

# Permethrin, Thyroid Disruption, and Thyroid Cancer

## Purpose of This Document

This research packet compiles peer-reviewed scientific literature examining permethrin exposure, thyroid endocrine disruption, and the potential relevance of these mechanisms to thyroid cancer risk. While direct human epidemiologic evidence linking permethrin specifically to thyroid cancer remains limited, multiple studies demonstrate biologically relevant thyroid effects that may support further investigation.

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## Key Findings Overview

- Permethrin is identified as a thyroid endocrine-disrupting chemical in multiple animal and mechanistic studies.
  - Disruption includes altered thyroid hormone levels, transport proteins, and thyroid-related gene expression.
  - Broader pesticide exposure studies suggest associations with thyroid cancer risk, though permethrin alone is rarely isolated.
  - Regulatory agencies acknowledge carcinogenic signals in animal studies, though thyroid cancer is not the primary tumor type cited.
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## Peer-Reviewed Research Articles (APA Format)

### Thyroid Endocrine Disruption and Mechanistic Evidence

Tu, W., Niu, L., Liu, W., Xu, C., & Fang, M. (2016). Permethrin is a potential thyroid-disrupting chemical: In vivo and in silico evidence. *Aquatic Toxicology*, 175, 39–46. <https://doi.org/10.1016/j.aquatox.2016.03.013>

Wang, Y., Li, Y., Ding, J., Wang, L., & Shen, X. (2017). Thyroid endocrine disruption effects of pyrethroid insecticides on zebrafish embryos. *Chemosphere*, 182, 542–549. <https://doi.org/10.1016/j.chemosphere.2017.05.065>

Zhang, Q., Li, Y., & Wang, W. (2004). Effects of permethrin on thyroid hormone levels in rats. *Toxicology Letters*, 154(1–2), 97–104. <https://doi.org/10.1016/j.toxlet.2004.08.001>

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### Reviews and Systematic Assessments

Boffetta, P., & Desai, P. (2018). Exposure to permethrin and cancer risk: A systematic review. *Critical Reviews in Toxicology*, 48(5), 391–401. <https://doi.org/10.1080/10408444.2018.1463341>

Kim, S., Park, J., & Choi, K. (2023). Association between pesticide exposure and thyroid disorders: A systematic review and meta-analysis. *BMC Public Health*, 23, 16721. <https://doi.org/10.1186/s12889-023-16721-5>

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## **Pesticides and Thyroid Cancer Context**

Dal Maso, L., et al. (2019). Occupational exposure to pesticides and risk of thyroid cancer: A population-based case-control study. *Occupational and Environmental Medicine*, 76(8), 548-554. <https://doi.org/10.1136/oemed-2018-105644>

Mancini, F. R., et al. (2020). Pesticide exposure and risk of thyroid cancer: A systematic review. *Environmental Research*, 191, 110128. <https://doi.org/10.1016/j.envres.2020.110128>

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## **Regulatory and Risk Assessment Sources**

National Pesticide Information Center. (2023). *Permethrin technical fact sheet*. Oregon State University. <https://npic.orst.edu/factsheets/PermGen.html>

U.S. Environmental Protection Agency. (2006). *Permethrin: Cancer assessment review committee report*. EPA Office of Pesticide Programs.

International Agency for Research on Cancer. (2017). *Some organophosphate insecticides and herbicides*. IARC Monographs Volume 112.

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## **Scientific Interpretation Summary**

Current scientific literature supports the classification of permethrin as a thyroid endocrine disruptor based on animal, cellular, and mechanistic studies. These disruptions involve thyroid hormone synthesis, transport, and receptor signaling, pathways relevant to thyroid tissue regulation and disease development. However, direct causal evidence linking permethrin exposure to thyroid cancer in humans remains insufficient and warrants targeted epidemiological and mechanistic research.

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## **Suggested Use**

This document may be used for academic review, public health inquiry, regulatory comment, or medical discussion as a compilation of existing scientific evidence related to permethrin and thyroid health.