (INDIA), consignment no. 19, valid until July 2014 (Fig. 1).

Figure 1: Tear gas capsule fired by the police against demonstrators in Maputo city⁵



Expired tear gas is regarded as hazardous waste, under the Resource Conservation and Recovery Act (RCRA) of 1976⁶ of the United States. The legislation states that discarding the capsules should be done in accordance with the waste management regulations.

Regular and prolonged exposure to the gas causes effects adverse to public health and to the environment. The effects are worse when human beings and the environment are exposed to expired gas.

Exposure to tear gas affects health and can even lead to death, particularly among children, the elderly, smokers, individuals with pre-existing diseases (eye and respiratory disease)⁷ and with a depressed immune system. Individuals in these conditions are among those involved in the demonstrations.

The short term risks of exposure to the gas include excessive weeping, burning in the eyes, sight difficulties, chest pains, breathing difficulties, coughs, a burning sensation in the throat, irritation and

⁵ Source of the image omitted for ethical reasons.

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The Resource Conservation and Recovery Act (RCRA) is a federal law approved in 1976 to regulate the management of solid and hazardous wastes in the United States. The law was passed to deal with the growing amount of waste in the country, and to protect the environment and human health..

⁷ Hon, K. L., Leung, K. K. Y. & Leung, A. K. C. (2020). Health effects of tear gas exposure in children, infants, and fetuses. *Hong Kong Med J.* 26 (4):351–352.

burning of the skin. The gas can also cause headaches, nausea and gastro-intestinal pain. In the long term, there can be greater risks of respiratory problems⁸.

People exposed to tear gas may be in mortal danger because of difficulties in visiting a health unit to receive first aid⁹. And the fact that health professionals do not know the chemical composition of the gas which may have affected the patient makes appropriate medical intervention difficult^{10,11}, apart from putting health professionals at risk of secondary contamination¹².

In addition to physical health, exposure to the gas may affect mental health in the short and long term. The risks include panic and incapacity to react, post-traumatic stress, depression, anxiety and sleep disturbances^{13,14}. These are problems that may affect the school and professional performance of the individual.

Exposure to tear gas not only affects human beings but may also cause short and long term negative impacts on the environment. The chemical properties of the gas persist for a long period (from minutes to weeks). The gas releases chemical compounds into the environment such as o-chlorobenzile malonitrile (CS), which contaminate the air, soil and water and may cause adverse effects on biodiversity¹⁵ and on the ecological balance.

O-malonitrile is a product of the decay of the gas. It is as highly toxic as cyanide¹, making it potentially damaging to the development and survival of the local terrestrial and aquatic flora and fauna, with the potential for dispersal from surface runoff caused by rains. Mozambique is currently in the rainy season.

The wildlife exposed to the gas may suffer eye irritation, excessive weeping, respiratory difficulties, disorientation and stress. These factors may lead to the migration or death of the affected species. The growth and development of plants, including agricultural products, is also affected since contact with tear gas can cause damage to plant cells, resulting in dehydration or even in plant death.

⁸ Tsang, A. C. O., Li, L. F. & Tsang, R. K. Y. (2020). Health risks of exposure to CS gas (tear gas): an update for healthcare practitioners in Hong Kong. *Hong Kong Med J.* 26 (2):151–153.

¹ Ibid (Gheorghe *et al.*, 2023).

⁹ Restrictions on travel to a health unit may occur due to lack of transport, long distances, or public insecurity due to the demonstrations.

¹⁰ Sivathasan, N. (2010). Educating on CS or 'tear gas'. *Emerg Med J*. 27 (11):881–882. ¹¹ Ibid (Hon *et al.*, 2020).

¹² Ibid (Tsang *et al.*, 2020). ¹³

Nathan, R., Wood, H., Rix, K. & Wright, E. (2003). Long-term psychiatric morbidity in the aftermath of CS spray trauma. *Med Sci Law*. 43 (2):98–104.

¹⁴ Chan, C., Lui, D., Lau, J., Lui, K., Lee, P., Chan, J., Ng, S., Yiu, K. & Hui, D. (2020). Health impact of teargas and other crowd control weapons: early findings from a panel study of journalists in Hong Kong. *ISEE Conference Abstracts*. (1): 2020–2021.

¹⁵ Gheorghe, V., Gheorghe, C. G., Bondarev, A. & Somoghi, R. (2023). Ecotoxicity of o-Chlorobenzylidene Malononitrile (CBM) and Toxicological Risk Assessment for SCLP Biological Cultures (*Saccharomyces sp.*, *Chlorella sp.*, *Lactobacillus sp.*, *Paramecium sp.*). *Toxics*, 11(3), 285. <https://www.mdpi.com/2305-6304/11/3/285> [accessado a 04 de Novembro de 2024, às 08.00h].

Exposure of the environment to the gas should also be avoided because of the risk of contaminating drinking water. The contamination may occur in surface or ground water from surface runoff and percolation in soils contaminated by the gas.

The continued use of tear gas to control demonstrations has been questioned internationally, because the Geneva Protocol of 1925 bans the use of chemical and biological weapons during war and because of the negative impacts that tear gas, particularly expired gas, can have on public health and the environment.

To safeguard the physical integrity of the demonstrators and the integrity of the environment, the following measures are recommended:

To the National Health Institute:

- Collect samples of the tear gas used by the police and undertake studies into the short and long term risks for health arising from the exposure of the civilian population to tear gas, and considering the exposure to expired tear gas.

To the National Directorate of the Environment:

- Hold studies on the risks of short and long term exposure to tear gas on the environment and biodiversity;
- Hold studies on the potential toxicity of exposing the environment and biodiversity to expired tear gas.

To Parliament:

- Inspect the use of expired tear gas by the police to contain mass demonstrations.

To the riot police:

Adopt alternatives to tear gas to disperse riots, which could include:

1. Use of loudspeakers and means of visual communication with clear and objective information for cases of imminent risk or the exhaustion of public space;
2. Use of social media to send warnings in real time to demonstrators;
3. Use of water cannon to disperse demonstrators.

To the demonstrators:

Apply first aid measures after exposure to tear gas, such as:

1. Move away immediately from the area exposed to the gas to a well ventilated place;
2. Protect one's eyes and wash them with clean water for 15 minutes;
3. Avoid rubbing one's eyes;
4. Wash one's face with clean water;
5. Breathe slowly with a damp cloth on one's face;
6. Avoid swallowing saliva before rinsing and gargle several times with clean water;
7. Wash one's skin with clean water and soap;
8. Change clothes immediately; and
9. Go to a health unit.


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