



Appendix II: Water

Mains Water

Water is a major ingredient in drinks from beverage vending machines. The quality of water supplied to vending machines is therefore of paramount importance.

The quality of water provided to buildings is specified by Directory 98/83 on the quality of water intended for human consumption which is to be implemented in the UK by 25th December 2000. This Directive requires that water shall:

Be free from any micro-organisms and parasites and from any substances which, in numbers or concentrations, constitutes a potential danger to human health.

Comply with minimum standards laid out in Annex I parts A and B, which lists a large number of potential chemical contaminants and two microbiological ones. The microbiological contaminants identified in the Directive are *Escherichia coli* (*E. coli*) and Enterocci species, both of which are required to be absent in a 100ml sample.

Annex 1 part C provides a further list of "indicator parameters" which includes coliform bacteria and colony count at 22°C. Monitoring of a mains supply is to include these two indicators. Coliforms should be absent in a 100ml sample and there should be no abnormal change in the colony count.

Water in a Vending Machine

Water, in whatever form, when dispensed from a vending machine is by definition a food. As such, the requirements which apply are those contained in the Food Safety (General Food Hygiene) Regulations 1995 and not the drinking water regulations. Microbiological testing carried out on water from a vending machine is done in the context of the requirements of the general food hygiene Regulations, rather than in the context of the drinking water Regulations applicable to mains water. There are no specific microbiological standards in the general food hygiene Regulations. The Regulations do however require that water used in food production must be potable so as not to adversely affect the wholesomeness of the finished product. The supply to which a vending machine is connected should comply with this requirement.

A water cooler supplied from a bottle would be the subject of further consideration and guidance on this is available in the Industry Guide to Good Hygiene Practice: Bottled Water Guide.*

Microbiological Testing of Water

The testing of water from vending machines assesses the quality and safety of the vended product, and the adequacy of cleaning regimes. Further details about the type of tests carried out and the implications for vending operators are provided below.

Aerobic Heterotrophic Colony Count

The Aerobic Colony Count (also reported as Total Viable Count (TVC) or simply colony count) at a given temperature only represents the bacteria and fungi, which are able to grow at the set temperature in the culture media used in an aerobic environment. This may represent only a small proportion of the total number of micro-organisms present in the sample. The count is reported as colony forming units (cfu) in a given weight or volume of sample. 22 °C is considered a good temperature for growth of organisms naturally present in the soil and cold water, and 37 °C is chosen because this is the human body temperature and bacteria, which may affect humans, will grow best at this temperature. To further identify potentially harmful bacteria examiners carry out specific tests. It is because there is no evidence on the harmful nature of the general bacterial population that grows at 22 °C and 37 °C that the Directive has not set limits on these measures. The microbiological count at 22 °C or 37 °C in UK mains water arriving at a premises is usually less than 100 cfu per ml. However micro-organisms tend to stick to and then grow inside tubing (more to plastic than metal) forming a biofilm. Bacteria multiply in and detach from this film so the count in water arriving at a vending machine after passing through a building may be higher than that in the incoming mains water. A number of factors will adversely affect the count in water. Low usage of water allowing a long time in the pipe, high temperature, dead legs, and storage tanks will all tend to increase the count. The growth will continue inside a vending machine. Levels of 100,000 cfu per ml are not uncommon. To put this figure in context, < 100,000 is the target level, for instance, in salad sandwiches.*

Pseudomonas aeruginosa

Pseudomonas species are frequently present in the mains water, but at such low levels that they may not be detected in routine samples. However, they grow in cold water systems. It is not uncommon to detect *Pseudomonas* in the water from a vending machine. It has been reported that if large numbers are allowed to grow within drinks vending machines, they may affect quality and may cause an adverse taste. In the unlikely event of such an occurrence the procedure would be to isolate the machine from supply and thoroughly clean the cold water tubing.

Because there is no evidence that *Pseudomonas aeruginosa* is harmful to health when ingested, there are no agreed standards for this bacteria.

