Scoping paper on the potential risks of chemicals (other than caffeine) found in green and black tea in the maternal diet

Chemical compounds in tea

In this guide

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This is a paper for discussion. It does not reflect the views of the Committee and should not be cited.

12. A literature search was carried out to gather information/data on compounds that are present in the that may present a health risk to women of childbearing age. The search terms are described in Annex A. The databases used were PubMed, Science Direct and Google Scholar. Any available relevant reports published by authoritative bodies such as the European Safety Authority (EFSA), World Health Organization (WHO), Food and Agriculture Organisation (FAO), the Joint FAO/WHO Expert on Committee on Food Additives (JECFA), United States of America Food and Drug Administration (US FDA) have also been included.

13. The respective compounds are presented in this scoping paper in compound groups and within their grouping in alphabetical order. In brief, the groups cover chemicals used in crop management (pesticides), naturally occurring toxins (pyrrolizidine alkaloids, tropane alkaloids, mycotoxins), heavy

metals (arsenic, cadmium, chromium, lead, mercury), plant components (catechins, polyphenols, trace elements) and process contaminants (acrylamide and furans, polyaromatic hydrocarbons).

Crop management

14. To increase tea crop yields, growers utilise synthetic agrochemical compounds to prevent, kill or repel pests or lessen the damage of animals, insects, nematodes, acarus (mites), fungi, viruses, bacteria, and plant competition. Data from the literature suggests that insecticides and herbicides are the main pesticides in tea (Fernandes et al., 2023).

15. Several studies have investigated the transfer rates of pesticide residues to tea infusions. The majority of which report that adverse health effects are dependent on whether maximum residue levels (MRLs) are exceeded (Fan et al., 2025a; Dong et al., 2023; Fernandes et al., 2023; Heshmati et al., 2020; Chen et al., 2014).

Pesticides

16. In GB, MRLs for pesticides including those applicable to green and black tea are set under Assimilated Regulation (EC) 396/2005. If a pesticide active substance is not listed with a specific MRL, the default MRL of 0.01 mg/kg applies.

17. The official data source for tea residue results is found in the Pesticide Residues in Food (PRiF) dataset (DEFRA, 2025). The most recent entry for tea was found in 2015 (PRiF, 2016b) and the report states that tea was last surveyed in 2012 as part of a herbal infusions and tea survey. The 2015 survey was limited to “true tea (infusions of *Camellia sinensis* of any type, such as black tea, green tea, white tea, and Earl Grey), and rooibos or red bush tea (infusions of *Aspalathus linearis*). The teas can be in teabags, loose or instant.” In both the 2012 and 2015 reports, it was noted that the country of origin does not necessarily indicate where the tea was grown. It may be where it was dried or packed for consumer purchase.

18. Tea was sampled in every quarter of 2015 and reported in quarter two (PRiF, 2016a) and four (PRiF, 2016b). The samples were tested for up to 250 pesticide residues. The results showed that 35 samples contained no residues from those sought and six samples contained residues above the reporting level. None of the samples contained residues above the MRL. One sample contained two residues. The main conclusion by the Expert Committee on PRiF was that

“none of the residues detected by the laboratory would be expected to have an effect on health.”

19. Colapinto et al., (2015) determined whether tea intake in the first trimester was associated with elevated concentrations of various organochlorine or organophosphate pesticides in maternal blood or urine. They further examined the relationship between tea consumption and adverse birth outcome. Data from the Canadian Maternal-Infant Research on Environmental Chemicals (MIREC) Study cohort were used for these analyses (n=1,898 women). The geometric means (GM) of organochlorine pesticide constituents or metabolites in maternal plasma (lipid adjusted) and organophosphate pesticide metabolites (adjusted for specific gravity) in maternal urine were calculated for participants who drank regular (black), green or herbal tea in the first trimester and for those who did not. The following GM of organochlorine pesticide constituents were detected: trans-nonachlor (2.74 mg/g lipid), metabolites oxychlordane (1.94 ng/g lipid) and p,p′-DDE (55.8 ng/g lipid). The organophosphate pesticide metabolite concentrations adjusted for specific gravity, were dimethylphosphate (GM: 3.19 µg/L), dimethylthiophosphate (GM: 3.29 µg/L), dimethyldithiophosphate (GM: 0.48 µg/L), diethlphosphate (GM: 2.46), and diethylthiophosphate (GM: 0.67 µg/L).

