¿Qué sabemos y qué no sabemos sobre los efectos en salud de los subproductos de la desinfección?

Cristina Villanueva, ISGlobal

3a Jornada Tècnica de la Càtedra ATL de l'aigua potable

26 octubre 2026, Barcelona.

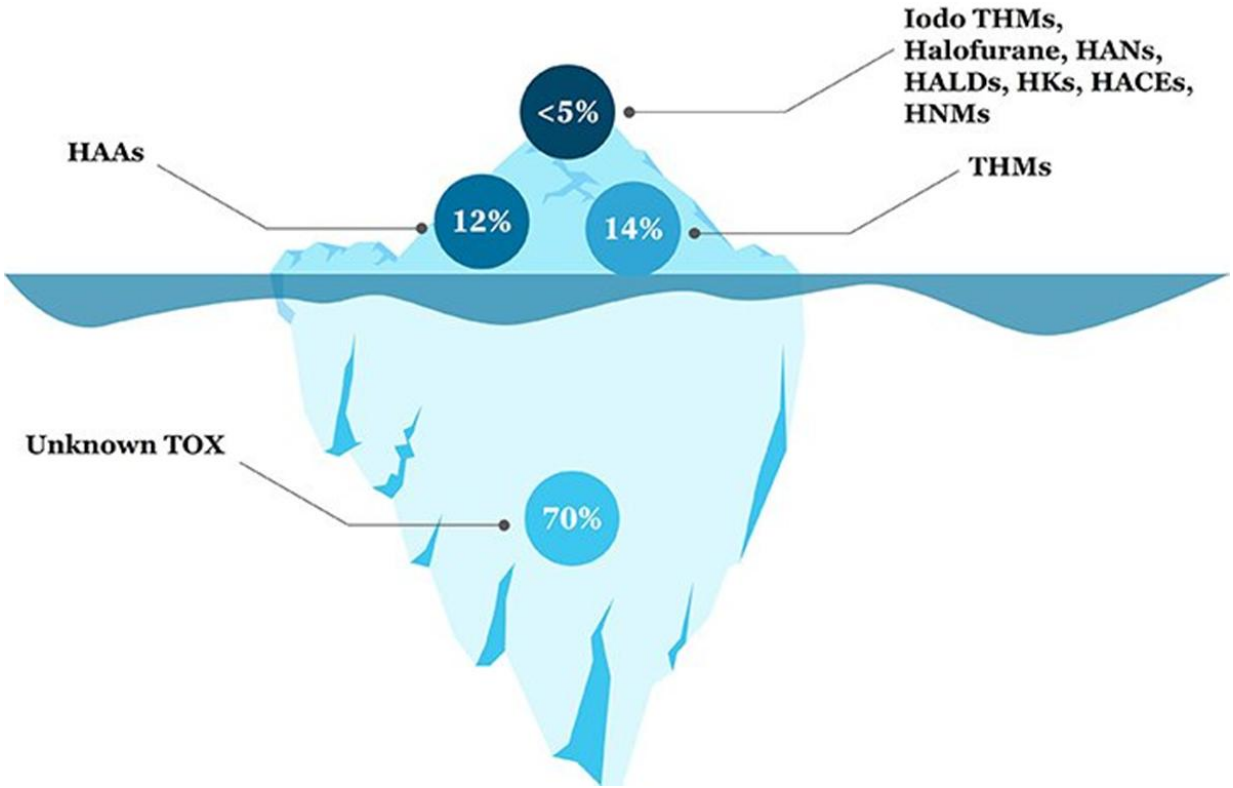
FORMATION OF HALOFORMS DURING CHLORINATION OF NATURAL WATERS

By
J. J. ROOK
Rotterdam Waterworks

Investigations have shown that haloforms are produced during chlorination of humic substances in natural waters. In view of possible physiological effects it is suggested that some caution might be needed in applying chlorination to such waters.

