



Pan American Health Organization

Regional Office of the
World Health Organization

***Taller Mercurio en el sector salud: uso, riesgos
y tendencia internacional de sustitución***

***Toxicidad del mercurio, efectos a la salud y el
ambiente***

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<http://www.paho.org>

Esbozo

Usos y emisiones de mercurio

Tranformaciones de mercurio en el ambiente

Fuentes de exposiciones y toxicología:

- Mercurio metalico - Hg^0
- Mercurio inorganico - Hg^{++}
- Mercurio organico - MeHg^+ and EtilHg

Uso de mercurio en salud pública



Mercurio: algunos factores de relevancia

- Diversidad de formas y compuestos – metálico, inorgánico, orgánico
- Persistente = tiene una vida media larga
- Transporte a larga distancia - atmósfera o por la migración de las cadenas alimentarias - bioacumulado en la forma orgánica
- Peor: niveles relativamente bajos de exposición al mercurio orgánico durante la vida prenatal pueden tener efectos negativos en el desarrollo neurocomportamental de las crianzas

Fuentes ambientales de exposición

- Producción de chloro-alkali
- Minería artesanal de oro y plata
- Minería de mercurio
- Quema de combustibles fósiles
- Incineradores de desechos
- Volcanoes

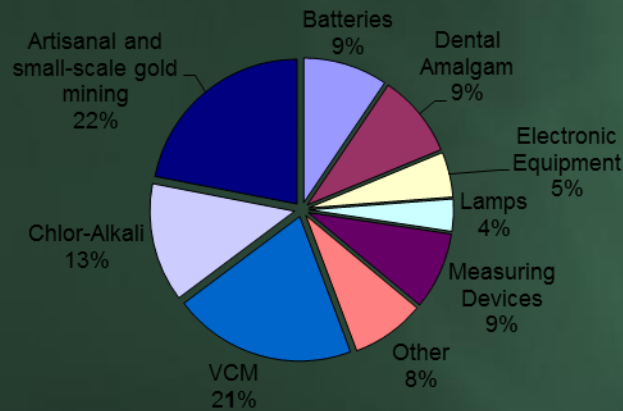


Mercury use and emission

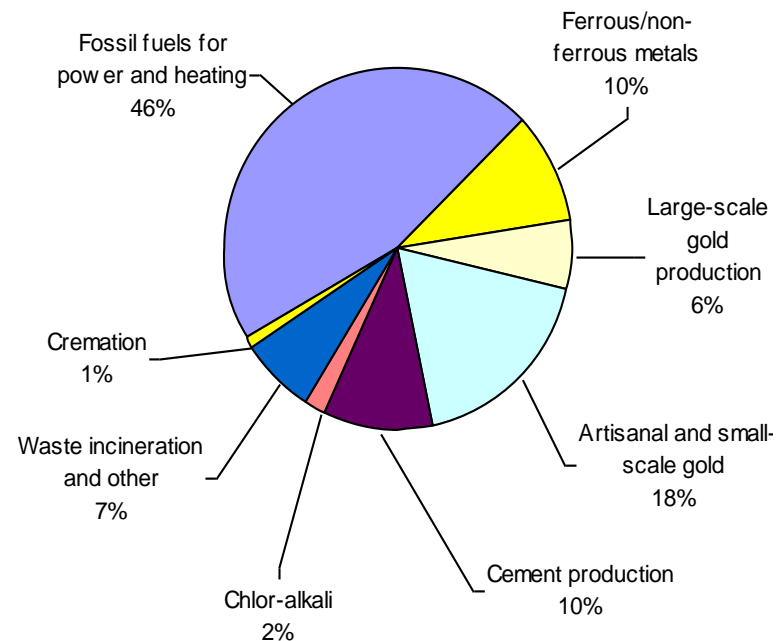
Global Mercury Use
3760 Metric Tons, 2005

Atmospheric emission
1930 metric tons

Global mercury use



Global Mercury Emissions (2005)



