Ensuring the supply of good water for use in the meat sector

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It is impossible to produce good and wholesome food without water. It is an ingredient, a means of production and when it is a cleaning material it ensures safe food production.

At a strategic level there is always the question of sufficient water availability. At a local level the question is one of quality and continuous supply.

The amount of water available varies from area to area. The balance of supply and need is constantly changing. As the world population grows it places pressure on supply. As industrial demand increases there is even more pressure on supply.

Water (ice) has close contact with many foodstuffs.

Threats to water supply

As climate change impacts on weather patterns it may affect where and when the rainfall occurs and how much feeds into the system. The expanding population and industrial activity can threaten water quality. So we take good water supply for granted at our peril.

Even the best water supply can fail and the threats to water supply can come from:

- Natural contamination.
- Accidental pollution.
- Water treatment failure.
- Water distribution system.
- Malicious tampering.

Infectious agents of microbial origin can get into the water system through natural events and contamination from cyclospora, giardia and cryptosporidium has to be guarded against.

Accidental pollution can occur, such as 20 tonnes of aluminium sulphate solution which was accidentally discharged into the water supply in Cornwall, UK, the material from sewage works entering the water supply in Worcester and the 'Burncrooks diesel incident' when a significant amount of diesel fuel entered the water mains of a major city.

The resulting contamination can cause severe operational consequences.

There can be water treatment failures that may also include deficiencies in monitoring procedures. The 'O157 Walkerton incident' in Ontario, Canada, was caused by inadequate water treatment and disinfection. Seven people died and more than 2,300 became ill from E. coli O157 and Campylobacter jejuni infections. The estimated cost of this incident was more than $US60 million.

In areas with a long established water distribution system there can be breakdowns in the service. Backflow through the system can be a threat, and where water or water using equipment is used with fluids or materials which could contaminate it, there must be adequate protection to stop backflow of potentially contaminated water into other parts of the system, especially potable water. In London, for example, we are still replacing water pipes that were laid when Queen Victoria was on the throne – 120 years ago. As well as being old, they have been subjected to bomb damage in the 1940s as well as the increased strain of traffic.

The threat from terrorism is not new. In the 6th Century BC Assyrians poisoned the wells of their enemies with rye ergot and, more recently, at least eight organisms and eight bio toxins have been judged to be a threat to the potable water supply if used maliciously.

Such one off events may seem of little consequence but on average, 8.6% of community water systems in the US reported violations in the standard of drinking water in 1996. In some areas of the country, this level was in excess of 11% of systems.

Even if we do have a good local water supply the structure of the world food chain is such that our ingredient suppliers may well face shortages of good water, and that will have an impact on our production.

The impact of a failure in supply translates into downtime in the factory, or closure of a restaurant or food business.

Downtime can be broadly classified into two categories:

- Complete failure of the water supply – there is no water!
- Contamination of the water supply – you have water but can not use it or it requires some form of additional treatment before it can be used.

Alternative supplies

In situations of no supply alternative water supplies, such as bowsers/tankers, would normally be made available, but for a business requiring substantial supplies, such as abattoirs or processing plants, the only alternative could be closure until supply is

resumed unless the business has standby arrangements, or carries a large on-site storage facility.

A meat company should also test its own water supply to establish if the contamination came on site and passed through its pipe work. In the case of significant bacteriological failure the water is of little value to the meat or poultry processor.

An investigation would be undertaken to ascertain the cause of contamination including extensive sampling from the treatment works, tanks and distribution pipe networks to various parts of the plant.

Remedial action may include anything from sources being taken out of supply through to disinfection of mains/service pipes.

Impact of downtime

The impact of downtime is, to an extent, determined by what uses water is put to in your business. It may be an essential food ingredient or a means of washing raw materials. It will probably be used for cleaning of food contact equipment and the processing environment and most certainly required for sanitary facilities for personnel, including hand washing

As a food ingredient or the means of washing raw materials it comes into direct contact with the food so is there a critical control point such as a subsequent lethal process? Where it is used for cleaning and personnel issues then cross contamination is a factor and questions may be asked about the infective dose of the contaminating organism. Can alternative protective means be used?

