Suggestions on Breastfeeding for Mothers Exposed to Riot Control Agents/Tear Gas

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Background:
In response to health concerns being raised about exposure to tear gas, the Centre for Health Protection (HKSAR) has released Health Information on Tear Gas[1]. Shortly after the release, the Secretary of Food and Health Bureau expressed that the department was not clear about the actual components of the riot control agents and their thermal degradation products such as hydrogen cyanide (HCN)[2] and possibly dioxin[3].

Due to these concerns, breastfeeding mothers in Hong Kong have become doubtful if they should continue breastfeeding after being exposed to tear gas. There are contradicting and confusing information and guidelines without solid evidence advising abstinence from breastfeeding, undermining mother and baby's physical and psychological needs through breastfeeding. La Leche League Asia & Middle East hopes this information will be helpful to alleviate some of these health concerns.

According to different references [4] [5] [6] [7] [8], the commonly used components for riot control agents by law enforcement agencies are:

- O- Chlorobenzylidene malononitrile, synonym: 2 – Chlorobenzalmalonitrile "CS"
- Chloroacetophenone "CN"
- Dibenzoxazepine "CR"
- Diphenylaminochloroarsine "DM"
- Oleoresin capsicum "OC in pepper spray"

[1] Centre for Health Protection, HKSAR, Health Information on Tear Gas, 7 Nov 2019: https://www.chp.gov.hk/en/healthtopics/content/460/102308.html?fbclid=IwAR1BbzUQ1KR9iGmefS-Tah5huOg5pJWH2Bm6lr7U2sAomObFljzGOfjWLoU

[2] Hout JJ, Hook GL, Lapuma PT, White DW. Identification of compounds formed during low temperature thermal dispersion of encapsulated CS riot control agent. J Occup Environ Hyg. 2010 Jun; 7(6):352-7: https://www.ncbi.nlm.nih.gov/pubmed/20391049

[3] HKFP. News reporter diagnosed with chloracne after tear gas exposure, https://www.hongkongfp.com/2019/11/14/hong-kong-reporter-diagnosed-chloracne-tear-gas-exposure-prompting-public-health-concerns/

[4] Carron PN, Yersin B. Management of the effects of exposure to tear gas. BMJ 2009 Jun; 338:b2283: https://www.bmj.com/content/338/bmj.b2283

[5] Rohini J. Haar, Vincent Iacopino, Nikhil Ranadive, Sheri D. Weiser, and Madhavi Dandu. Health impacts of chemical irritants used for crowd control: a systematic review of the injuries and deaths caused by tear gas and pepper spray, BMC Public Health. 2017; 17: 831: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5649076/

[6] US Army Chemical School. Chapter 3 in Potential Military Chemical/Biological Agents and Compounds. 2005. [Dec. 30, 2013]. Military compounds and their properties. FM 3-11.9, MCRP 3-37.1B, NTRP, 3-11.32, AFTTP(I) 3.255. January 2005 [online] https://fas.org/irp/doddir/army/fm3-11-9.pdf

[7] Center for Disease Control and Prevention (CDC). Facts about riot control agents interim document: https://emergency.cdc.gov/agent/riotcontrol/factsheet.asp

[8] NonLethal Technologies, http://www.nonlethaltechnologies.com/

When riot control agents are released into the air, people could be exposed to them through skin contact, eye contact, breathing or swallowing saliva (if in great amounts). Acting through TRPA1, a pain perception receptors in mucous membrane of dermal, ocular, respiratory and gastrointestinal tracts, chemicals cause transient irritative symptoms.

Basic breastfeeding pharmacology:

- For a chemical to enter a mother's breastmilk, the chemical must enter a mother's blood stream first.
- The physical and chemical properties of a chemical will determine whether it can pass from a mother's blood stream to the milk ducts, i.e chemical in a mother's blood stream does not mean it is present in breastmilk.
- The chemical level in breastmilk will rise and fall with mother's plasma concentration.
- At 5 times the plasma half-lives of an agent, 99% of it will be eliminated from a mother's body, hence, from her breastmilk.

There is no scientific evidence measuring the amount of tear gas components in human breastmilk or the relative infant dose. However, knowing the plasma half-life (t ½) of a chemical, we can advise with evidence if a mother needs to abort or temporarily avoid breastfeeding.

