Preliminary Screening of Chloroxylenol
for Future Consideration as a Potential Designated Chemical

November 16th, 2026 Meeting of the Scientific Guidance Panel
Biomonitoring California[1]

Biomonitoring California staff have prepared this preliminary screening document for the Scientific Guidance Panel (SGP) regarding the possible future consideration of chloroxylenol (para-chloro-meta-xylenol; PCMX), a chlorophenolic antimicrobial, to be added to the Program's list of designated chemicals.

In 2016, the US Food and Drug Administration (FDA) announced that it was banning the use of 19 active ingredients, including triclosan and triclocarban (both of which are on Biomonitoring California's list of designated chemicals), in soap and other consumer antiseptic wash products, citing potential health risks and bacterial resistance (FDA 2016). However, the FDA deferred regulatory action at that time on the use of chloroxylenol and two quaternary ammonium compounds (QACs) (benzalkonium chloride and benzethonium chloride) as active ingredients in soap products (FDA 2016).

QACs and chloroxylenol are being used as antibacterial alternatives to triclosan and triclocarban in soaps and hand sanitizer products (Chen and Wang 2025; Rundle et al. 2019). QACs were added to the Program's lists of designated chemicals in 2020 and to the list of priority chemicals in 2021. However, the use of QACs (such as benzalkonium chloride) in cleaning and personal care products is currently under evaluation by the California Department of Toxic Substances Control's Safer Consumer Products Program (DTSC SCP 2024). Chloroxylenol would be a likely substitute if QACs were to become regulated in California.

This document presents preliminary screening information relevant to possible future consideration of adding chloroxylenol to the list of designated chemicals, including:

- Chemical identity
- Functional use and production volume
- Select detections in biological samples
- Toxicity information and other concerns for human health

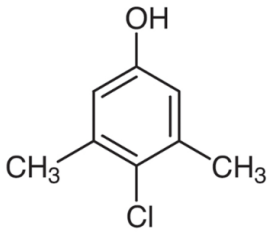
[1] California Environmental Contaminant Biomonitoring Program, codified at Health and Safety Code section 105440 et seq.

At the November 16, 2026 SGP meeting, the Panel will provide input on possible next steps for adding chloroxylenol to the Program's list of designated chemicals. These could include further screening, or development of a potential designated chemical document on chloroxylenol.

Chemical identity

Chloroxylenol is a chlorine-substituted phenol compound.

(Parachlorometaxylenol, PCMX)
CAS#: 88-04-0



Functional use and production volume

Chloroxylenol is widely used as an active ingredient in antibacterial liquid hand soaps, hand sanitizers, wound cleansers, and household disinfectants and as a preservative in consumer products such as cosmetics and personal care products at concentrations up to approximately 0.5% (Cherian et al. 2023; US EPA Chem Expo Knowledgebase (accessed: Aug 2026)[2]; Mintel Database (accessed: Aug 2026)[3]). It can also be used in concentrated antiseptic products at concentrations up to 4.8% and is meant to be diluted before use (NIH NLM Daily Med (accessed Oct 2026)[4]). Chloroxylenol is also registered with the United States Environmental Protection Agency (US EPA) as a pesticide (National Technical Reports Library (accessed: Oct 2026)). It is an antimicrobial used to control bacteria, algae, and fungi.

Table 1. Aggregated production volume of chloroxylenol in the US (US EPA 2024 CDR Public Database).