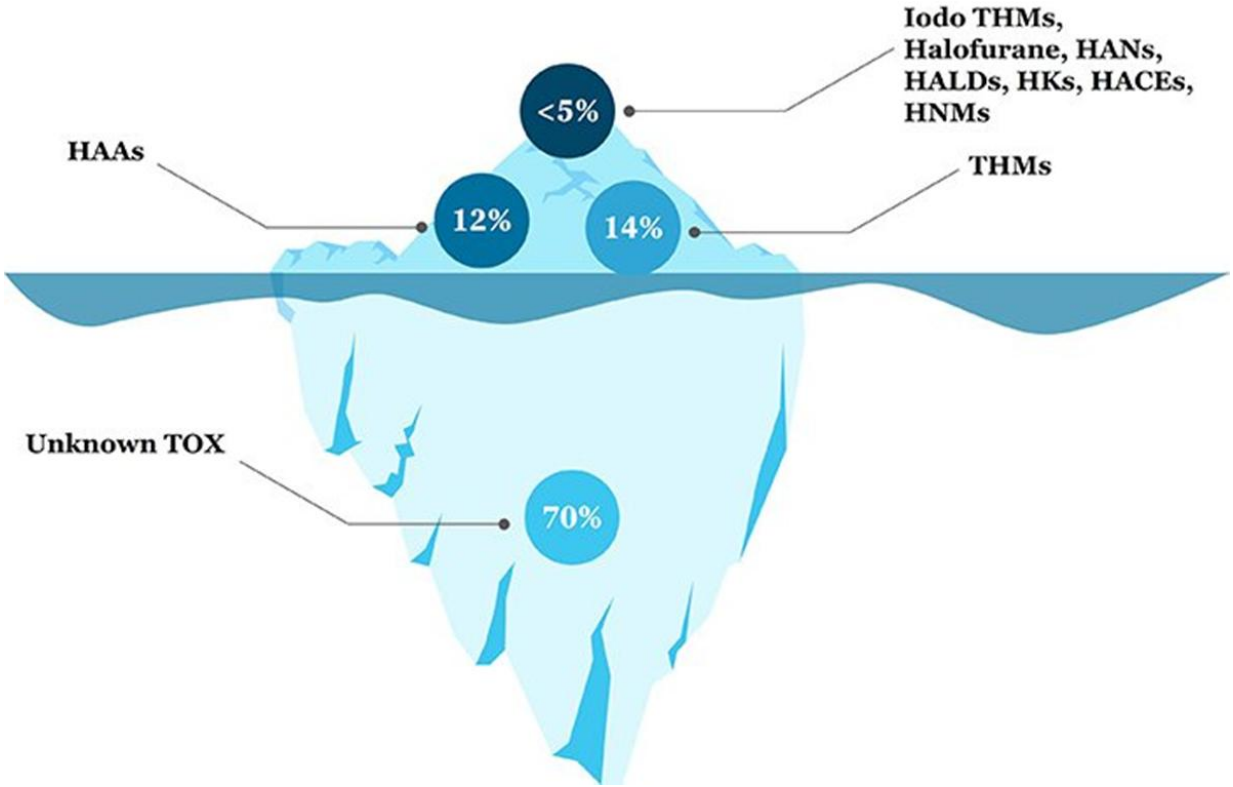
1974, Water Treat Exam

Disinfection by-products = complex mixture



Mitch et al. (2009)
https://wcponline.com/2024/06/01/on-tap-past-and-future-perspectives-on-disinfection-by-product-regulations/