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Usos en sector salud

Amalgama dental

Thermometers

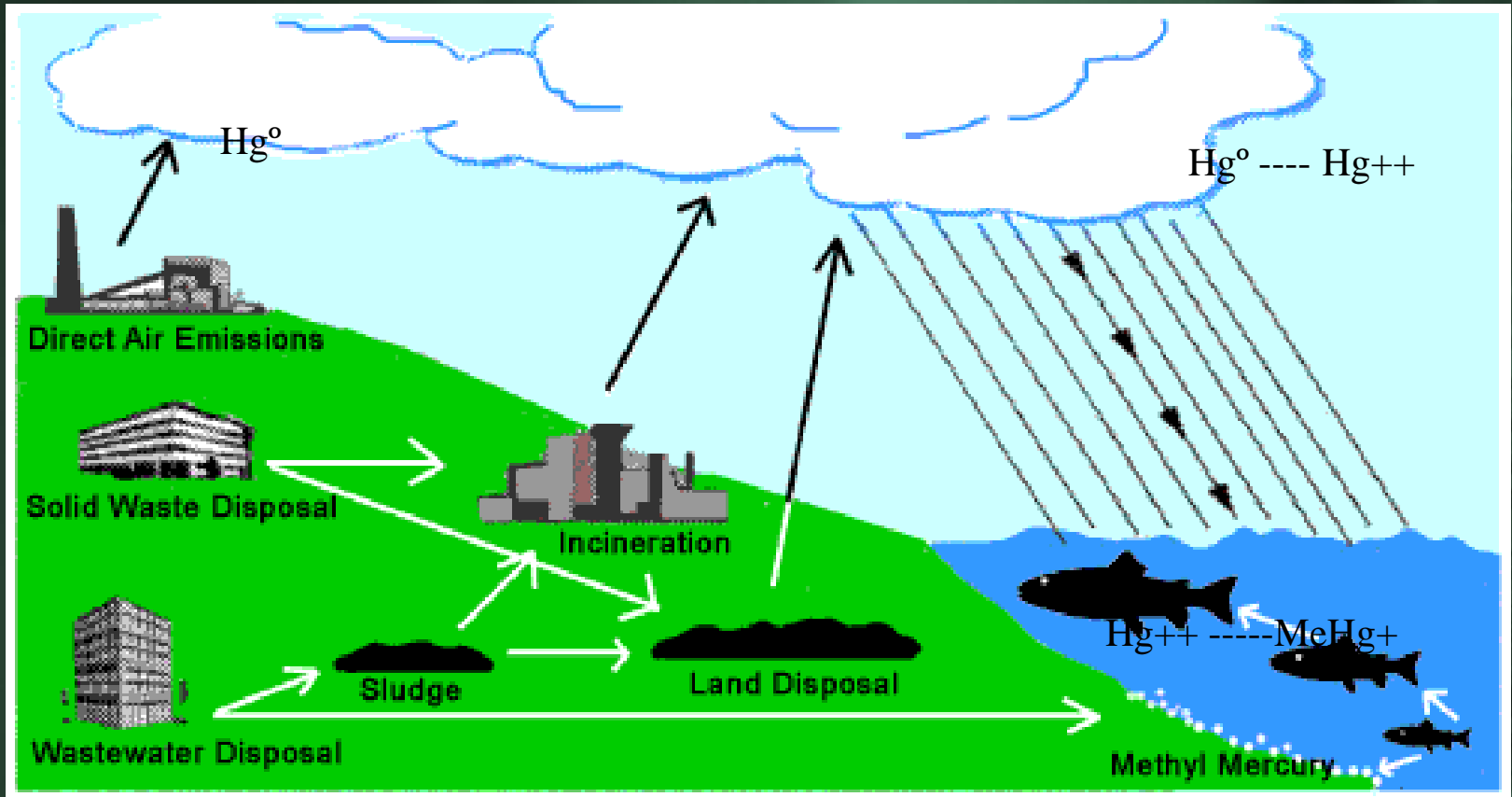
Esfigmomanometers

Thiomersal en vacunas



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Mercurio en el ambiente



Bioacumulacion

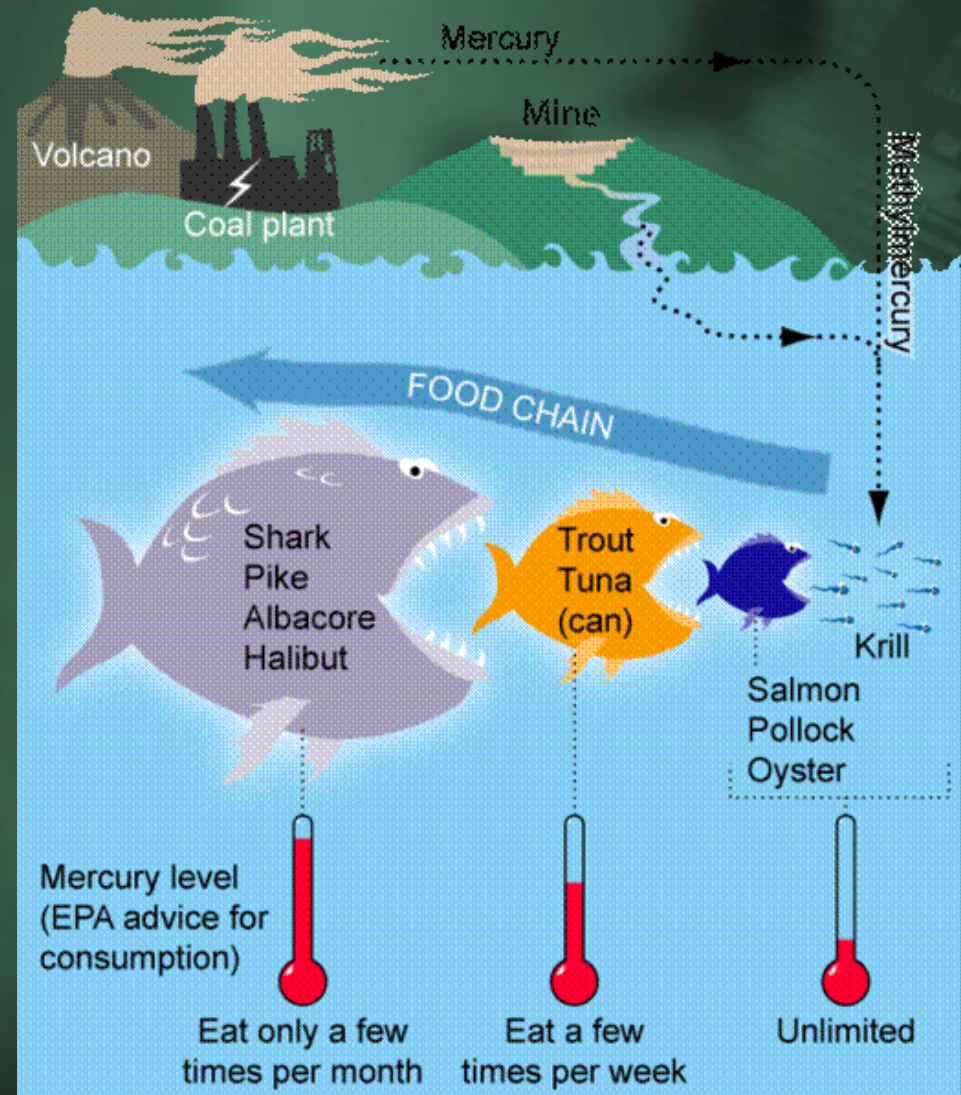
Cadenas alimentares

Nivel trófico

Taja metabolica

Migración

Distribución mercurio local



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Exposición mercurio metálico

- Ocupacional
- Amalgam dental
- Rutas de exposición – inhalación (75-85% absorption)

- Central nervous system

- Acute exposure - psychotic reactions characterized by delirium, hallucinations, and suicidal tendency

- Occupational exposure - irritability, fatigue, loss of memory, excitability, excessive shyness, and insomnia

- Continuing exposure - fine tremor develops of hands - eyelids, lips, tongue; violent muscular spasms in the most severe cases.



