



February 8, 2021

TO: Chair Bynum, Vice Chair Noble, and Members of the House Subcommittee On Equitable Policing

RE: YES on HB 2928

FR: Mary Peveto, Founder and Executive Director, Neighbors for Clean Air
Juliane Fry, PhD, Professor of Chemistry and Environmental Studies, Reed College, Board Member Neighbors for Clean Air

To: Chair Bynum and members of the committee:

Thank you for the opportunity to provide comment today in support of HB 2928, which seeks to severely restrict the use of tear gas in Oregon. Neighbors for Clean Air is a grassroots advocacy organization that seeks to protect public health through the reduction of harmful air contaminants.

We must banish CS tear gas: the ultimate air toxin

Chemical irritants such as pepper spray and tear gas which are illegal for use in war under the 1925 Geneva Protocol and the 1997 Chemical Weapon Convention, were recently regularly deployed by local law enforcement and federal agents to stem lawful assemblies in Portland.

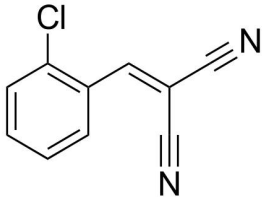
These chemical irritants were recently banned under Oregon law except in cases where a riot has been declared by the mayor or sheriff and notice has been given to the crowd – yet continued deployment threatened the lawful participation in public assembly– a right that may not be abridged under the US Constitution.

Chemical irritants are inherently indiscriminate, as they involve the dispersal of aerosolized liquids or solids from grenades or spray canisters and inevitably spread through the air. While the stated justification for the use of chemical irritants is to limit harm, it is impossible to avoid harming the nonviolent participants who are lawfully assembling. Beyond the stated intent, the chemical irritants are also spreading to others in the area who are unable to leave the area, such as the inmates in the 450-bed Multnomah County Detention Center in the Justice Center next door, the houseless population, and local residents.

The mechanism of action of these chemical irritants is to target pain-sensing neurons, causing acute lung, skin, and eye injuries.¹ Long-term effects of repeated exposure are less clear, though studies have found outcomes such as chronic bronchitis and

¹ Rothenburg, et al., "Tear gas: an epidemiological and mechanistic assessment," Annals of the NY Academy of Science, 2016, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5096012/>

respiratory infections.² Although classified as a non-lethal method of crowd dispersal, chemical irritants are more harmful to individuals with underlying conditions that make them more susceptible to toxic inhalants. These include asthma, chronic obstructive pulmonary disease (COPD), and cardiovascular disease,³ diseases which are disproportionately prevalent in Black communities that already suffer poorer air quality due to elevated exposure to diesel and industrial emissions. This pre-existing disparity in respiratory health renders the use of chemical irritants a particularly cruel response to protests for racial justice.



This is the chemical structure of 2-chlorobenzylidene malononitrile, the “CS” tear gas being used in Portland. CS gas was developed about a century ago as a less toxic alternative to another tear gas, “CN” gas. It is solid at room temperature, so it’s delivered as a 1% solution in a solvent that quickly evaporates (methyl isobutyl ketone) in a spray or canister grenade, producing an aerosol cloud.

According to prior studies, most of it will settle out of the air, and the recommended treatment for exposure is fresh air, after which symptoms should subside within 30 minutes.⁴ The lifetime of this substance as vaporized is estimated to be 110 hours, based on its primary degradation being reaction with hydroxyl radical in the atmosphere.⁵ The aerosol particles will be removed by wet and dry deposition to the surface. Based on the best available knowledge, “if CS tear gas is used by properly trained law enforcement officers and exposed combatants leave the area rapidly, few, if any, significant or long-term human disabling effects should occur.” However, the study also notes that “there is incomplete scientific data to make comprehensive recommendations.”⁶ In rats, metabolism of CS gas to cyanide has been implicated in observed mortality at high doses.⁷ A study of the degradation of CS gas found evidence that hydrogen cyanide (HCN) is released at high temperatures,⁸ and elevated airborne HCN levels have been observed in the field at live CS training events at a military base.⁹ HCN is highly toxic by all routes of

² Arbak, et al., “Long term effects of tear gases on respiratory systems: Analysis of 93 cases,” Scientific World Journal, 2014, <https://www.hindawi.com/journals/tswj/2014/963638/>

³ Fraunfelder, “Is CS gas dangerous?” British Medical Journal, 2000, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1127513/>

⁴ Fraunfelder, 2000, see above.

⁵ Committee on Acute Exposure Guideline Levels, Board on Environmental Studies and Toxicology, National Research Council, “Acute Exposure Guideline Levels for Selected Airborne Chemicals: Volume 16, National Academies Press, 2014, <https://www.ncbi.nlm.nih.gov/books/NBK224932/>

⁶ Fraunfelder, 2000, see above.

⁷ Committee on Acute Exposure Guideline Levels, 2014, see above.