Disinfection by-products = complex mixture



>700 DBPs identificados

Mitch et al. (2009)
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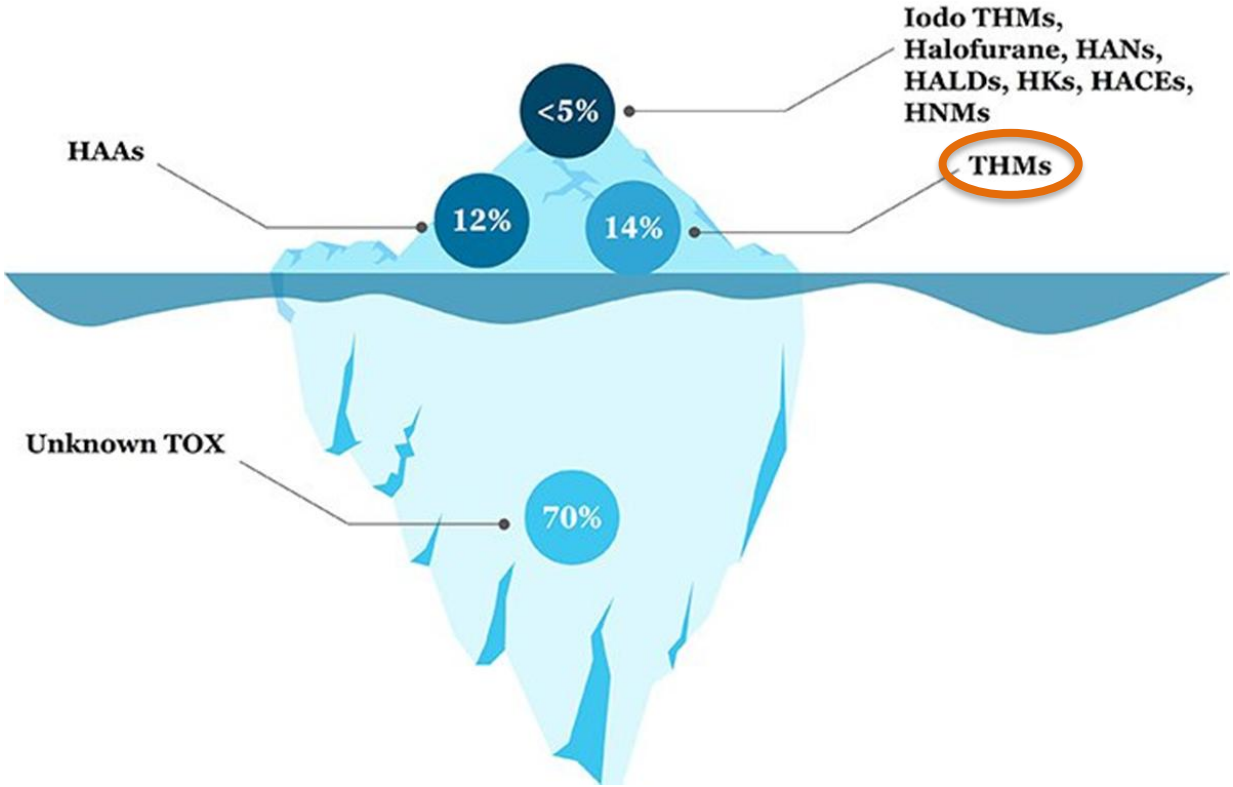

