



UK FLOUR MILLERS BRIEFING DOCUMENT

Aluminium in flour

Revised July 2017

Summary

Aluminium is a common metallic element. Everyone is exposed to low levels of it through food, air and water. Although toxic levels of aluminium are very rarely found in the food chain, regulatory agencies are aware of potential exposure levels. The UK Food Standards Agency (FSA) regularly measures aluminium in food through the UK Total Diet Survey. In anticipation of a negative opinion from the European Food Safety Agency (EFSA), European Flour Millers (EFMA) members, including **UK Flour Millers**, carried out analyses of aluminium levels in wheat, flour and bran during 2008. In 2016, AHDB Contaminants Monitoring Project analysed aluminium levels in wheat. These analyses showed that levels of aluminium in wheat and flour are relatively low and milling does not appear to be a significant contributor.

This briefing note provides background information on aluminium, along with results of **UK Flour Millers** and EFM's surveys, the FSA's analyses and current legislative levels for aluminium in food.

Background

Aluminium is naturally occurring element that makes up about 8% of the surface of the earth and is always found combined with other elements such as oxygen, silicon and fluorine. Aluminium is the most common metallic element in the earth's crust but has no clear biological role. It is often included in the term potentially toxic elements (PTEs). Everyone is exposed to low levels of aluminium from food, air and water.

Aluminium metal is silver-white and flexible. It is often used in cooking utensils, containers, packaging, appliances and building materials. It is also used in paints and fireworks; to produce glass, rubber and ceramics; and in consumer products such as antacids, astringents, buffered aspirin, food additives and antiperspirants. Within the milling sector, lorry trailers and most of the tubing within mills are manufactured from aluminium-rich alloys. Some of this is painted or coated with protective resins.

Aluminium is present in a range of everyday foods and drinks, many of which (such as cereals and vegetables) are important parts of a healthy diet. It can be present naturally in food but is sometimes added during processing. In baking, the use of sodium aluminium phosphate is an important potential source of aluminium. It is also used in dried powdered foods and drinks and processed cheeses to improve texture.

Aluminium becomes mobile in acid soils so that plants can then absorb it from both soil and water. Some plants, such as tea, and some herbs and leafy vegetables can build up high levels of aluminium naturally.

The clinical symptoms of aluminium toxicity include anaemia, bone disease and progressive dementia as concentrations of the metal increase in the brain. In animals there are also effects on

the reproductive systems. Prolonged intravenous feeding of preterm infants with solutions containing aluminium is associated with impaired neurologic development. In 1997, the World Health Organization said that it had found no evidence that aluminium was a health risk for healthy people who did not come into contact with aluminium at work and that there was no evidence of aluminium being a primary cause of Alzheimer's disease.

UK Flour Millers and EFM surveys

In 2008, in anticipation of a decision by the EFSA, **UK Flour Millers** conducted a survey of aluminium levels in 26 samples of wheat and the flour/ bran milled from it. Results are as follows:

	Wheat (ex farm) mg/kg	Wheat (at intake or first break) mg/kg	Flour mg/kg	Bran mg/kg
Mean	1.3	1.9	2.6	2.7
Range	<0.1 – 4.1	0.3 – 7.8	0.1 – 8.0	0.6 – 7.5
Standard deviation	1.7	1.7	2.1	1.8

A similar study was conducted by millers in France (source European Flour Millers). Results are as follows:

	Stored wheat mg/kg	Wheat at mill mg/kg	Flour out of mill mg/kg	Flour at bakery mg/kg
Mean	12.3	6.1	2.9	2.9
Range	2.0 – 30.0	1.9 – 21.0	<0.5 – 7.3	<0.5 – 7.1

AHDB Contaminants Monitoring Project (previously Project 3779)

In 2011 and 2017, aluminium levels were analysed in stored wheat samples as part of a screen for heavy metals. Results are as follows:

	2011 (n=47) mg/kg	2017 (n=60) mg/kg
Mean	2.7	4.4
Range	0.5-6.5	<0.5-37.6
Standard deviation	1.4	6.6

FSA and EFSA positions

The FSA regularly measures the average amount of aluminium in the UK diet. In the most recent Total Diet Study, conducted in 2006, dietary intakes of aluminium were as follows. Another study is

being conducted with samples taken in the duration February 2014 to February 2015. The publication date for the results from this study is currently unclear but is likely to be in mid to late 2017.

Food Type	Aluminium (mg/kg)			
	1987	1997	2000	2006
Plain flour	5.1	-	-	-
Wholemeal flour	1.8	-	-	-
Self-raising flour	6.8	-	-	-
White bread	2.9	-	-	-
Brown bread	3.3	-	-	-
Wholemeal bread	2.3	-	-	-
Bread (general)	-	6.6	2.8	3.59
Miscellaneous cereals	-	5.2	19.0	17.5

In June 2008 EFSA published an opinion on the safety of aluminium from dietary intake of a tolerable weekly intake (TWI) of 1mg/kg body weight. However, the UK FSA did not change its advice to people as a result of this opinion. The EFSA opinion followed statements on aluminium from the Codex Committee of the joint WHO/FAO meeting in 2007.

EFSA has now proposed an established a tolerable weekly intake (TWI) of 1 milligram of aluminium per kilogram of body weight and they estimate that intakes of aluminium may exceed the TWI in a significant part of the European population. A tolerable weekly intake is the amount of a contaminant that experts recommend can on average be eaten every week over a whole lifetime without causing harm. EFSA has been unable to conclude on the specific sources contributing to the aluminium content of particular foods. Their report highlighted that, based on information from a non-UK study, some brands of infant formula milk may give infants an aluminium intake higher than the safety guideline.

Element	Estimated dietary exposure ($\mu\text{g}/\text{kg bw}/\text{day}$)			
	Adults		Young people (4-18 years)	
	Mean	High level	Mean	High level
Aluminium	67-68	134-135	120-121	244-245

The European Commission has been reviewing the conditions of use of currently permitted aluminium additives (free-flow agents and certain raising agents). It is unclear if they will legislate to remove these additives. This is not an issue primarily for millers but may impact certain confectionary mixes.

Future work

UK Flour Millers will continue to monitor and report on the levels of aluminium in wheat and flour. Dialogue is maintained with the Food Standards Agency, the European Food Standards Agency (EFSA) and European Flour Millers (EFM).