

Exposure to pesticides and metals following tea consumption in Belgium

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Background

Tea is one of the most popular non-alcoholic beverages in the world. Tea consumption contributes to the daily dietary requirements of essential elements but also to toxic overdose conditions of certain elements and contaminants [1, 2]. Pesticide residues and (heavy) metals are some of the major chemical contaminants found in tea matrices.

Conclusion

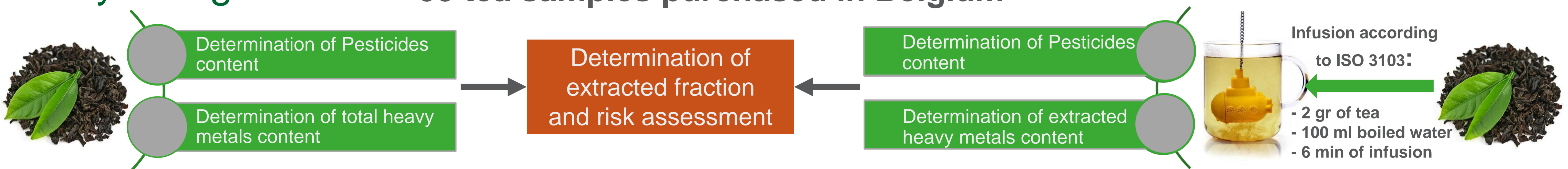
Despite that 21% of tea samples were not satisfying the EU legislation for their pesticide residues content, none of them present a risk as pesticide residues concentration were largely below the ARfD and/or the ADI.

For heavy metals, only tea containing algae led to arsenic concentrations above the WHO drinking water guidelines

Results show that tea consumption in Belgium seem not to be a concern for the Belgian consumer, except for arsenosugar for which the toxicity need to be more documented.