Coliforms

Coliforms, and indeed, *E. coli*, a member of the coliform group, are occasionally found in mains water at low levels. Their presence must generate an investigation by the supplier. However, the main cause of the presence of coliforms in water samples from vending machines is contamination of the dispense head. As with all measures of bacteria that are not pathogenic, the importance is not so much in the individual result, but in the result set in context with other results. Low coliform counts are not inherently a cause for concern, but indicate further investigations are necessary, perhaps into the cleaning regime.

Readings above 10cfu per ml (1,000 cfu per 100ml) or presence of *E. coli* in 100ml would normally be an indication for the sanitisation of the machine.

Cryptosporidium

Cryptosporidium is a protozoan parasite that can occur in water and gives rise to symptoms similar to food poisoning. The control of cryptosporidium in mains water is now reinforced by Government Regulations and water undertakers with a high risk of cryptosporidium in their source of supply now have to take special measures. Normal filters will not remove this parasite from the water supply. The presence of cryptosporidium at levels that pose a risk to health would give rise to a "Boil Water Notice".

Filters

Activated carbon filters are often used to improve the taste of water by removing organic materials and halogens (often chlorine), which are initially introduced into the water supply to control bacterial growth. Ion exchange units are used to remove calcium, partly to decrease scale build-up on hot water tanks and partly to improve the appearance and test of tea. Both these units provide sites for bacterial growth. Sometimes activated carbon is treated with silver to inhibit growth but this is not always effective. The management of these units is important and they should be maintained and changed in line with the manufacturer's recommendations. Their presence should be taken into account when sanitising machines and pipework.

Boil Water Notices

Should the mains water supply become contaminated, the water undertaker will generally make consumers aware through the media. If the source of contamination is microbiological, a "Boil Water Notice" is usually issued. Under these circumstances it is usually satisfactory for the hot side of a beverage vending machine to continue operating and for the cold side to be switched off. This is because most modern vending machines operate at over 80 oC and have a low temperature cut out. Machines without such a low temperature device should be switched off during the course of a "Boil Water Notice". If there is any doubt about the correct action, the machine should be switched off and advice sought from the local Environmental Health Department, water supplier or the AVA.

Once the "Boil Water Notice" has been lifted, those parts of the machine which have been inactivated, should be cleaned with a sanitising solution and thoroughly flushed with mains water.

Occasionally water supplies are subject to chemical contamination which if sufficiently serious will result in the water undertaker advising consumers not to use water for drinking and cooking. In these cases it is likely that all machines will need to be taken out of service. Once the water undertaker has resolved the problem the machine should be thoroughly flushed with mains water, cleaned with a sanitising solution and then thoroughly flushed again using mains water.

Legionnaires Disease

Since Legionnaires disease has a connection with water, some users of vending machines have asked for the dispensed water to be tested on a regular basis for the presence of *legionella* bacteria. Most testing for hazardous substances is based on an estimate of the risk of the substance being present and its potential for causing harm. In the case of *legionella*, the bacterium is widely distributed in the environment and may, on very rarer occasions, be present in low numbers in the water supply. However, its mode of transmission is through the inhalation of droplets of contaminated water. Thus, in the case of a hot drinks vending machine, the heat would kill any *legionella* bacteria present. Where cold water is dispensed, even if carbonated, the temperature would need to be >20 oC to allow growth of the organism. The chances of this

occurring are considered to be so small as to be negligible and the routine sampling of water from vending machines to detect the presence of *legionella* bacteria is not recommended.

Immunocompromised People

It has been recommended by a working group of experts that certain immunocompromised people should boil and cool their drinking water whatever its source including tap and bottled water. They should also use boiled, cooled water to make ice cubes.***

It is recommended that within hospitals machines are not sited in ward areas with patients at particular risk from environmental bacteria, these would include wards such as intensive care, neonatal, AIDS and transplant units.

* Currently in draft form only. For details contact Food Standards Agency, Microbiological Safety Division, Tel: 020 7972 5071

** Data for sandwiches is taken from the British Sandwich Association Code of Practice and Minimum Standards for Sandwich Manufacturers, Producers 1999.

****Cryptosporidium* in water and the immunocompromised, CDR weekly, vol 9. No 33 of 13 August 1999.

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