The half-lives of CS, 2-chlorobenzylmalonitrile, and 2-chlorobenzaldehyde were measured in cats and rabbits [9] [10]. The chemicals were administered directly into the femoral artery via a cannula in cats and directly into the ear vein of rabbits. The half-lives of these chemicals in animals ranged from 4.5 seconds to 55 seconds.

The "in vitro" half-lives of these chemicals in the blood of cats, humans and rats were also measured. The half-lives in humans was 5 seconds for CS, 660 seconds for 2-chlorobenzylmalonitrile, and 15 seconds for 2-chlorobenzaldehyde.

Upon a single, transient exposure to riot control agents and after decontamination (i.e. take off all contaminated clothes and shower), avoiding breastfeeding for an hour (5 x t ½ of 5 seconds for CS ; 5 x t ½ of 660 seconds for 2-chlorobenzylmalonitrile) is sufficient. There is no need to "pump and dump" breastmilk.

Be cautious that tear gas is designed to cause severe local irritations, not systemic poisoning. Decontamination, i.e. removing chemicals from the body and clothes, is the most important way to avoid "implanting" chemicals onto young children.

Decontamination methods:

- wear gloves to take off mask, clothes and shoes
- do not pull clothes over the head, they should be unbuttoned/ unzipped/cut open in the front
- dispose clothes in double plastic bags, best to avoid washing them at home or it risks contaminating the washing machine and other laundry

[9] Acute Exposure Guideline Levels for Selected Airborne Chemicals: volume 16. Committee on Acute Exposure Guideline Levels; Committee on Toxicology; Board on Environmental Studies and Toxicology; Division on Earth and Life Studies; National Research Council. Washington (DC): National Academies Press (US); 2014 Mar: https://www.ncbi.nlm.nih.gov/pubmed/25077184

[10] Paradowski M. Metabolism of toxic doses of o-chlorobenzylidene malononitrile in rabbits. Pol. J. Pharmacol. Pharm. 1979;31:563–572.

- shower downward from head to toe with copious amounts of soap and water
- take time to rinse your bathroom to clear chemicals possibly splashed on wall/bath curtain

Unless a mother is repeatedly exposed to tear gas in large quantities, for example, as a riot control police officer, frontline protestor or journalist, there is no reason to avoid nursing.

For concerns over secondary products from tear gas, especially for those fat-soluble agents which may possibly be present in human breastmilk. The above decontamination methods are the best an exposed victim can perform at home. When it is unfortunate that those agents are present and spread in the environment in large quantities, people in the community are exposed through skin contact, inhalation, and/or ingestion of contaminated foods and drinks. Giving up breastfeeding will not avoid zero contact of these harmful agents to breastfed children.

Dioxin is known to pass from the mother's body to the embryo in utero and through breastfeeding, and the biological effect is heavier in the unborn child than through breastfeeding after birth. Besides, dioxin intake by babies from breastfeeding is restricted to a relatively short period of their lives, contributing a small amount of the "dioxin body burden", which refers to accumulated dioxins in the body during lifetime. The current evidence still shows that the advantages of breastfeeding far outweigh the possible disadvantages of chemical toxicity. [11] [12]

Breastfeeding in emergencies saves lives[13]. In emergencies, when access to clean water and food source is interrupted, breastfeeding guarantees a safe, nutritious and accessible food source for young children.

Breastfeeding is not just about food and nutrients. It is also about love and security, meeting psychological needs for both children and nursing mothers.

" My heart sank while I searched military weapons information and wrote this article. No one desires such knowledge. I wish that no La Leche League Leader or family will find a need to look this up."

– Area Professional Liaison for La Leche League Asia & Middle East

[11] Fact Sheet on Dioxin in Feed and Food. European Commission. MEMO/01/270: https://ec.europa.eu/commission/presscorner/detail/en/MEMO_01_270?fbclid=IwAR0djSreHSbSUOJ9AXGVdUA_AbtmwacyARo_5nzH7wVtbPbR_Ag_uNkvdTc

[12] Van den Berg, M., Kypke, K., Kotz, A. et al. WHO/UNEP global surveys of PCDDS, PEDFs, PCBs and DDTs in human milk and benefit-risk evaluation of breastfeeding. Archives of Toxicology 2017 January; Vol. 91: Issue 1, pp. 83-96: https://doi.org/10.1007/s00204-016-1802-z

[13] Breastfeeding in Emergency Situations. UNICEF. WHO: https://www.unicef.org/nutrition/files/8_Advocacy_Brief_on_BF_in_Emergencies.pdf