

ALUMINIUM AND HEALTH

Introduction

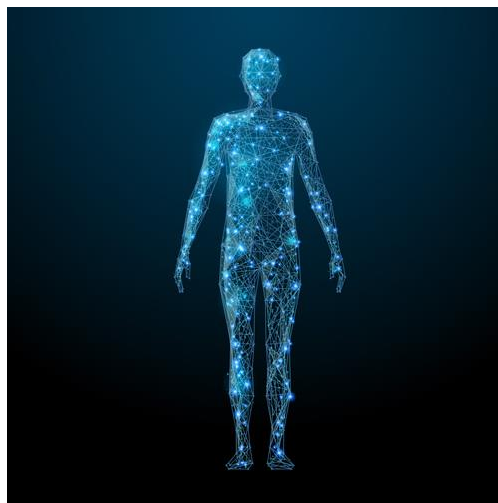
Aluminium is the third most common element and the most common metal in the earth's crust. In nature it is almost always found combined with other elements and there are many, different compounds which contain aluminium. The richest source is aluminium trihydrate or bauxite, the ore from which aluminium is produced. Aluminium also combines readily with silicon to form aluminosilicates, the major constituent of many rocks, clays, and soils.

While aluminium is abundant in the environment, the naturally occurring forms are stable and do not interact with the biological processes which go on in living organisms. Under very acidic conditions, however, aluminium can be released from rocks and soils in a soluble form which can be absorbed by plants and animals. Some plants naturally accumulate relatively high amounts of aluminium compounds in their leaves, from the soil in which they grow. Tea, for example, has a high aluminium content.

Aluminium sulphate is widely used around the world in the treatment of water supplies. It is added as a flocculating agent to remove suspended particles, including the spores of some infectious organisms which are difficult to remove by other means. Most of the aluminium is removed in the later stages of treatment and the final concentration is usually much less than two hundred parts per billion. Thus, drinking water contributes only a very small fraction, less than 1%, of the aluminium which we take in each day. Aluminium cookware and foil are also relatively insignificant sources of dietary aluminium, compared to food additives or pharmaceutical preparations such as antacids. Aluminium drink cans are internally lacquered, so there is no contact between the metal and the drink.

Aluminium in the Body

It has been estimated that the human body contains around 35 mg of aluminium, of which approximately 25% is in the soft tissues, 25% in bone and the rest in the lungs, probably as inhaled dust particles. There is no known biological role for aluminium, it does not appear to be an essential trace element and the body has highly effective barriers to exclude aluminium. Only a minute fraction of aluminium in the diet is taken up from the gut and in healthy individuals, most of this absorbed aluminium is excreted by the kidneys. The brain is vulnerable to many metals but there is a 'blood-brain barrier' which prevents most of the aluminium in blood from entering this organ. When blood aluminium levels are high, bone appears to act as a 'sink', taking up aluminium and releasing it slowly over a long period.



Medical Problems Associated with Aluminium

When the natural barriers which limit the absorption of aluminium are bypassed, or when the ability of the kidneys to excrete aluminium is impaired, the accumulation of aluminium in the body may sometimes be associated with adverse health effects. Individuals receiving regular intravenous treatment with products such as blood proteins that were contaminated with aluminium were found to be at risk, and such preparations are now produced in ways which eliminate aluminium.

Aluminium is not considered to be a carcinogen.

In a few, extremely rare cases, long-term exposure to massive levels of flake powdered aluminium in the workplace has previously been shown to cause toxic effects. Modern occupational hygiene practices, which are enforced by health and safety legislation, now prevent the occurrence of such exposures in the workplace.

Aluminium in Cooking and Packaging

Cooking utensils such as trays, containers, pots and pans are made of aluminium because it is lightweight and conducts heat well. Aluminium is energy-efficient for heating and cooling, and is a preferred material for packaging.



Aluminium foil is widely used for packaging as well as wrapping and storing food as it is light odourless and flexible. It is impervious to ultraviolet light, keeps out micro-organisms, air and light to better preserve the contents and extend shelf-life.