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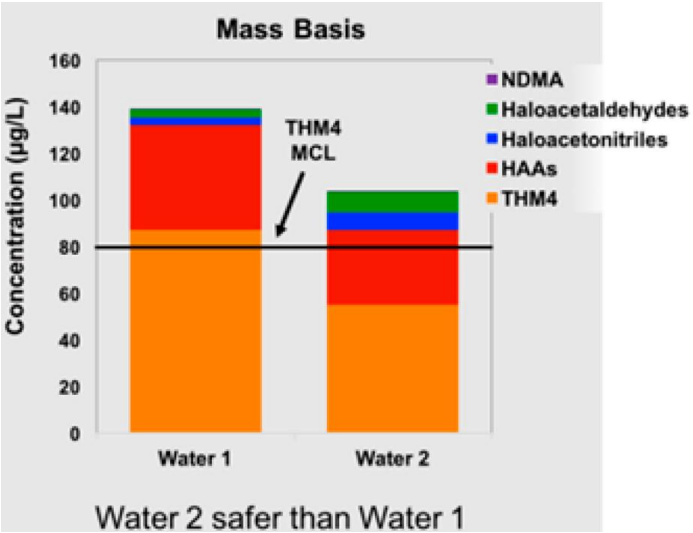
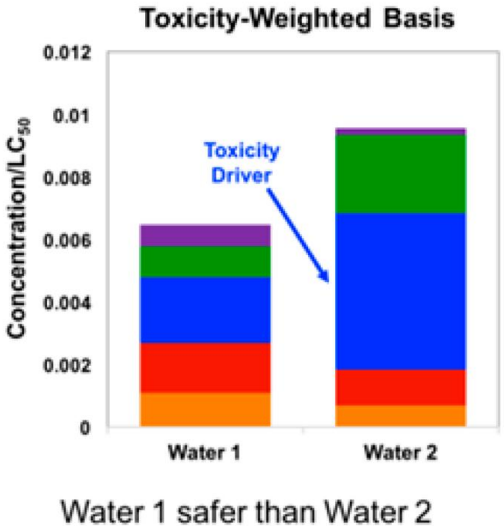
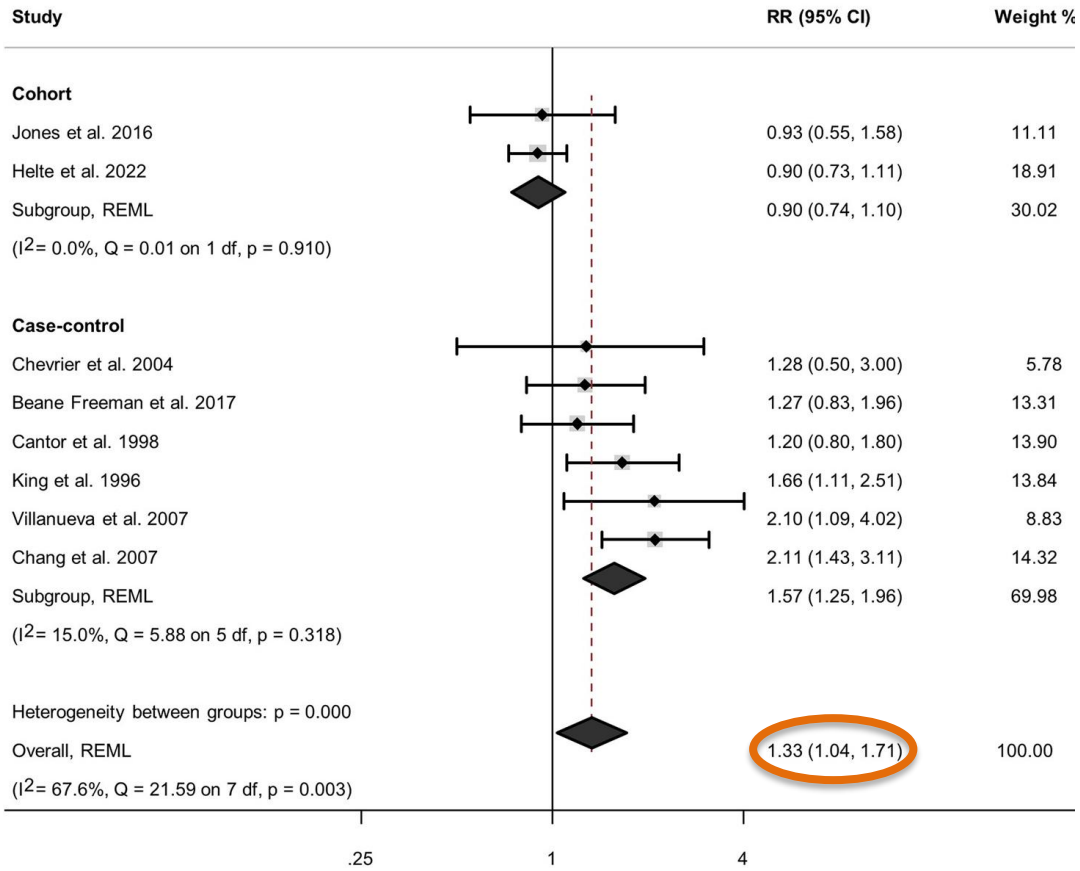
Concentración vs. toxicidad