Study Design

53 tea samples purchased in Belgium



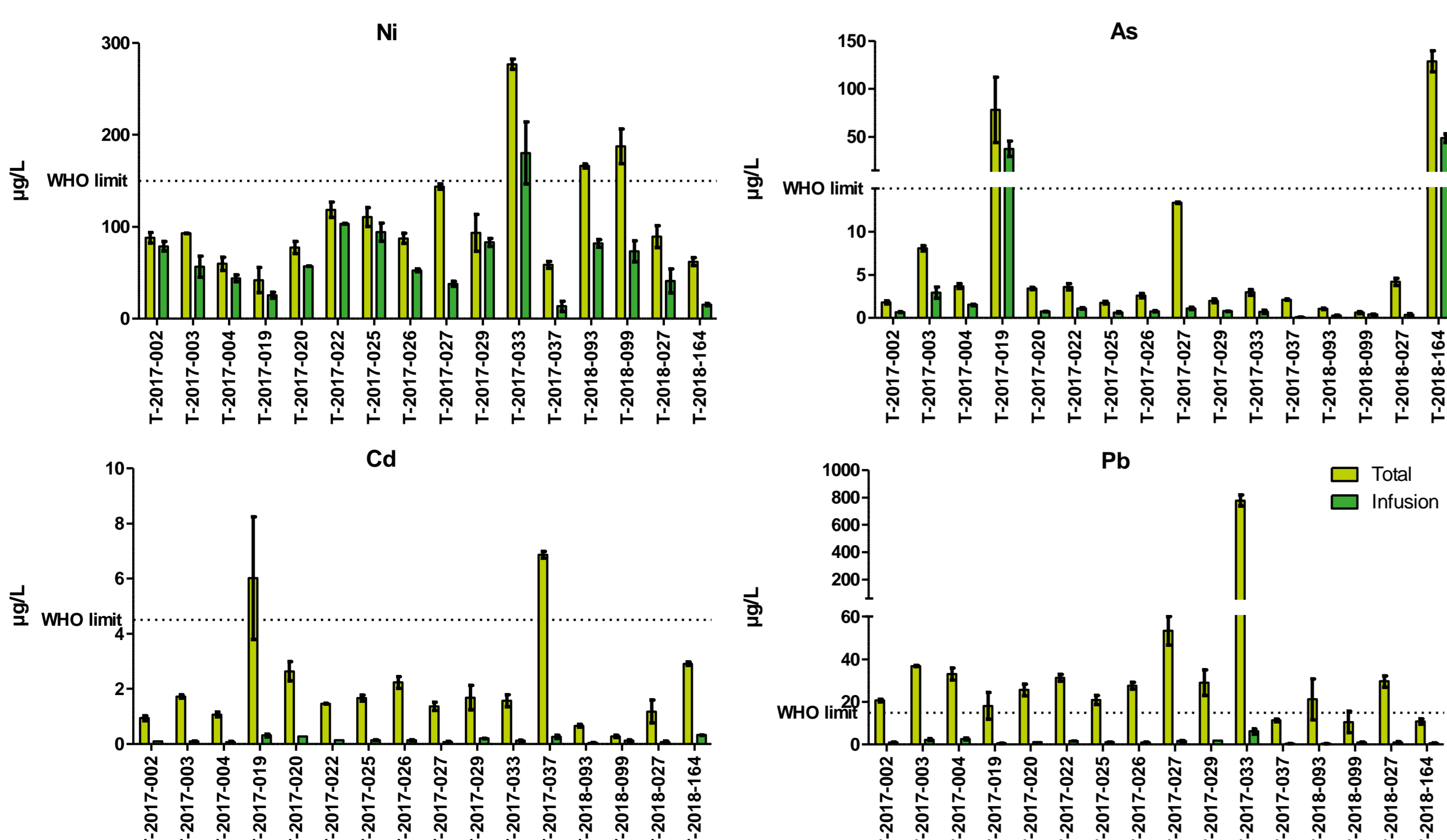
Heavy Metals

- Total element concentrations** of Fe, Co, Ni, Cu, As, Se, Cd, Pb were measured by ICP-MS/MS after acid (50% HNO₃) closed-microwave digestion. The concentrations in mg/kg tea leaves were recalculated to concentrations in the tea as drunk, assuming that all elements were totally extracted by the water (DF 50).

µg/L	Fe	Co	Ni	Cu	As	Se	Cd	Pb
min	792	1.6	11	41	0.06	0.25	0.10	0.94
median	2200	5.6	88	223	1.96	1.76	1.14	13
max	4615	34	277	526	129	15	6.86	779
WHO limit			150	2000	15	40	4.5	15