⁸ Kluchinsky et al., “Formation of 2-chlorobenzylidenemalononitrile (CS riot control agent) thermal degradation products at elevated temperatures,” Journal of Chromatography A, 2002, <https://digitalcommons.unl.edu/usarmyresearch/163/>

⁹ Johnson-Kanapathy, “Quantification of hydrogen cyanide generated at low temperature o-chlorobenzylidene malononitrile (CS) dispersal,” MPH thesis, Uniformed Services University, 2013, <https://apps.dtic.mil/dtic/tr/fulltext/u2/1012989.pdf>



exposure.¹⁰ There are distressingly few studies on the long-term effects of exposure to CS gas, and on the ground reports from the demonstrations note worrisome additional symptoms.

Furthermore, Portland protesters have noted expired tear gas canisters. While the assumption is that past expiry, these canisters are simply less potent, toxicologists have noted uncertainty about whether these canisters grow more toxic with age.¹¹ As the combustible component breaks down, it leads to inaccuracy in deployment, or can result in localized higher concentrations because chemicals are unable to properly disperse.

Under the federal Clean Air Act, the Environmental Protection Agency is required to create and enforce regulations to protect air quality “so as to promote the public health and welfare and the productive capacity of its population.”¹² One of the programs, the National Emissions Standards for Hazardous Air Pollutants (NESHAP), requires the EPA to regulate hazardous air pollutants emitted by stationary sources. This program regulates 187 substances based on their threat of adverse human health effects or adverse environmental effects;¹³ “cyanide compounds” are on this NESHAPs list.

While NESHAPs would not apply to this non-stationary source dispersal of toxic substances, it is shocking that law enforcement would heavily use a substance whose toxicity remains poorly understood, and whose degradation products include known hazardous air pollutants that would be regulated, were it a stationary source. Given the thorough and protective stance to air toxics embodied in the Clean Air Act, Americans likely believe that their government would never spray them with a substance that is known to be toxic. In that, we are naive.

Portlanders have a long history of exposure to unregulated toxic pollutants, from old dirty diesel engine emissions to poorly regulated industrial sources. The Portland metro area is in the 95th percentile nationally for diesel pollution exposure.¹⁴ To this already large pollution burden we are lately adding CS gas, which has poorly understood environmental lifetime and long-term effects on human health. If the federal clean air regulation has a loophole for federal agents spraying chemical weapons into a crowd, our

¹⁰ CDC Toxic substances portal, Hydrogen Cyanide.

<https://www.atsdr.cdc.gov/MMG/MMG.asp?id=1141&tid=249>

¹¹ <https://www.newsobserver.com/news/politics-government/article243581212.html>

¹² Clean Air Act, 42 U.S.C 42 §7401: Congressional findings and declaration of purpose.

¹³ Clean Air Act, 42 U.S.C 42 §7412 (b)(1): “The Administrator shall periodically review the list established by this subsection and publish the results thereof and, where appropriate, revise such list by rule, adding pollutants which present, or may present, through inhalation or other routes of exposure, a threat of adverse human health effects (including, but not limited to, substances which are known to be, or may reasonably be anticipated to be, carcinogenic, mutagenic, teratogenic, neurotoxic, which cause reproductive dysfunction, or which are acutely or chronically toxic) or adverse environmental effects whether through ambient concentrations, bioaccumulation, deposition, or otherwise”

¹⁴ Multnomah County Office of Sustainability Diesel Pollution fact sheet, <https://www.portlandoregon.gov/brfs/article/733313>.



local officials must act to protect Portlanders. NCA and other environmental health advocates have long pushed for Oregon to enact stronger air quality regulations to protect residents from toxic air contaminants such as diesel particulate matter. In the case of tear gas, Oregon must exercise its authority to **ban the use of tear gas by all law enforcement in its jurisdiction**. In addition, we urge Oregon DEQ to investigate whether this activity is the type of “short term unexpected or emergency activity” that qualifies as requiring an Air Contaminant Discharge Permit under Oregon law.¹⁵

It is horrifying to see law enforcement use these chemical weapons in ways clearly beyond the stated scope and punishing protesters with physical harm of unknown severity. The excessive use of these cough- and tear-inducing respiratory irritants is particularly unconscionable in this time of pandemic, with a respiratory virus that is spread by coughing and which can be transmitted through the eyes.

We ask our Oregon legislature to protect the health of all from undue harm from law enforcement, by **banning the use of tear gas**.

Thank you.

Juliane Fry, PhD, Professor of Chemistry and Environmental Studies, Reed College
Mary Peveto, Founder and Executive Director, Neighbors for Clean Air

¹⁵ Oregon Department of Environmental Quality, “Instructions for Using Air Contaminant Discharge Permit Applications Forms,” <https://www.oregon.gov/deq/FilterPermitsDocs/acdp-applguidelines.pdf>