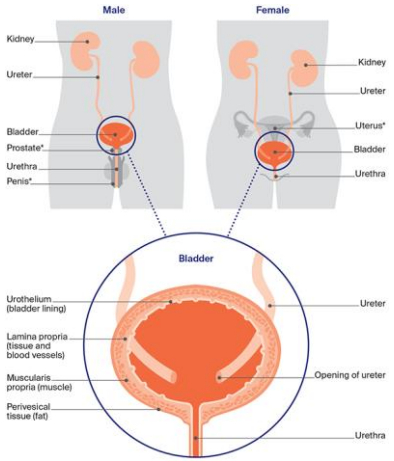




Li and Mitch 2018 ES&T

Riesgo relativo de cáncer de vejiga y exposición crónica a THMs



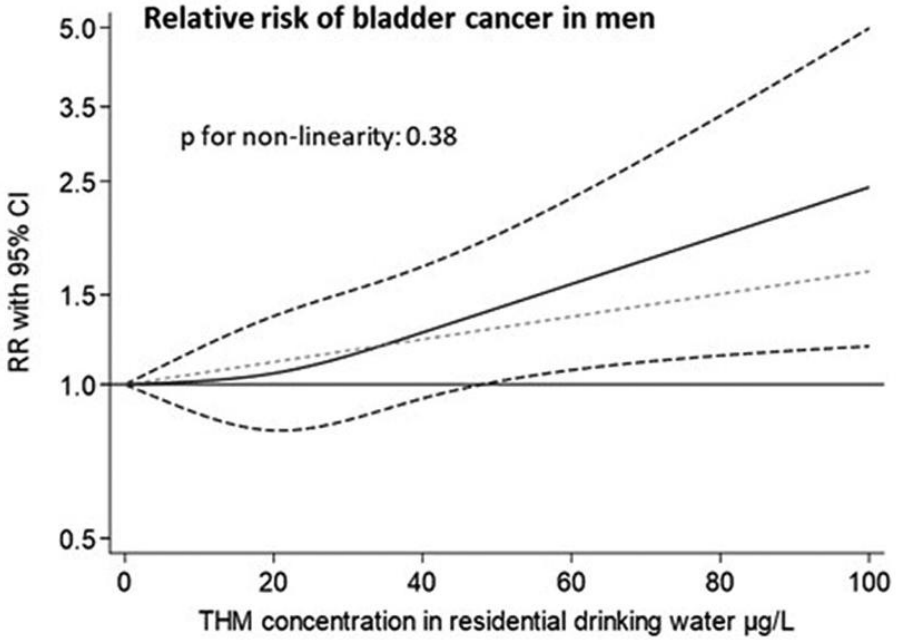


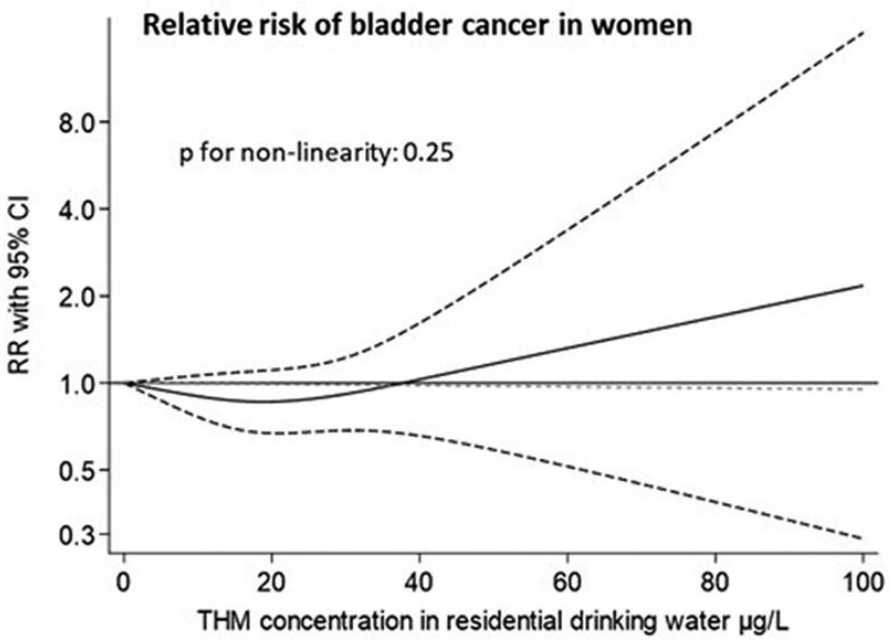
Men + women
Highest vs. lowest exposed category

N total cases=3,920,
n total controls=9,379
N total person-years=965,590

Helte et al. 2025 EHP - https://doi.org/10.1289/EHP14505

Riesgo relativo de cáncer de vejiga y exposición a THMs





Helte et al. 2025 EHP - https://doi.org/10.1289/EHP14505

Cáncer de vejiga asociado a exposición en ducha y baño.

Duracion x conc. THM (hombres)

(min/day)x(μg/l)	OR (95% CI)	Ca/co
<50	1.00	86/133
50-<167	1.6 (1.1-2.5)	142/167
167-<333	1.8 (1.1-2.9)	103/117
≥333	2.0 (1.2-3.3)	146/157
p-trend	0.01	