Inorganic mercury

Oxidacion del mercurio metalico en sangre

Cremas de aclareamiento de piel – bloquea produccion de melanina

Toxicidad – funciones renales

Riñones – proteinuria

Síndrome nefrótica – respuesta inmunologica

Dermatitis-pink disease



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Mercurio organico: metil mercurio

Crianzas y adultos

Ingestion – sangre - sistema nervoso central - cerebellum, visual cortex and sistema nervoso periferico - afinidade con sulfidril de las proteinas – cabello como biomarcador – recapitulacion de exposicion

Dependiendo de la dosis – sintomas y señales clinicos - paraesthesia (loss of sensation in the extremities and around the mouth), ataxia (impairment of the gait), dysarthria (impairment of speech), impairment of hearing, tremor in the limbs and constriction of the visual fields

Brote en Iraq - paraesthesia con niveles de mercurio en cabello 50 to 120 ppm ataxia, dysarthria y otros agravos mayores que 300 – 500 ppm Hg cabello

Minamata – peak of 700 ppm Hg cabello



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Metil mercurio – vida prenatal

Elevadas exposiciones maternas (200 – 500 ppm Hg cabello) - parálisis cerebral, microcefalia, hiper-reflexia, trastornos motores y mentales, ceguera y muerte.

Sistema Nervioso en desarrollo – MeHg afecta división y migración celular – alteraciones en la síntesis de sustancias celulares, mitosis, alteraciones en las formaciones sinápticas y citoarquitectura anormal, etc



Vida prenatal – bajas exposiciones

Exposiciones relativamente bajas (8 – 30 ppm Hg cabello) asociadas con atrasos en el desarrollo neuro motor durante los primeros 6 – 8 años de vida

- New Zealand – 8 – 10 o 20 – 25 ppm
- Faroes Islands 10 -20 ppm – similar to Iraq
- Seycheles – 20 -30 ppm

Beneficios de consumo de pescado - acidos grasos omega 3 fatty acids, selenium
antagonistic efectos toxicidade MeHg

Riesgos y beneficios consumo de pescado

http://books.nap.edu/catalog.php?record_id=11762

Fish advisories based on each local context is required to ensure methyl mercury protection during prenatal and early postnatal life.



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Niveles de referencia

JECFA provisional tolerable weekly intake

1.6 $\mu\text{g}/\text{kg}$ body weight/week

US EPA reference dose

0.1 $\mu\text{g}/\text{kg}$ body weight/day

Agency for Toxic Substances and Disease Registry minimal risk level

0.3 $\mu\text{g}/\text{kg}$ body weight/day

SOURCES: FAO/WHO JECFA, 2003; US EPA, 2001; ATSDR, 1999



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Health sector use of mercury



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Health sector use of mercury: Dental amalgam



- Almost all countries use dental amalgam: Alternatives are more expensive and have technical limitations
- WHO 2009 technical meeting, co-supported by UNEP, recommended a phase down be pursued by:
 - Promoting disease prevention and alternatives to amalgam
 - Research and development of cost-effective alternatives
 - Education of dental professionals and raising public awareness



Mercury thermometers and blood pressure measuring devices (BPMD)



- Breakage results in exposure of patients, health care workers, etc and creates hazardous waste
- WHO recommends use of mercury-free thermometers and BPMD in health-care and domestic settings.
- Validated and affordable alternatives are available, including for calibration in clinical setting.
- Thermometers are cheaper and have a shorter life than BPMD