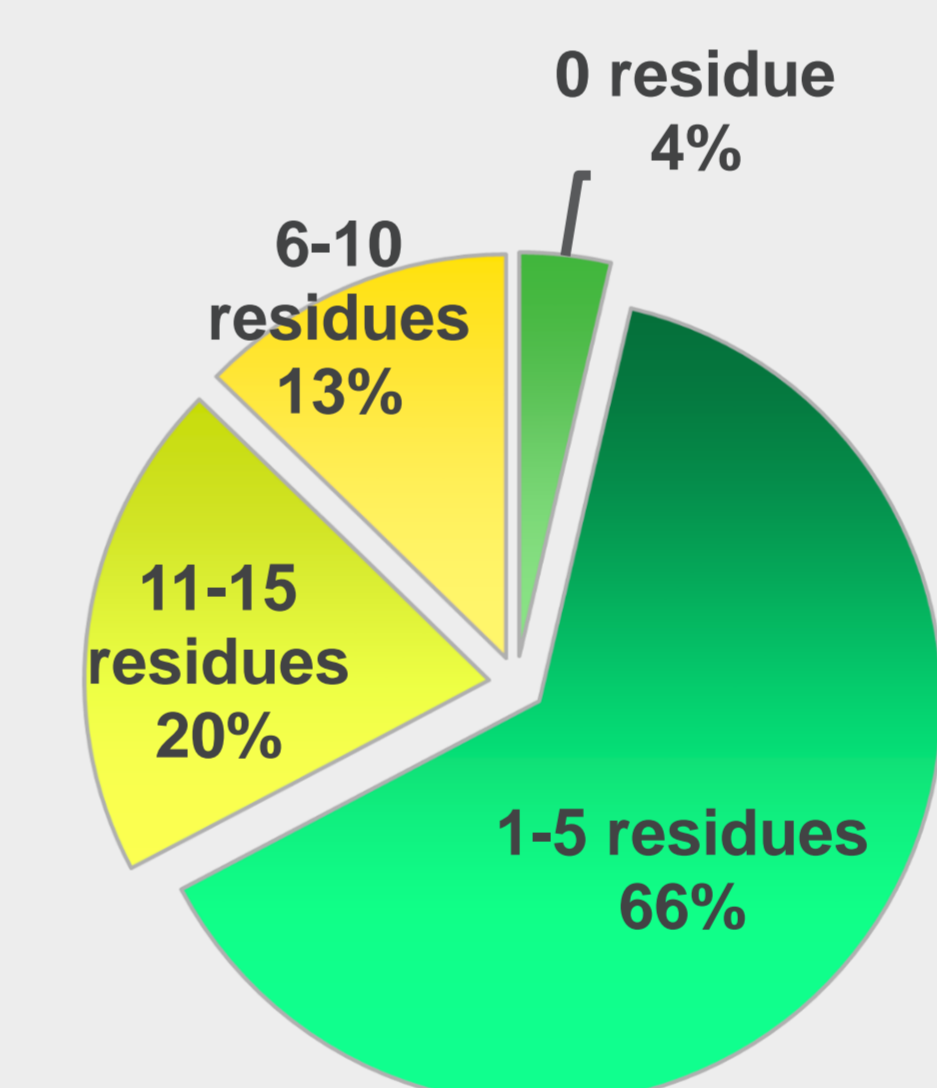


- Samples with elevated element concentrations were selected to brew tea. **Extracted element concentrations** were measured by ICP-MS/MS after acidification with HNO₃.
- The potential risk is estimated by comparing the measured element concentrations with the drinking water guidelines of the WHO [4]:
 - Cd, Pb, Ni: not extracted in tea
 - As: 2 teas (containing algae) with concentrations above WHO limit -> As from algae = arsenosugars -> toxicity?



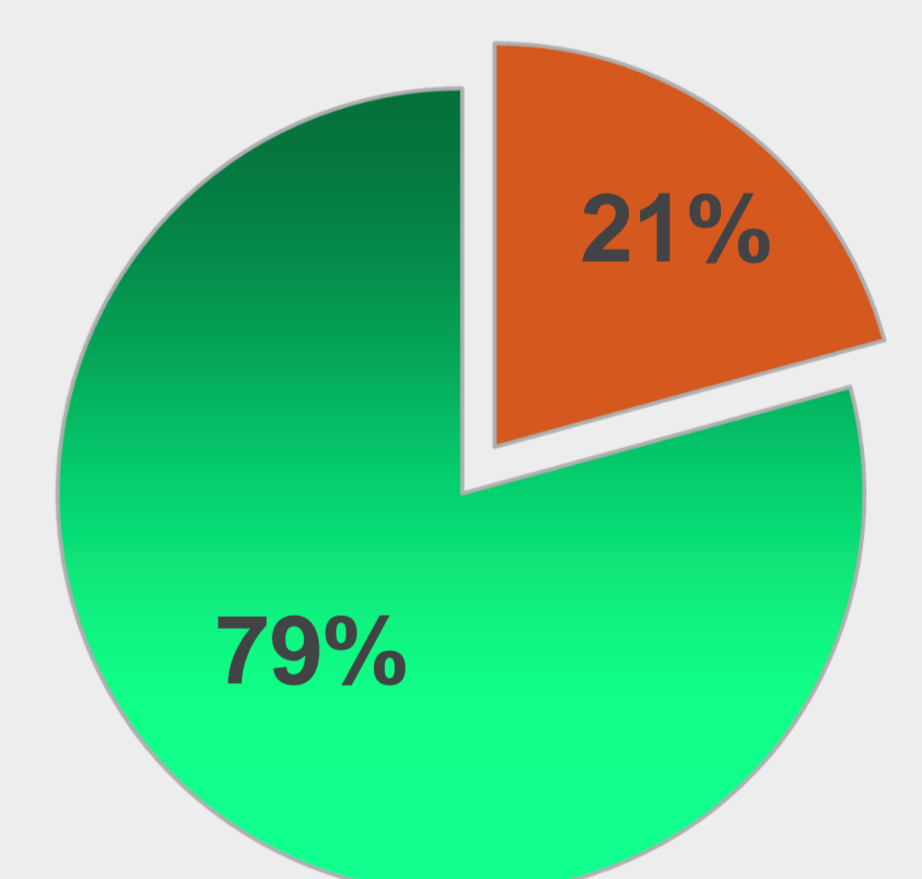
Pesticides

Number of pesticides residues in tea leaves



Samples compliance according the EU legislation

■ Nb. exceeding EU legislation
 ■ Nb. satisfying EU legislation



Pesticides detected more than 10 times in 53 tea leaves and associated % of transfer in infusion

Compound	Nb. Of detection	Pesticide class	% of pesticide in infusion
DEET	24	Insect repellent	0
Bifenthrin	19	Pyrethroid	1.2
Antraquinone	16	Insecticide/bird repellent	5.8
Cyhalothrin-L	15	Pyrethroid	<1
OPP	13	Fungicide	12.1
Acetamiprid	12	Neonicotinoid	53.7
Imidacloprid	12	Neonicotinoid	77.9
Thiametoxam	11	Neonicotinoid	61.9
Carbendazim	11	Fungicide	27.5

Risk assessment for some pesticides exceeding MRL

Compound	MRL (mg/kg)	Conc. Max found (mg/kg)	% transfer in infusion	% ARfD*	
				Children	Adults
Cypermethrin	0.100	0.436	1.4	0.2	0.1
Imidacloprid	0.050	0.240	77.9	0.6	0.2
OPP	0.050	0.663	12.1	0 (%ADI**)	0 (%ADI**)
Thiachloprid	0.050	0.079	14.9	0	0

* Acute reference dose / ** Admissible Daily Intake

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