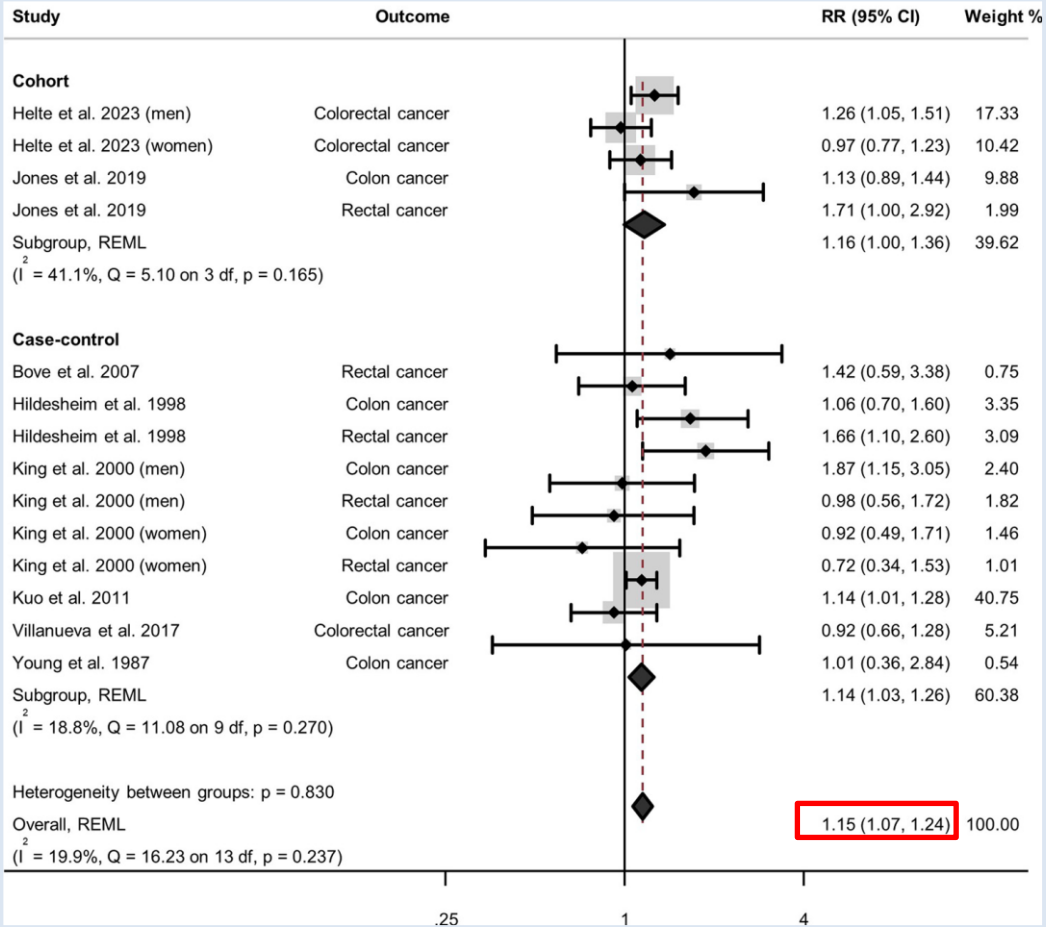
Adjusted for area, age, gender, smoking status, education, urbanicity of longest residence and overall quality of interview





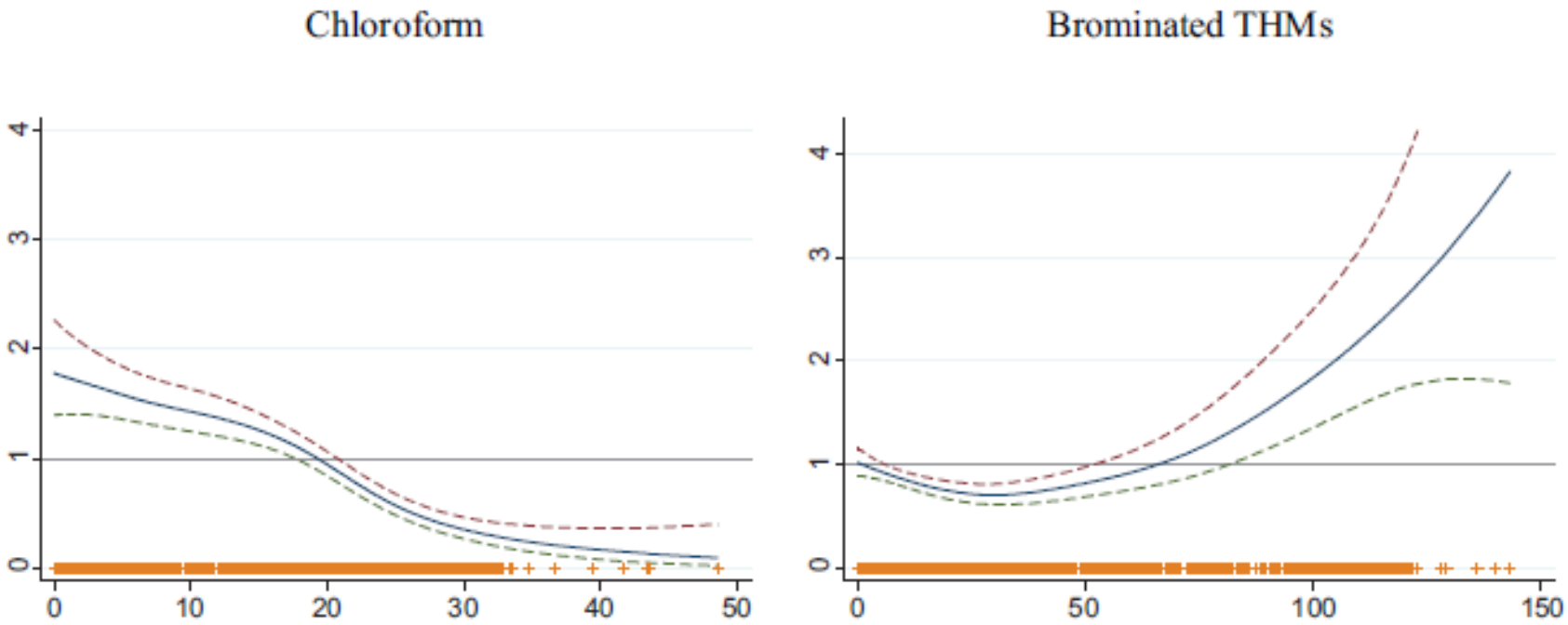
Villanueva et al. *Am J Epidemiol. 2007*

