

The Microbiological Quality of Water from Vending Machines and Mains Water Coolers

Below is some useful background on water from vending machines and mains water coolers. After reading this information, if you require more, then the AVA position on microbiological quality of water, below, is set out in more detail in Appendix III of the Industry Guide to Good Hygiene Practice. The Guide, available from TSO at <https://www.tsoshop.co.uk/bookstore.asp?Action=Book&ProductId=9780112430995>, is an official guide recognised by the Food Standards Agency.

Mains Water

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

The quality of water provided to buildings is specified by Directive 98/83EC on the quality of water intended for human consumption, which is implemented in England by the Water Supply (Water Quality) Regulations 2000, in Wales by the Water Supply (Water Quality) Regulations 2001 (Wales) and in Scotland by the Water Supply (Water Quality) (Scotland) Regulations 2001. These Regulations require that water provided for human consumption shall be wholesome and clean. It defines water which is wholesome and clean as that which:

- is free from any micro-organism and parasite and from any substance which, in value or concentration, constitutes a potential danger to human health;
- complies with standards laid out in Schedule I parts A and B, which lists a large number of potential chemical contaminants and two microbiological ones. The microbiological contaminants identified in the Schedule are *Escherichia coli* (*E. coli*) and *Enterococci* species, both of which are required to be absent in a 100ml sample.

Schedule 2 provides a further list of “indicator parameters”, which includes coliform bacteria and colony count at 22°C and 37°C. Monitoring of a public supply has to include these as indications of the quality of the supply and the integrity of the mains supply network. Coliforms should be absent in a 100ml sample and there should be no abnormal change in the colony count at either incubation temperature.

The Regulations specify that the point at which compliance is determined is the consumer’s tap. Water supply companies in England, Wales and Scotland take approximately 300,000 samples each year for analysis and, while they are not responsible for the condition of the supply system within buildings, they must report on this if samples they take are found to fall below the standard.

Microbiological Testing of Water from Vending Machines

Testing of water from vending machines for compliance with the Regulations would include *E. coli*, coliforms and colony count. The importance of the testing for measuring the quality and safety of the water and the adequacy of the cleaning of a vending or dispensing unit will be outlined below.

The standards for vending machines are essentially those of the Regulations. However, it is important to note that while the Regulations define water which is wholesome, samples which give results above those in the Regulations do not necessarily imply that the water is unsafe to drink.

Aerobic Hetrotrophic 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 under an aerobic environment. This is likely to represent only a small proportion of the total number of microorganisms present in the sample. The count is reported as colony forming units (cfu) in a given weight or volume of sample. Tests are carried out at 22°C and 37°C and it is because there is no evidence on the harmful nature of the general bacterial population that grows at either of these temperatures that limits have not been set for these parameters. The Regulations specify no abnormal change in this parameter. This is because any change could indicate a disturbance within the distribution system. Paragraph 6.25(v) of the DWI guidance to the Regulations* makes it clear that the base for measuring abnormality of change is the count from the given outlet over a period of time, not whether an individual count is elevated.

The microbial count at 22°C in UK mains water arriving at a premises is usually less than 100 cfu per ml. However, a number of factors could adversely affect the count in water depending on the storage and distribution system within the building. Low usage of water, allowing a long residence time in the pipe, high temperature, dead legs, and storage tanks will all tend to increase the count. Microbial growth will also continue inside a vending machine. Levels of 10⁵ cfu per ml (10,000 per ml) in water from a vending machine are not uncommon. However, if levels above 10⁵ are found it would be good practice to sample from the stopcock and the end of the inlet hose to identify where growth might be occurring.

Coliforms

Coliforms and *E. coli*, a member of the coliform group, are occasionally found at low levels in samples of mains water taken from consumers' taps. Their presence must generate an investigation by the water supplier since it could indicate a break in the integrity of the mains network.

The main cause of the presence of coliforms or *E. coli* in water samples from vending or dispensing machines is known to be human contact with the dispense head. The first action should be thorough cleaning or replacement of the dispense point.

Detection after cleaning or initial levels of coliforms greater than 10³ cfu per 100ml are both unusual and the remedial action should be taken. Regular detection of coliforms in a machine or group of machines cleaned by a particular operator would suggest the need for a review of the cleaning procedures and operator training. As with all measures of indicator

bacteria (rather than specific pathogens) , the importance is not so much in the individual result, but in the result set in context with other results. Paragraph 6.25(iv) of the DWI guidance on the Regulations* makes it clear that low numbers of coliforms (in the absence of other faecal indicators) do not represent a risk to health, but indicate further investigations are necessary. It should be noted that it would be highly unlikely that the presence of these bacteria would result in ill health of those who have been consuming the water.

The presence of *E. coli* in 100ml of sample water would be very unusual and should be investigated. The cause is usually contamination of the dispense point, but might be because of ingress of contamination at other points in the system. The first action would be thorough cleaning or replacement of the dispense point. It would be good practice to check that this cleaning had been effective.

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. There is one report in the literature 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 the water supply and replace or thoroughly clean the cold-water tubing.

Pseudomonas aeruginosa is recognised as an opportunist pathogen in wounds but there is no evidence that *Pseudomonas aeruginosa* is harmful when ingested and it is for this reason that there are no agreed standards for this bacterium in mains water.

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". (See Appendix IV)

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 taste 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 tubing.

Contamination of mains water supplies

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. Detailed advice on the action to take in these circumstances is provided in Appendix IV.

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, as a minimum, be thoroughly flushed with mains water, cleaned with a sanitising solution and then thoroughly flushed again using mains water. Further advice may be issued by the water undertaker.

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 rare 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°C 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.

**Guidance on the Water Supply (Water Quality) Regulations 2000 (England) and the Water Supply (Water Quality) Regulations 2001 (Wales), Drinking Water Inspectorate May 2005*

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