

## Aluminium in our environment

Aluminium is the third most abundant element present in the earth's crust and found naturally in soil, plants, some foods we eat and water. Aluminium is added during the processing of some foods such as bread, and is also in the air we breathe. Baby formula, commercial cow's milk and human breast milk all contain aluminium. Baby formula has the highest amount, around 226 micrograms/litre, and human milk the lowest, around 14–34 micrograms/litre.

## Aluminium in vaccines

Some vaccines contain a tiny amount of aluminium salts, such as aluminium hydroxide, aluminium phosphate, and potassium aluminium sulphate (alum), to act as an adjuvant. Aluminium adjuvants help retain the active component of the vaccine (antigen) at the injection site and attract inflammatory factors and immune system cells to the injection site to improve the immune response to the vaccine.

## Aluminium and our body

We are born with some aluminium already stored in our body and continue to add to our aluminium stores through eating, drinking, receiving some vaccines and taking some medicines. Even though we regularly consume food and drinks containing aluminium throughout our lifetime, only a small amount of aluminium travels into the blood stream from digestion, the rest comes out in faeces. Most of the aluminium that enters our blood stream is quickly processed and removed by the kidneys in urine. The small amount that stays in our body is mainly stored in our bones, with some stored in our lungs and brain.

More of the aluminium we are exposed to in vaccines is absorbed into the blood stream than the aluminium from our food and drink, but the amount we are exposed to is tiny, this exposure happens less frequently, and most of the aluminium is also quickly processed and removed.

Individuals with kidney problems who regularly take medications containing a lot of aluminium over a long period of time may store too much aluminium, leading to illnesses involving the lungs, nervous system, blood, or bones. However, it is still recommended that they receive aluminium containing vaccines to protect them from other diseases.

## Aluminium in vaccines is safe

After more than 90 years use of aluminium containing vaccine and millions of doses given, there is no evidence that the aluminium in vaccines causes any long term health problems. Short term redness, pain and/or an area of hard swelling can occur where an aluminium containing vaccine has been given. Occasionally a small nodule can develop at the injection site. There is no evidence that the aluminium from intermittent vaccine doses cannot be removed by the body. The potential benefits from disease prevention through immunisation with aluminium containing vaccines are greater than an unproven, theoretical risk from intermittent exposure to aluminium in vaccines.

## Summary

Purpose	Safety
Aluminium salts are used in some vaccines to improve the immune response.	<ul style="list-style-type: none"> <li>» There is no evidence that aluminium in vaccines causes long term problems.</li> <li>» Some individuals will experience short term vaccine reactions where an aluminium-containing vaccine has been given.</li> <li>» The potential benefits from disease prevention through immunisation with aluminium-containing vaccines are greater than an unproven, theoretical risk from intermittent exposure to aluminium in vaccines.</li> </ul>

## References

- Ameratunga R, Gillis D, Gold M, Linneberg A, Elwood JM. Evidence refuting the existence of Autoimmune/Autoinflammatory Syndrome Induced by Adjuvants (ASIA). *J Allergy Clin Immunol Pract.* 2017;5(6):1551-5.e1.
- Fernandez-Lorenzo J, Cocho J, Rey-Goldar M, Couce M, Fraga J. Aluminum contents of human milk, cow's milk, and infant formulas. *J Pediatr Gastroenterol Nutr.* 1999;28(3):270-5.
- Karwowski MP, Stamoulis C, Wenren LM, Faboyede GM, Quinn N, Gura KM, et al. Blood and hair aluminum levels, vaccine history, and early infant development: A cross-sectional study. *Acad Pediatr.* Forthcoming 2017.
- Keith L, Jones D, Chou C. Aluminum toxicokinetics regarding infant diet and vaccinations. *Vaccine.* 2002;20(Suppl 3):S13-7.
- Mitkus RJ, King DB, Hess MA, Forshee RA, Walderhaug MO. Updated aluminum pharmacokinetics following infant exposures through diet and vaccination. *Vaccine.* 2011;29(51):9538-43.
- Offit PA, Jew RK. Addressing parents' concerns: Do vaccines contain harmful preservatives, adjuvants, additives, or residuals? *Pediatrics.* 2003;112(6):1394-7.
- Sorenson JR, Campbell IR, Tepper LB, Lingg RD. Aluminum in the environment and human health. *Environ Health Perspect.* 1974;8:3-95. Whyte DA, Fine RN. Chronic kidney disease in children. *Pediatr Rev.* 2008;29(10):335-41.
- World Health Organization. Global Advisory Committee on Vaccine Safety, June 2012: Aluminium adjuvants. *Wkly Epidemiol Rec.* 2012;87(30):282-3.