Relative Risk of colorectal cancer (highest vs. lowest exposure)



Helte et al. 2025 EHP - https://doi.org/10.1289/EHP14505

Riesgo de cáncer colorectal por tipo de THM

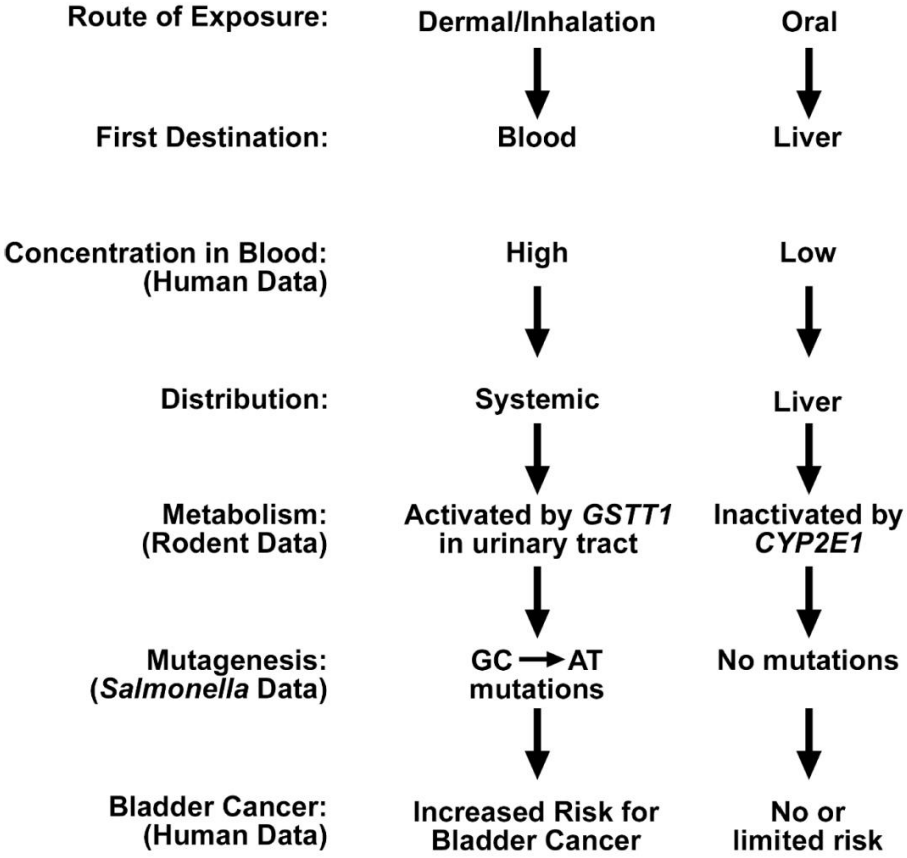


Average adult life level in the residence, μg/l

Villanueva et al. 2017 EHP

MCC MULTI-CASO CONTROL - SPAIN

Model for Br-THM-Induced Bladder Cancer



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A Review on the 40th Anniversary of the First Regulation of Drinking Water Disinfection By-products

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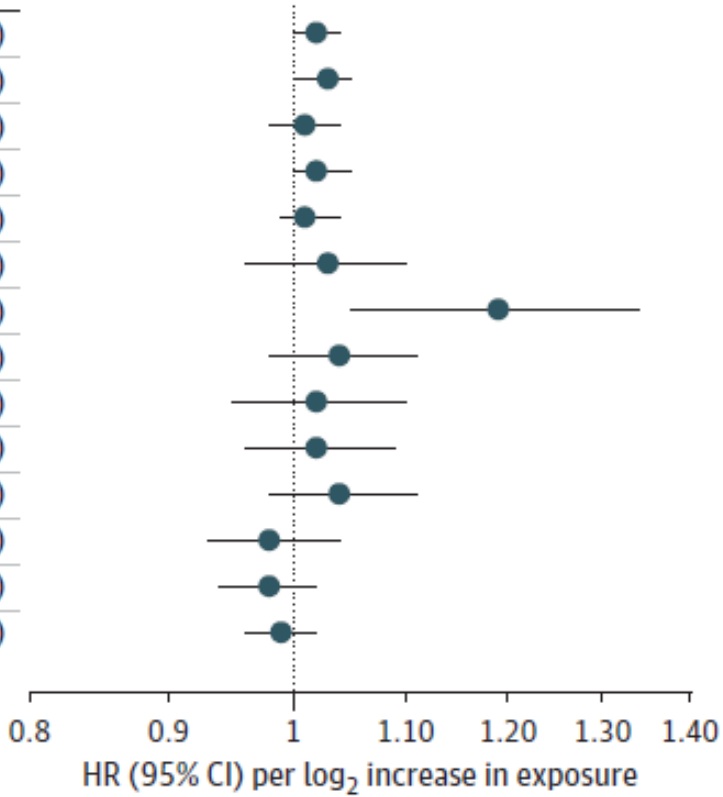
Biomolecular and Computational Toxicology Division, Center for Computational Toxicology and Exposure, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina