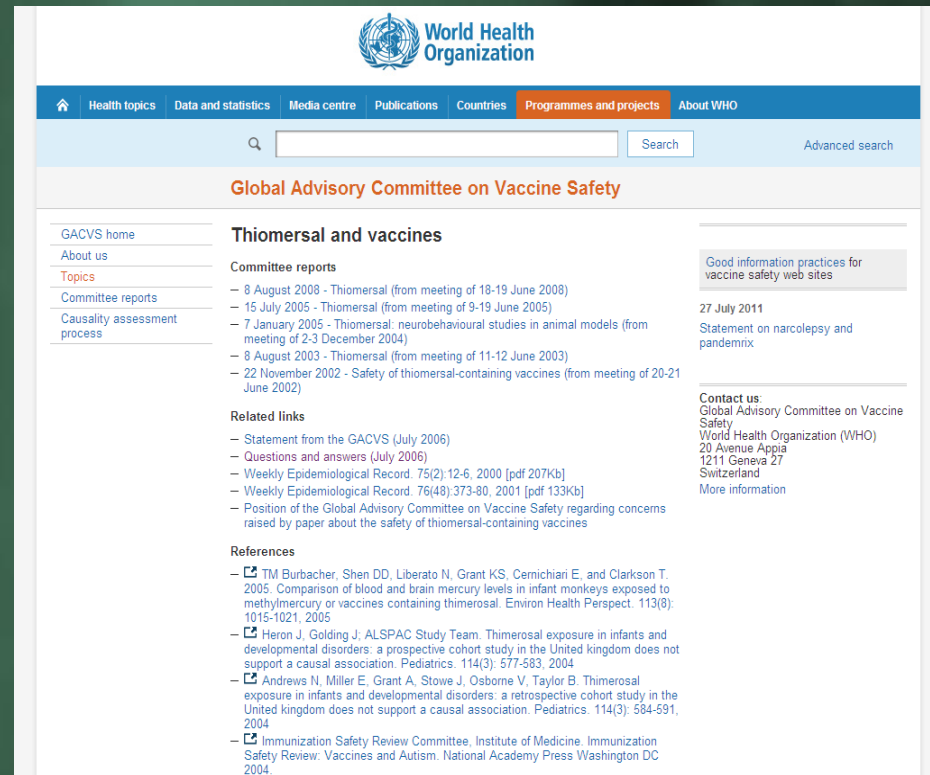
Thiomersal containing vaccines and global public health

- Thiomersal containing vaccines are essential medicines
 - used in over 120 countries to immunize at least 64% of global birth cohort each year
 - protect against four major killers; diphtheria, tetanus, pertussis, and *Haemophilus influenzae* type b disease
 - estimated to avert at least 1 400 000 child deaths per year
- Thiomersal-containing vaccines are also used by developed and developing countries to protect their populations against pandemic (influenza) and epidemic (eg meningitis in Africa) threats



Thiomersal and vaccine safety

- High-quality population-based studies conducted in several countries since 2000 conclusively show that vaccines that contain thiomersal are very safe
- There is no credible scientific evidence that thiomersal-containing vaccines cause autism



The screenshot shows the WHO website interface. At the top is the WHO logo and name. Below it is a navigation menu with links for Health topics, Data and statistics, Media centre, Publications, Countries, Programmes and projects, and About WHO. A search bar is present with a search button and a link to Advanced search. The main content area is titled 'Global Advisory Committee on Vaccine Safety' and features a sub-section 'Thiomersal and vaccines'. This section includes a 'Committee reports' list with dates and meeting details, a 'Related links' section with various documents and statements, and a 'References' section with citations from 2004 to 2005. On the right side, there is a sidebar with a link to 'Good information practices for vaccine safety web sites', a date '27 July 2011', a 'Statement on narcolepsy and pandemics', and contact information for the GACVS.

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Search Search Advanced search

Global Advisory Committee on Vaccine Safety

GACVS home
About us
Topics
Committee reports
Causality assessment process

Thiomersal and vaccines

Committee reports

- 8 August 2008 - Thiomersal (from meeting of 18-19 June 2008)
- 15 July 2005 - Thiomersal (from meeting of 9-19 June 2005)
- 7 January 2005 - Thiomersal: neurobehavioural studies in animal models (from meeting of 2-3 December 2004)
- 8 August 2003 - Thiomersal (from meeting of 11-12 June 2003)
- 22 November 2002 - Safety of thiomersal-containing vaccines (from meeting of 20-21 June 2002)