The amount of aluminium that migrates into foods from aluminium pots, foil and cans is

negligible. Higher amounts result from cooking or storing of highly acidic foods such as tomatoes, rhubarb, citrus or salty foods for a long time in aluminium cookware or foil. Hence it is easy for the consumer who wishes to do so to reduce these amounts.

Aluminium ingested into the body from foods and food contact

Minimal amounts of the aluminium that we ingest from foods and food contact materials is absorbed by the body. Scientific studies show that only a small amount of the total amount of aluminium that is taken in through food and water is absorbed by the digestive tract. Most is quickly filtered out by the kidneys and eliminated from the body.

The amount of aluminium that the average person takes in from food each day is only a small fraction of the safe levels recommended by international health institutions. The recommended safe limit for an adult weighing 80 kilos is approximately 23 milligrams a day, the average adult actually takes in about 2 to 10 milligrams a day. Only a very small portion of this comes from cookware and foil used in food preparation.

In Europe, a new Council of Europe Resolution on metals and alloys in contact with food will place labelling requirements on manufacturers of aluminium food contact materials, such as foil, for information purposes. In compliance with this



Resolution, packages of aluminium foil will carry instructions on limiting the use of the product with acidic or salty foods.

Adjuvants in Vaccines

An adjuvant is a substance added to a vaccine to improve the immune response to the vaccine. This can reduce the amount of the antigen, the substance that produces an immune response to the disease, required in the vaccine. It may also reduce the number of doses a person needs to gain immunity. In addition, adjuvants can provide immunity to a disease in people with weakened immune systems, such as elderly people or those with some medical conditions, who might otherwise remain vulnerable to the disease.

Adjuvants are made of several different substances and are used in a manner that is specific to each vaccine. Only some vaccines contain adjuvants. In the US adjuvants are used in the vaccines for hepatitis A, hepatitis B, DTaP (diphtheria–tetanus–pertussis) and in some influenza (flu) vaccines.

Aluminium in vaccine adjuvants enters the bloodstream and within 24 hours about half of the aluminium in the bloodstream is eliminated and more than three-quarters is eliminated within two weeks.



Experts agree that aluminium in vaccines does not cause neurological conditions, such as autism. It can cause local reactions at the injection site, commonly swelling and pain, which are mild and temporary. Some people may experience an allergic reaction to one or more components of a vaccine.

Aluminium has a record of over 70 years of use as a safe vaccine adjuvant. International experts and medical institutions conclude that aluminium adjuvants are safe and effective components in vaccines, which protect individuals and populations from serious diseases.

Aluminium in antiperspirants

Aluminium salts are the active ingredient in antiperspirants, reducing wetness and odour from underarm sweating. Deodorants are different from antiperspirants as they contain fragrances to mask perspiration odour, but do not prevent perspiration.

The skin does not absorb aluminium very well, and antiperspirants do not penetrate the skin or the sweat glands. Antiperspirants form a thin layer on the skin, over the sweat ducts where they are applied. They do not block perspiration from sweat ducts in the rest of the body. Sweat is not a major route of eliminating toxins from the body; antiperspirants do not prevent the release of toxins from the body in sweat, or force toxins back into the body.

Many studies have been done on the safety of aluminium in antiperspirants and other personal care products with the overwhelming conclusion is that antiperspirants that contain aluminium do not cause breast cancer or other illnesses.

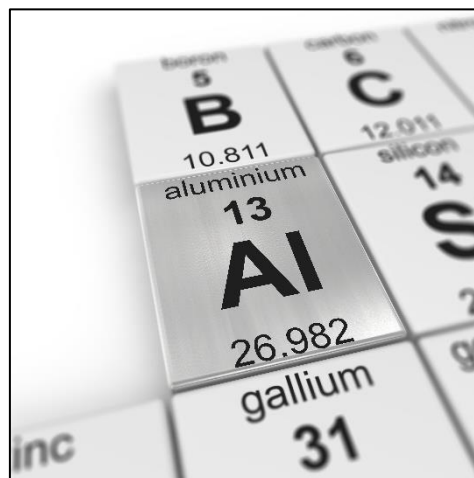
The American Cancer Society states that scientific evidence does not link breast cancer risk with antiperspirant use. It notes that “a carefully designed epidemiologic study of this issue found no link between breast cancer risk and antiperspirant use, deodorant use, or underarm shaving.”

