

**COMMITTEE ON TOXICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT**

**PAPER FOR INFORMATION**

**OPINION ON NICKEL LEACHING FROM KETTLE ELEMENTS INTO BOILED WATER**

1. In January 2003, COT Members were asked to provide urgent advice on the health implications of report on nickel leaching from kettle elements into boiled water, based upon results of a study commissioned by the Drinking Water Inspectorate (DWI). Members were provided with paper TOX/2003/02, which contained in Annex the draft full DWI study report, a summary of the data drafted by the COT Secretariat, the draft risk assessment of nickel from the Expert Group on Vitamins and Minerals (EVM) and an opinion previously provided by a COT expert to support the EVM evaluation.
2. A summary of Members' comments was approved by the COT Chairman and is attached at Annex A.

**Secretariat  
January 2003**

**COMMITTEE ON TOXICITY OF CHEMICALS  
IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT**

**OPINION ON NICKEL LEACHING FROM KETTLE ELEMENTS INTO  
BOILED WATER**

**Background**

1. The Committee was asked for urgent advice on the health implications of nickel leaching from kettle elements into boiled water, based upon results of a study commissioned by the Drinking Water Inspectorate (DWI). Members were provided with the full DWI study report, a summary of the data drafted by the Secretariat, the draft risk assessment of nickel from the Expert Group on Vitamins and Minerals (EVM) and an opinion previously provided by a COT expert to support the EVM evaluation.
2. Seven Members were able to provide written comments in the time available. The following summary of the comments was drafted by the Secretariat and approved by the Chairman.

**Nickel in boiled water**

3. The new data show that boiling of water in some types of exposed element kettle results in an increase in the nickel content. This is consistent with the results of previous studies reviewed in the DWI report.
4. There is no statistical analysis of the data in the DWI report and it is therefore not possible to draw conclusions with respect to possible effect of water filtration. The study design involved 3 types of filter, 8 models of kettle, 4 kettles per model, 2 samples of water, which were sometimes but not always pooled for analysis, with 8 sampling days. Specialist statistical expertise is required to analyse these data.
5. The data indicate that there might be a difference between filtered and unfiltered water. However this depends on a number of factors such as the age of both the kettle and the filter, type of kettle, whether the water is hard or soft, and how long the water is allowed to stand in the kettle after boiling. In practice, it is likely that kettles are often boiled containing appreciable amounts of water from previous use. The results of repeated boiling studies are odd since the nickel content of the water appears to decrease. The limited study of water boiled under "domestic conditions" indicates that if there is a difference it is much less marked when the kettle and filter are older.
6. The data only address water from two specific locations and it is not possible to determine whether these are representative of all water supplies, or how variable the results would be using water from other areas. Potential variables include the presence of organic compounds (e.g. in peaty water),

differences in reservoir conditions, distance water has been piped and types of piping used.

7. In considering the nickel levels that should be used in a risk assessment, Members concluded that it would be preferable to have more complete data on boiled water corresponding to normal usage of kettles. Members considered that if it is necessary to conduct a risk assessment on the currently available data, then since the leaching declines rapidly during the first seven uses, it would be more relevant to use the data from the later sampling points.

### **Health risks associated with ingestion of nickel**

8. As noted by the EVM, ingestion of nickel may result in an elicitation or exacerbation of allergic reactions in individuals who already have allergic sensitisation to nickel. Nickel-sensitised individuals should therefore be considered to be at greater risk; nickel sensitisation is more prevalent in women than in men. There is limited evidence that atopic dermatitis sufferers may have a higher rate of nickel sensitisation (Cronin *et al.*, 1993). An allergic skin reaction may result from single exposure to pre-sensitised individuals, but is not considered to be a serious health risk.

9. Oral exposure is not considered to cause skin sensitisation in the absence of prior exposure via jewellery or other skin contact. Oral exposure to nickel at an early age (prior to ear piercing) may inhibit subsequent development of allergic hypersensitivity to nickel (Todd *et al.*, 1989; Van Hoogstraten *et al.*, 1991; Vreeburg *et al.*, 1984). Therefore infants are not considered to be at greater risk than adults. In addition, there is some evidence that oral exposure to nickel may reduce sensitisation in those who already have contact hypersensitivity (e.g. Jovall *et al.*, 1987; Panzani *et al.*, 1995).

### **Information needs for risk assessment**

10. Since absorption of nickel from beverages such as tea or ingested with food is greatly reduced compared with absorption from water alone, information is required on the ways in which boiled water may be consumed, and the amounts consumed.

11. More information is required on the factors influencing leaching, using water samples that are representative of different supplies. A study with distilled water would be useful for comparison. More information is needed on different types of filter and kettle, on the time-course of changes in nickel leaching with the age of the kettle used, frequency and effects of descaling and how frequently consumers replace their kettles. Exposure data to be used in a risk assessment should be based on water boiled under conditions similar to those used in homes, the work-place and catering establishments.

## Conclusions

12. The Committee concluded that the results of the DWI report support previous observations that boiling water in some types of kettle may result in elevated levels of nickel in the water. No other conclusions could be reached in the absence of statistical analysis of the data.

13. Individuals with prior allergic sensitisation to nickel are at greatest risk of adverse effects arising from nickel ingestion. A single exposure to high levels of nickel in food or water may result in exacerbation or elicitation of an allergic skin reaction in these individuals. This is not considered to be a serious health risk. Infants are not considered to be at greater risk than adults.

14. In order to assess the risks associated with nickel in boiled water, more information is needed on the possible exposure resulting from use of different types of filter and kettle under normal conditions of use.

## References

Cronin E, McFadden JP. Patients with atopic eczema do become sensitized to contact allergens. *Contact Dermatitis* 1993;28(4):225-8.

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