US Aggregated Production Volume (lbs)[5] by year	
550,000 – <1,000,000	2020
250,000 – <550,000	2021
250,000 – <400,000	2022
250,000 – <550,000	2023

[2] US EPA Chem Expo Knowledgebase. https://comptox.epa.gov/chemexpo
[3] Mintel Database. https://www.mintel.com/
[4] National Institute of Health, National Library of Medicine, Daily Med. https://dailymed.nlm.nih.gov/dailymed/index.cfm
[5] US EPA 2024 CDR Public Database. https://www.epa.gov/chemical-data-reporting/access-cdr-data#2024

Select detections in biological samples

- Chloroxylenol was detected in all tested urine samples of children (n=53) and pregnant women (n=62) in a study in China. The geometric means of urinary chloroxylenol in children and pregnant women were 21.6 µg/L and 31.9 µg/L, respectively, which were 1 to 3 orders of magnitude higher than those of triclosan and triclocarban. The estimated daily intake (EDI) of chloroxylenol was higher than the chronic reference dose (RfD) calculated by the researchers in 9.7% of children and 5.7% of pregnant women (Tan et al. 2021).
- The detection frequencies of chloroxylenol in urine samples (n=256) of young adults in China were 99.2% in the winter and 100% in the summer, suggesting minimal seasonal effects. The geometric means of urinary chloroxylenol in males and females were 128 µg/L and 180 µg/L, respectively, which were 2 to 4 orders of magnitude higher than those of triclosan and triclocarban (Zhang et al. 2025).
- Chloroxylenol was detected at a 1-12% frequency in human breastmilk samples from Canada (n=207) and South Africa (n=387) using non-targeted analysis (Chi et al. 2025).

Toxicity information and other concerns for human health

- Chloroxylenol can cause allergic and irritant contact dermatitis in humans (Berthelot and Zirwas 2006; Jin et al. 2025; Verma et al. 2011).
- Exposure of male rats to chloroxylenol resulted in testicular effects (e.g., altered histopathology) and reductions in testosterone and estradiol levels (El-Naggar et al. 2022).
- Chloroxylenol altered expression of genes involved in reproduction, cell growth/proliferation, amino acid metabolism, cellular stress response DNA repair, hormone metabolism, and blood coagulation/hemostasis in early-life stages of rainbow trout (Amekor et al. 2025; Capkin et al. 2017).
- In developing zebrafish models, chloroxylenol delayed embryonic development, reduced hatching and survival rates, induced ocular and other morphological abnormalities (An et al. 2023; Man et al. 2025; Man et al. 2026; Sreevidya et al. 2018; Wu et al. 2026), and altered spinal neuron development and behavior (Rerkamnuaychoke et al. 2025).
- In bacteria, chloroxylenol promotes the conjugation transfer of antibiotic resistance genes by multiple mechanisms (Guo et al. 2022).

References

Amekor M, Kohlman E, Roberts C, Alcaraz AJ, Jain N, et al. 2025. Effects of legacy and emerging antimicrobial compounds to early-life stages of rainbow trout (Oncorhynchus mykiss). Aquat Toxicol 286:107487.

An G, Kim M, Park J, Park H, Hong T, et al. 2023. Embryonic exposure to chloroxylenol induces developmental defects and cardiovascular toxicity via oxidative stress, inflammation, and apoptosis in zebrafish. Comp Biochem Physiol C Toxicol Pharmacol 268:109617.

Berthelot C, Zirwas MJ. 2006. Allergic contact dermatitis to chloroxylenol. Dermatitis 17:156-159.

Capkin E, Ozcelep T, Kayis S, Altinok I. 2017. Antimicrobial agents, triclosan, chloroxylenol, methylisothiazolinone and borax, used in cleaning had genotoxic and histopathologic effects on rainbow trout. Chemosphere 182:720-729.

Chen X, Wang J. 2025. Antimicrobial functional ingredients used in hand hygiene products: a cross-sectional survey on regional e-commerce platforms in Wuhan area of China. Asian Biomed (Res Rev News) 19:383-393.

Cherian P, Bergfeld WF, Belsito DV, Cohen DE, Klaassen CD, et al. 2023. Chloroxylenol. Int J Toxicol 42:22s-23s.

Chi ZH, Cariou R, Motteau S, Le Bizec B, Dervilly G, et al. 2025. Application of non-targeted analysis for the identification of uncommon or unreported chlorinated contaminants in human milk. Exposome 5:1.