Cáncer de útero y contaminantes del agua de consumo

Source	Total, No.	Cases, No.	HR (95% CI)
TTHM	53100	1038	1.02 (1.00-1.04)
Chloroform	53100	1038	1.03 (1.00-1.05)
Bromoform	53100	1038	1.01 (0.98-1.04)
Bromodichloromethane	53100	1038	1.02 (1.00-1.05)
Dibromochloromethane	53100	1038	1.01 (0.99-1.04)
HAA5	33240	331	1.03 (0.96-1.10)
Monobromoacetic acid	33280	330	1.19 (1.05-1.34)
Monochloroacetic acid	33303	331	1.05 (0.99-1.11)
Dibromoacetic acid	33303	331	1.02 (0.95-1.10)
Dichloroacetic acid	33303	331	1.02 (0.96-1.09)
Trichloroacetic acid	33305	331	1.04 (0.98-1.11)
Arsenic	53060	1037	0.98 (0.93-1.04)
Uranium	49831	974	0.98 (0.94-1.02)
Nitrate-N	53073	1037	0.99 (0.96-1.02)



Spaur et al. 2026 JAMA

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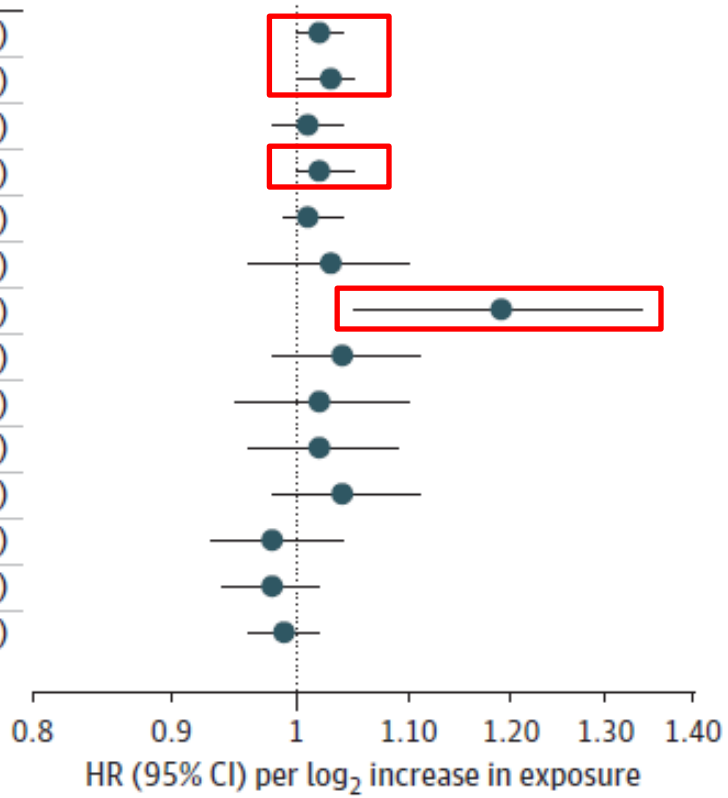

Spaur et al. 2026 JAMA

Preguntas por responder

- **Mecanismos moleculares** (en humanos)
  - Por qué diferente riesgo en hombres y mujeres
- **Agente(s)/combinación responsable**
  - DBP emergentes

Retos

- **Acceso a datos adecuados de exposición**
- **Evaluar el efecto de mezclas**
- **Estudios con biomarcadores (respuestas biológicas tempranas)**



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Invited Perspective

Invited Perspective: Drinking Water Disinfection By-Products and Cancer—A Historical Perspective

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https://doi.org/10.1289/EHP16443

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