

# Aluminium in vaccines: a quick guide for healthcare professionals

## Key message

Some vaccines for children include aluminium salts to enhance their effectiveness. Aluminium is quickly eliminated from the body via the kidneys. The aluminium content in childhood vaccines is less than what is ingested through children's diets and remains within safe limits.

## Understanding aluminium in our environment

Aluminium is the third most abundant element in the earth's crust and is present naturally in soil, plants, foods, and water. It is also added to some processed foods and is found in the air we breathe.

Aluminium is present in milk, including commercial cow's milk and human breast milk:

- **Baby formula:** ~2.26mg/L
- **Commercial cow's milk:** ~0.7mg/L
- **Human breast milk:** 0.14–0.34mg/L

## Aluminium and the human body

We accumulate aluminium from food, drinks, and certain medications. Vaccines contribute minimally to aluminium levels.

**Processing aluminium:** Once in the bloodstream, aluminium is processed by the body in the same way – regardless of whether it comes from food or vaccines.

**Rapid elimination:** After entering the bloodstream, most aluminium is processed by the kidneys and excreted in urine, with half eliminated within 24 hours.

**Comparative exposure:** While some vaccines can introduce more aluminium at once, daily dietary intake from food and drink results in greater overall exposure over time.

**Health considerations:** Individuals with kidney issues who consume high levels of aluminium in medications over time may experience health effects but are still advised to receive vaccines with aluminium for disease protection.

## Aluminium in vaccines

Aluminium salts (e.g., aluminium hydroxide, aluminium phosphate) are used as adjuvants to boost the immune response, this allows for less antigen to be used and sometimes fewer doses.

## Examples of aluminium in vaccines:

- Meningococcal B vaccine: 0.25–0.52mg/dose
- DTaP/inactivated polio/Hep B vaccine: <0.85mg/dose
- Pneumococcal vaccine: 0.125mg/dose
- Human Papillomavirus (HPV) vaccine: 0.5mg/dose

## Safety of aluminium in vaccines

### Historical usage

Aluminium adjuvants have been used for over 80 years with millions of doses administered and have a strong safety record

### Research findings

- No evidence links aluminium in vaccines to serious or long-term health issues
- Some studies report local reactions or small nodules at the injection site, especially if the injection is not deep enough
- Conversely, other studies have reported fewer reactions with aluminium-containing vaccines than those without. This depends on the overall vaccine formulation

### Risk vs. benefit

- The health benefits of preventing diseases through vaccines outweigh any theoretical risks from aluminium exposure

## Key points for patient conversations

### Purpose of aluminium in vaccines

To enhance the immune response effectively

### Safety assurance

- No long-term problems linked to aluminium in vaccines
- Some short-term local reactions may occur
- Disease prevention benefits surpass any theoretical risks
- Delaying vaccines to limit aluminium exposure leaves a child vulnerable to potentially dangerous pathogens for a longer period of time than necessary

## Key reference findings

1. Aluminium and vaccines: Current state of knowledge  
While high doses of aluminium can lead to various health issues, the amount present in vaccines is too low to cause any toxic effects. In fact, the aluminium levels in the bodies of people who receive aluminium-containing vaccines are no different from those in unvaccinated individuals.  
**Goullé JP, Grangeot-Keros L. Med Mal Infect 2020 Feb;50:16-21.**
2. Blood and hair aluminium levels, vaccine history, and early infant development: a cross-sectional study  
Researchers evaluated children aged 9 to 13 months for blood and hair aluminium levels, vaccination history, and cognitive, language, and motor development scores. Children who had received aluminium-containing pharmaceuticals were excluded from the study. The authors found no correlation between aluminium levels in blood or hair and vaccination history, nor between blood aluminium levels and overall developmental status.  
**Karwowski MP, Stamoulis C, Wenren LM, et al. Acad Pediatr 2018;18:161-165.**
3. Evidence refuting the existence of autoimmune/autoinflammatory syndrome induced by adjuvants (ASIA)  
The authors found two studies disputing the claim of autoimmune/autoinflammatory syndrome induced by adjuvants (ASIA) as proposed by Shoenfeld and coworkers. One study showed that lupus patients did not experience more exacerbations after receiving a hepatitis B vaccine with an aluminium adjuvant. Another study of over 18,000 patients who received allergen-specific immunotherapy with aluminium showed a lower incidence of autoimmune disease than the control group. The authors concluded that current evidence does not support the existence of ASIA.  
**Ameratunga R, Gills D, Gold M, et al. J Allergy Clin Immunol Pract 2017;5:1551-1555.**
4. Adverse events after immunization with aluminium-containing DTP vaccines: systematic review of the evidence  
The authors reviewed adverse events following exposure to aluminium-containing diphtheria, tetanus, and pertussis (DTP) vaccines, comparing them to identical vaccines without aluminium or with different aluminium levels. In children up to 18 months old, aluminium-containing vaccines were linked to more redness and swelling at the injection site but were not associated with serious adverse events.  
**Jefferson T, Rudin M, Di Pietrantonj C. Lancet Infect Dis 2004;4:84-90.**

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