



# Occurrence of tropane and ergot alkaloids in cereal-based products for young children: a survey in the Netherlands

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## Background

Tropane alkaloids (TAs) are plant toxins that occur in *Datura*, *Atropa* and *Hyoscyamus* sp (Figure 1). Particularly *Datura* species may occasionally be co-harvested with (pseudo)cereal crops. An acute reference dose (ARfD) of 0.016 µg TAs/kg body weight was derived by EFSA based on the effect of TAs on lowering the heart rate (Opinion 2013:3386).

Ergot alkaloids (EAs) are mycotoxins produced by the fungus *Claviceps purpurea*, that can infest most common cereals. A tolerable daily intake (TDI) of 0.6 µg EAs/kg bw/day was set by EFSA (Opinion 2012:2798). No regulations are in place for TAs and EAs in food products in the EU. Data on occurrence of TAs and EAs are scarce, particularly with respect to food products for children, who are considered as a vulnerable group.

## Objective

- To gain insight on the actual exposure of young children (4-36 months) to TAs and EAs via the diet, with a focus on cookies and breakfast cereals for young children.

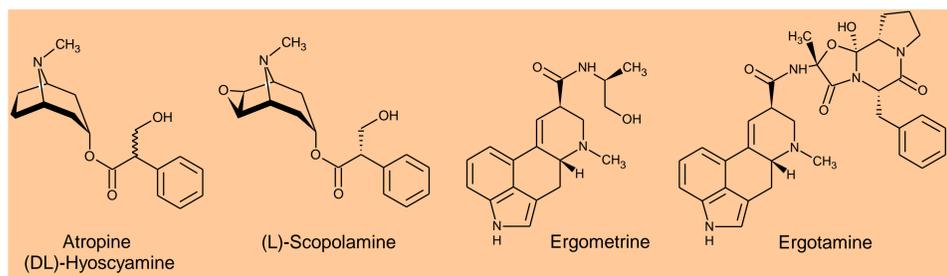


Figure 1. Representative TAs (left) and EAs (right)

## Method

- Extraction: in duplicate: 30 min with MeOH/H<sub>2</sub>O/HCOOH, 60/40/0.4 (1:10, w:v)
- Clean-up: centrifugation over a 30 kD Amicon Ultra-4 ultrafiltration filter
- Separation: Waters Xbridge C18 column (150 x 3.0 mm) with a H<sub>2</sub>O/CH<sub>3</sub>CN/NH<sub>4</sub>OH gradient
- Analysis: Waters-Micromass Ultima LC-MS/MS in positive ESI (MRM mode, 1 precursor to 2 product transitions)
- Quantification: by 1-point standard addition (25 µg/kg)
- LODs: 0.1 µg/kg for EAs and 0.3 µg/kg for TAs

## Results

A total of 113 cereal based food products for young children (4-36 months) were collected in retail shops and supermarkets in the Netherlands in 2011, 2012 and 2014. The samples were classified as breakfast cereals, including muesli, for children, to be prepared by the addition of milk (n=71) or water (n=15), and rusks and cookies for children (n=27).

TAs were detected above the LOD in 25 samples, all breakfast cereals that had to be prepared with milk, with a maximum of 81 µg/kg (Table 1). For a child of 10 kg, one average serving (20 g) of the latter sample results in an intake of 0.16 µg/kg bw, which is 10 times the ARfD.

EAs were detected in 54 samples with a maximum of 115 µg/kg. Positive samples were found in all categories. One daily serving (20 g) of the latter sample corresponds to an intake of 0.23 µg/kg bw/day (child of 10 kg).

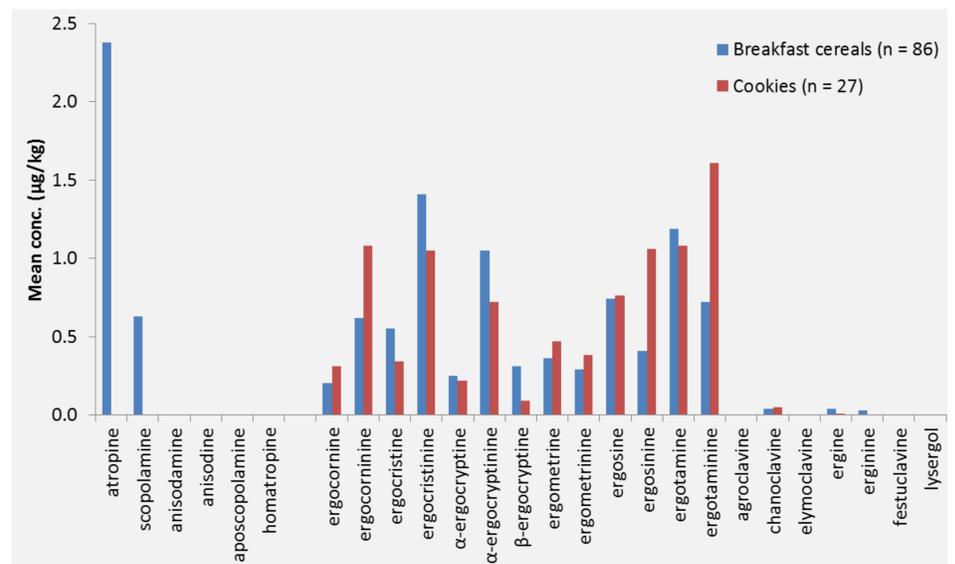


Figure 2. Average concentration of 6 individual TAs (left) and 20 EAs (right) in breakfast cereals and cookies for children

## Conclusions

- TAs are regularly found in cereal-based breakfast products for children
- TA exposure may exceed the ARfD established by EFSA up to 10 times
- TA levels seem to have dropped since 2012 (as a result of EFSA 2013 opinion?)
- EAs are present in approx. 50% of the cereal-based products for children
- EA levels in this survey will likely not lead to an exceedance of the TDI
- EA levels are quite constant over the years

Table 1. Results obtained for TAs and EAs in breakfast cereals and cookies for young children

	No. of samples				Alkaloids	No. with detectable levels				Mean conc. (µg/kg)				Max. conc. (µg/kg)		
	All	2011	2012	2014		All	2011	2012	2014	All	2011	2012	2014	2011	2012	2014
All samples	113	47	46	20	TAs	25	12	7	6	2.29	3.04	2.37	0.37	80.8	57.6	3.9
					EAs	54	25	16	13	8.47	10.60	6.24	8.61	79.9	115.4	83.1
Breakfast cereals	86	36	30	20	TAs	25	12	7	6	3.01	3.96	3.64	0.37	80.8	57.6	3.9
					EAs	42	19	10	13	8.24	7.76	8.03	8.61	39.8	115.4	83.1
Biscuits and cookies	27	11	16	-	TAs	0	0	0	-	0	0	0	-	0	0	-
					EAs	12	6	6	-	9.29	19.32	2.29	-	79.9	10.5	-

## Acknowledgement

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