Department of Toxic Substances (DTSC) Control Safer Consumer Products (CSCP) (2024). Background Document on Quaternary Ammonium Compounds in Cleaning Products and Beauty, Personal Care, and Hygiene Products. https://dtsc.ca.gov/wp-content/uploads/sites/31/2024/11/QACs-Background-Document-Final-Accessible.pdf

El-Naggar DA, El-Zalabany LMA, Shahin DA, Attia AM, El-Mosallamy SA. 2022. Testicular Toxicity of Chloroxylenol in Rats: Biochemical, Pathological and Flow Cytometric Study. J Exp Pharmacol 14:213-220.

Guo Y, Gao J, Cui Y, Wang Z, Li Z, et al. 2022. Chloroxylenol at environmental concentrations can promote conjugative transfer of antibiotic resistance genes by multiple mechanisms. Sci Total Environ 816:151599.

Jin S, Jin S, Wang P. 2025. Clothing-facilitated allergic contact dermatitis to chloroxylenol: Symmetrical thigh erythema in an occupational cleaner. Indian J Dermatol Venereol Leprol 91:824.

Man X, Du Y, Guo H, Bao Y, Zuo X, Feng X. 2025. Chloroxylenol causes cardiovascular toxicity and neurobehavioural abnormalities by inducing mitochondrial dysfunction and oxidative stress in zebrafish (Danio rerio). Environ Res 285:122338.

Man X, Bao Y, Feng X. 2026. Chloroxylenol impairs the visual system, induces visually-mediated behavioral abnormalities and circadian rhythm disorders in zebrafish (Danio rerio). Comp Biochem Physiol C Toxicol Pharmacol 308:110616.

National Technical Reports Library (NTRL). Reregistration Eligibility Decision (RED): Chloroxylenol. https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/PB95186920.xhtml [accessed 30 October 2026]

Rerkamnuaychoke W, Sreevidya VS, Svoboda KR. 2025. Chloroxylenol and benzethonium chloride exposure alters spinal neuron development and behavior in developing zebrafish. Ecotoxicol Environ Saf 295:117993.

Rundle CW, Hu S, Presley CL, Dunnick CA. 2019. Triclosen and Its Alternatives in Antibacterial Soaps. Dermatitis 30:352-357.

Sreevidya VS, Lenz KA, Svoboda KR, Ma H. 2018. Benzalkonium chloride, benzethonium chloride, and chloroxylenol - Three replacement antimicrobials are more toxic than triclosan and triclocarban in two model organisms. Environ Poll 235:814-824.

Tan J, Kuang H, Wang C, Liu J, Pang Q, et al. 2021. Human exposure and health risk assessment of an increasingly used antibacterial alternative in personal care products: Chloroxylenol. Sci Total Environ 786:147524.

US Food and Drug Administration (FDA) (2016). Safety and Effectiveness of Consumer Antiseptics; Topical Antimicrobial Drug Products for Over-the-Counter Human Use https://www.federalregister.gov/documents/2016/09/06/2016-21337/safety-and-effectiveness-of-consumer-antiseptics-topical-antimicrobial-drug-products-for [accessed 30 October 2026]

Verma GK, Mahajan VK, Shanker V, Tegta GR, Jindal N, Minhas S. 2011. Contact depigmentation following irritant contact dermatitis to chloroxylenol (Dettol). Indian J Dermatol Venereol Leprol 77:612-614.

Wu G, Zhong X, Feng X, Yi Y. 2026. Chloroxylenol induces hematopoietic bias and immune dysregulation in zebrafish associated with MAPK signaling disruption. Chem-Biol Interact 440:112349.

Zhang X, Han L, Sun Q, Wang X, Hu X, et al. 2025. Exposure of individuals aged 18-44 years to personal care products in Beijing, China: Exposure profiles, possible influencing factors, and risk assessment. J Environ Sci (China) 148:691-701.