Related links

- Statement from the GACVS (July 2006)
- Questions and answers (July 2006)
- Weekly Epidemiological Record, 75(2):12-6, 2000 [pdf 207Kb]
- Weekly Epidemiological Record, 76(48):373-80, 2001 [pdf 133Kb]
- Position of the Global Advisory Committee on Vaccine Safety regarding concerns raised by paper about the safety of thiomersal-containing vaccines

References

- TM Burbacher, Shen DD, Liberato N, Grant KS, Cemichini E, and Clarkson T. 2005. Comparison of blood and brain mercury levels in infant monkeys exposed to methylmercury or vaccines containing thiomersal. *Environ Health Perspect.* 113(8): 1015-1021, 2005
- Heron J, Golding J. ALSPAC Study Team. Thiomersal exposure in infants and developmental disorders: a prospective cohort study in the United Kingdom does not support a causal association. *Pediatrics.* 114(3): 577-583, 2004
- Andrews N, Miller E, Grant A, Stowe J, Osborne V, Taylor B. Thiomersal exposure in infants and developmental disorders: a retrospective cohort study in the United Kingdom does not support a causal association. *Pediatrics.* 114(3): 584-591, 2004
- Immunization Safety Review Committee. Institute of Medicine. Immunization Safety Review: Vaccines and Autism. National Academy Press Washington DC 2004.

Good information practices for vaccine safety web sites

27 July 2011
Statement on narcolepsy and pandemics

Contact us:
Global Advisory Committee on Vaccine Safety
World Health Organization (WHO)
20 Avenue Appia
1211 Geneva 27
Switzerland
More information



Alternative preservatives

- There is very little evidence that a range of vaccines can be preserved with alternatives such as 2 phenoxyethanol
- Extrapolation from a few examples (such as injected poliovirus vaccines) that all vaccines can be switched to an alternative preservative is not supported by evidence



Thiomersal-free vaccines

- Thiomersal-free vaccines would have to be available in 1 or 2 dose presentations, rather than the 10-dose products currently used by most countries
- This would double the cost of vaccines and the global immunization effort; as immunization will need to continue in the long term, this will be an additional cost long into the future
- A switch to single-dose vials alone would require more raw materials, more energy for manufacturing processes and transport, and more waste



The environmental impact of thiomersal-free vaccines is not negligible



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International distribution of vaccines

- Vaccines that contain thiomersal are manufactured in no more than 40 countries but used in over 120 countries
- Vaccines require import permits to be traded across international borders
- The introduction of new provisions on vaccines that contain thiomersal will introduce potential technical barriers to trade which may inhibit access to life-protecting products



WHO response on the use of thiomersal in human vaccines

- The amount of mercury involved with thiomersal use in vaccines is very small compared to other sources of mercury
- There is no evidence that suggests a possible health hazard with the amounts of thiomersal currently used in human vaccines
- WHO recommends multi-dose vaccine vials for routine immunization programmes in many countries because they are safe and effective, they limit the required storage capacity and help reduce vaccine costs
- Alternative presentations would incur significantly higher costs in manufacturing procedures and new regulatory approvals, thereby limiting the ability to offer affordable



Role of the health sector in addressing health impacts of mercury

1. Providing the health evidence and raising public awareness about the health implications of mercury exposure
2. Setting health-based guidelines and targets for mercury exposure
3. Providing clinical management and educating health workers
4. Reducing health sector use of mercury-added products
5. Working with other sectors in advocating effective health-positive interventions and safer alternatives, with special emphasis on vulnerable populations
6. Sharing knowledge and participating in international mechanisms to solve problems



7. Assessing impacts of policies through monitoring and evaluation

Further Information

WHO INC3 Submission: INC3 website

WHO chemical safety website www.who.int/ipcs/en/

Global Tools for substitution
of mercury thermometers and BPMD in health care.

WHO HCWH project website
www.mercuryfreehealthcare.org

WHO Immunization, biologicals and vaccines website:
www.who.int/immunization/en/



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