Any food processing company or business should have a documented action plan, as part of their operations manual, stating how they will deal with this type of emergency.

Experience shows that few do have a plan.

A modest further processing plant where water was a critical ingredient had no plan and thought the only solution would be to stop production entirely.

A small processor had a documented plan in which their responses to different causes of water supply interruption were laid out and ready to kick in, but the most important factor was that they had built enough storage on site to continue production for 24 hours.

This would not only give them continuity, but in the event of a longer loss of supply they could take in tankers from a non-affected area, and if they had to stop production they would at least be able to clean down and be ready for a flying start when normal supply resumed.

Larger businesses are usually more prepared and will often have their own water treatment facilities, especially if water is a major component of their product and potable water is already further treated as a matter of course. Ideally they will be able to draw water from their own wells.

The action plan of one large producer

took into account not just processes and products because it would affect the whole site. There was a 12-24 hour backup of potable supply and plans to have further water tankered onto site that may then be treated in sufficient volumes to meet the total site needs.

Contaminating substance

Such contingency plans do not end when supply is resumed. The contamination may have entered the business' internal water system. Are there plans to empty, flush and sanitise the system before replenishing it with potable water? Some questions that need to be resolved include discovering what the contaminating substance/organism was because that will affect the decontamination regime.

For instance, bacteria will adhere to a surface in a matter of minutes and a biofilm can develop within hours. Development may, however, take a number of days depending upon the production lines and cleaning protocols in place. Within approximately two hours, short term attachment takes place.

Over several hours, mid term attachment occurs, while long term attachment is longer than 10 hours.

Adequate cleaning should reduce the prevalence of long term attachment on food and hand contact surfaces.

The bacteria in the biofilm are protected from the action of biocides, including cleaning chemicals and antibiotics. An increase in resistance up to 1000 times has been reported.

Risk assessment will be required, looking at the minimum infective dose, biofilm or adherent bacteria and the planning to use effective biocides. The decontamination protocol should form an integral part of any action plan and the total plan should form part of the Quality Manual. It should include:

- Responsibility – who does what.
- Emergency contacts – water supplier, customers, chemical suppliers, enforcers.
- Equipment issues – identity and order of switching, sanitary facilities, emergency tankers, emergency systems.
- Communication procedures – who talks to who.
- Isolation and product recall – identifying at risk product and procedures for removing from the system.
- Decontamination protocols – options for alternative contaminants.

The Water Plan should be reviewed regularly and updated.

Impact on production

With such a plan it would seem that food companies in developed countries are well protected against the vagaries of intermittent supply of good water.

However, the structure of the world food chain is such that our ingredient suppliers may well face shortages of good water, and that will also have an impact on production.

The effects of a supplier's water crisis are likely to impact over a longer period. There could be time to find alternative supplies. That assumes that you have been told of the fresh water irrigation system being contaminated with sewage, or that the continuous flow has been stopped and there is now a half day rationing system.

The statement that the expansion of the global population may outpace the development of fresh clean water may well be ignoring the fact that a thirsty population may not survive to reproduce!

On the other hand, it may mean that the growing population consumes the good water that would otherwise be used for food production.

It may well mean the farmers have to make do with less palatable waters that will impact on the quality and safety of their produce. There are examples such as the fish farm being fed sewage from pig farms.

There is also the fact that up to 90% of people in developing countries are infected with Helicobacter and this can be spread by contaminated water.

For food companies relying on the supply of water critical products from overseas sources it will be ever more important that they take a pro-active stance in their supplier's own water plan. The issues associated with water supply will not improve and global investment is needed in all countries to source increasing supply of good quality water.

Communication between the water provider and sensitive customers is key to avoiding a crisis, and the food industry must be aware of the potential dangers and document realistic action plans for themselves and, if necessary, for their suppliers. ■