In 2008, another major French review of 59 published scientific studies on antiperspirants found no evidence of a link between antiperspirants and breast cancer.

Aluminium in the Body and Alzheimer's Disease

Aluminium is a common natural element that is found in soils, water and dust in the air, as well as in plants and animals, we all have trace amounts of the substance in our bodies. However, these low levels are not dangerous to our health.

Alzheimer's Disease is a form of dementia that affects predominantly older people. There is a great deal of research carried out to understand the cause, or causes, of Alzheimer's Disease, however a clear cause has not been identified. Links to genetic factors have been established for some types of the disease.



The United Nations' International Programme on Chemical Safety has concluded that there is no evidence that aluminium is a primary cause of Alzheimer's Disease and that aluminium does not cause Alzheimer's Disease in humans or other animals.

The US Alzheimer's Association similarly notes that most researchers do not believe that normal exposures to aluminium lead to Alzheimer's Disease, and that experts today focus on other areas of research, mostly genetic factors.

Research has concluded, for example, that there are not greater amounts of aluminium in the brains of Alzheimer's patients than those who did not have the disease. According to reliable studies, the Alzheimer "plaques" that form in the brains of Alzheimer's patients are not caused by aluminium; instead, the plaques cause some metallic elements, including aluminium, to accumulate in the brain. It has been shown that aluminium is not easily absorbed into the skin, and there is no evidence from reliable scientific studies that the use of these products on the skin, such as cosmetics and antiperspirants, can be associated in any way with Alzheimer's Disease.

Older research that reported a possible relationship between aluminium and Alzheimer's Disease had used exposure types and amounts that are very different from those we get from common products containing small amounts of aluminium. For example, research carried out in 1965 involved injecting aluminium directly into the brains of rabbits. Other studies used amounts of aluminium that were up to 1,000 times higher than normal exposures from all sources. In addition, the brain changes observed in these experiments are not like those seen in Alzheimer's Disease.

Kidney Disease Patients and Alzheimer's Disease

People with certain serious medical conditions are more sensitive to adverse effects from aluminium; these include people on dialysis treatment as a result of severe kidney disease. The kidneys filter out substances that are not needed by the body, including aluminium, and excrete them. When the kidneys are not working properly these substances build up in the body to levels that are damaging.

Early types of dialysis treatments often resulted in a build-up of aluminium in the brain that led to a specific type of dementia, but this is not the same as Alzheimer's Disease.

McIntyre Powder was developed in Canada in the 1930s as a way to help prevent silicosis in mine workers. This Powder contained aluminium oxide and aluminium and was purposely inhaled by some miners before each shift in accordance with protocols used at the time.

A recent study reveals a higher incidence of Parkinson's disease among gold miners, who were exposed to McIntyre Powder. The same study found no increase in the risk to exposed miners of Alzheimer's disease or motor neurone diseases, such as Amyotrophic Lateral Sclerosis (ALS) – also known as Lou-Gehrig's Disease.

As public exposures ingested and dermal to aluminium are very different from historic occupational (inhaled) exposures to McIntyre Powder, studies on the health effects of McIntyre Powder are unlikely to relate to the safety of everyday exposures to aluminium.

For Further Reference on Aluminium and Alzheimer's disease:

Alzheimer's Disease Society Fact Sheet 406, available from the ADS, Devon House, 58 St Katharine's Way, London E1W 1LB, or via www.alzheimers.org.uk.

Further information about aluminium and aluminium alloys, their production, fabrication and end use can be obtained from:

- Aluminium Federation www.alfed.org.uk
- European Aluminium Association in Brussels www.european-aluminium.eu
- International Aluminium Institute in London www.world-aluminium.org