

# **FACTORS CAUSING OFF-TASTE IN WATERS, AND METHODS AND PRACTICES FOR THE REMOVAL OF OFF-TASTE AND ITS CAUSES**

## **EXECUTIVE SUMMARY**

### **OBJECTIVES**

To provide an overview of the issues relating to taste and odour problems in drinking water with particular regard to the consumer perception of off-taste episodes, their causes and methods for detection and control.

### **REASONS**

Tastes and odours are major factors influencing the consumers' perception of drinking water quality. Consumers generally believe that if their drinking water tastes or smells 'off', then it is probably not safe to drink. This is because unfamiliar or unpleasant tastes or odours and appearance represent the only tangible and instant means for consumers to gauge the quality of drinking water.

Consumer complaints relating to off-tastes in drinking water are a significant concern for water supply companies, particularly in terms of their public image. Although drinking water quality in the U.K. as measured against health based parameters is very high, the recognition of objectionable odours or flavours in drinking waters undermines consumer confidence and raises often unfounded concerns about the safety of water supplies. The widespread usage of point of use devices (PoUs) in households to remove residues from drinking water is a largely a consequence of this consumer concern.

### **CONCLUSIONS**

Objectionable tastes and odours in drinking water originate from a wide variety of potential sources. However detecting the specific causes of what are often ephemeral taste and odour episodes poses particular technical challenges to water companies. The isolation and identification of chemicals responsible for off taste problems is often hindered by the fact that some residues have very low taste and odour thresholds down to  $\text{ng l}^{-1}$ .

Assessments of consumer survey data following serious taste and odour incidents confirm that the reporting of symptoms or health problems can in some cases be related to psychological factors or anxiety caused by an incident rather than to any actual toxic effects from the contamination. Attempts by water supply companies to reassure consumers are often unsuccessful because of difficulty in identifying specific causes of taste and odour problems, which may be short lived and may be caused by chemicals present at very low concentrations.

Significant discrepancies between the taste and odour descriptors used by consumers and those provided by trained taste and odour panellists can result in misleading data on which to base taste and odour investigations. A recent French study has indicated that about 90% of consumer complaints were identified by expert panellists as being caused by tastes or odours other than chlorine. Consumers' may recognise and report unpleasant off-flavours, but may not provide accurate or consistent taste descriptors. A combination

of the use of trained panellists and rapid analytical screening methods provides a more effective means of taste and odour identification.

The development of strategies or 'tool-kits' for water companies to enable better prevention, identification and optimised treatment of taste and odour problems could result in swifter resolution of taste and odour incidents and maintain better public relations. 'Tool-kits' could include operational monitoring or screening methods for taste and odour chemicals, micro-organisms identification methods, optimisation of removal techniques, and intake protection methods. The use of 'surrogate' chemical indicators for identification of causative organisms may also be applicable.

More rapid sample screening and identification of the extent and causes of taste and odour problems would be achieved by the use of integrating sample preconcentration techniques such as solid phase extraction (SPE). Solid phase micro-extraction (SPME-GCMS) merits further assessment as a rapid 'emergency' screening tool for taste and odour and other drinking water pollution incidents. There is considerable scope for assessing the utility of different SPME microextraction fibres for target suites of taste and odour compounds from both natural and anthropogenic sources.

The recent implementation of the Water Industry Approved Plumbers' Scheme (WIAPS) may improve plumbing practices in domestic premises and avoid some taste and odour problems which occur within consumers' premises such as from drinking water pipes being warmed by close proximity to hot pipes and lack of thermal insulation. However, it is likely that the main improvements from the introduction of these measures will occur in new premises or installations. The number of customer complaints relating to taste and flavour of drinking water which can be directly attributed to problems with washing machine supply hoses is significant and these problems would be reduced by restricting the use of non-metallic products to only those which meet the requirements of BS6920 and by better use of check valves.

Manufacturers normally test the efficiency with which point of use devices (PoUs) remove taste and odour problems from drinking water by carrying out chlorine reduction tests. Although it is generally assumed that PoUs based on activated carbon will remove many organic chemicals responsible for taste or odour problems from challenge waters no data was available from manufacturers to confirm this. The removal of some of the highly polar organic chemicals that may cause taste and odour problems by activated carbon may be less effective than for more hydrophobic chemicals. Further investigations would be required to determine the efficiency of activated carbon removal of taste and odour chemicals with a range of physicochemical properties.

Consumers' perceptions of health risks posed by taste and odour problems in drinking water and their desire for choice, their willingness to pay for 'quality' and their perception that food and drink products should satisfy their own view of what constitutes 'wholesome' or 'safe' will ensure that the use of PoUs for the treatment of drinking water and consumption of bottled waters will continue to be significant.