20. The authors observed that there was no significant difference in mean concentrations between tea drinkers (of any type) and non-tea drinkers. No association was found between tea intake in the first trimester and adverse birth outcomes.

Nicotine

21. Nicotine is the main alkaloid in tobacco; it is also found in low concentrations in other crops belonging to the family of *Solanaceae*. Due to its action as an agonist for acetylcholine receptors, nicotine exhibits insecticidal activities, and the compound was used as an active substance in plant protection products in the past. In the UK, the current MRL for nicotine in tea is 0.5 mg/kg (though this is subject to be reduced to 0.4 mg/kg in February 2026).

22. A temporary European Union (EU) MRL for nicotine in tea is established under Regulation (EC) No. 396/2005 at 0.6 mg/kg. This was used in the EFSA assessment (described in the next paragraph). However, it should be noted that this was reduced to 0.5 mg/kg in line with EU Commission Regulation (EU) 2023/377. This may be further reduced to 0.4 mg/kg which is scheduled for February 2026.

23. In 2022, EFSA published a statement on the short-term (acute) dietary risk assessment for the temporary maximum residue levels for nicotine in rose hips, teas and capers (EFSA, 2022a). The PRIMo (rev 3.1) model was used to calculate acute exposure calculations for unprocessed tea leaves and tea infusions. Specific discussion/exposure for maternal women was not included in the review as the exposures were based on the general population.

24. The highest consumption data expressed as dried tea leaves have been reported for adults and children. For adults, this was German women (aged 14-50 years) (P97.5): 33.74 g/person, equivalent to 0.5 g/kg bw. For children, this was Irish children (P97.5): 30.6 g/person, equivalent to 1.53 g/kg bw. EFSA considered that a large portion of tea leaves contained residues equal to the legal EU MRL limit (0.6 mg/kg), with estimated exposure amounts of 0.3 µg/kg body weight (38% of the acute reference dose; ARfD) for adults and 0.92 µg/kg body weight (115% of the ARfD) for children. The outputs from these exposure calculations gave an indication that the existing temporary MRL for tea was not sufficiently protective for children. The threshold residue concentration for nicotine in teas (dry leaves) that leads to an exposure that does not exceed the ARfD was calculated to be 0.52 mg/kg.

25. The highest consumption expressed on the basis of tea infusion (processed tea leaves) have been reported for adults and children. For adults, this was the Dutch general population (P97.5): 1335.3 g/person, equivalent to 20.29 g/kg body weight. For children, this was Dutch children (P97.5): 645.7 g/person, equivalent to 35.09 g/kg body weight. EFSA utilised a default dilution factor of 0.01 for tea, the residue concentration in tea infusion (corresponding to the existing EU MRL of 0.6 mg/kg) is estimated up to 0.006 mg/kg. For tea infusions the calculated exposure amounted to 0.12 µg/kg body weight for adults and 0.21 µg/kg body weight for children. This exposure corresponds to 15% and 26% of the ARfD for adults and children, respectively.

26. It should be noted that the COT reviewed literature on possible effects of exposure to nicotine on developmental outcomes in humans, from exposure via the parents prior to or during pregnancy or lactation (TOX/2018/45) as part of their work on determining the potential toxicological risks from electronic nicotine (and non-nicotine) delivery systems (e-cigarettes). However, since this considers a different exposure route (i.e. inhalation) rather than exposure via the diet from tea, the data may be of limited relevance.