FACTSHEET

Managing mineral content of water for pigs

Different minerals have varying effects in terms of challenge, either to the pig's health or to the unit infrastructure, with regard to chemical or physical reactions.

Pigs often have a higher tolerance than humans to many minerals found in water. Pigs are tolerant to high sodium and chloride levels; water supplies with high levels of these minerals and heavy metals can lead to an unpleasant taste, discoloration, pipe blockages and damage to equipment. Unpleasant tasting water causes reduced intake of water, which affects pig productivity.

Total dissolved solids (TDS) is a measure of all dissolved minerals in water (Table 1). Assessment of TDS should be carried out to determine the risk of one or more minerals being present in excessive amounts and, potentially, having a detrimental effect on health or production (Table 2).

Incoming water to the unit should be analysed first for TDS. If products, such as organic acids, are added then further tests downstream maybe required.

- High sulphate levels (>250ppm) in water can cause diarrhoea. All major sulphate salts are laxative. Recent analysis of UK borehole water samples show that up to 16% of 140 livestock units were above the limits for sulphate levels
- Nitrates can be converted to more toxic nitrites in the pig's body, which can have detrimental effects on the ability to carry oxygen. High levels of nitrates were found in 7% of UK borehole sites. High nitrate levels should be followed by tests on the bacterial quality of the water
- Pigs tend to be tolerant of calcium, but high levels can interfere with the absorption of phosphorus and the effectiveness of the tetracycline group of antibiotics
- Calcium alongside magnesium forms part of the water hardness rating. Hard water promotes limescale build-up within pipelines and drinking systems, which can reduce flow rates
- Calcification of biofilms protects microorganisms from the effects of chlorine water sanitisation
- Dissolved iron salts are common in ground water and high levels are problematic in waterlines. At low levels of 2–3 ppm, iron can have an indirect, detrimental effect on pig health when used for bacterial growth; iron is essential for the growth of most bacteria, including *E.coli*.

Table 1. Potential chemical components of water and risk levels

Mineral	No Risk (ppm)	Risk (ppm)	Detrimental effects for pigs
pH	5–8	>9 and <4	No direct effects
Ammonia	<1	>2	Limited effects
Nitrite (as N)	<0.1	>1	May reduce oxygen binding capacities of haemoglobin
Nitrate (as N)	<25	>100	Rarely seen. May be concurrent with bacterial contamination
Chloride	<250	>1,000	Poor taste may reduce water intakes
Salt (as NaCl)	<1,000	>2,000	Acute salt poisoning
Iron	<0.2	n/a	Blockage of waterlines may result in poor intakes. Scour at high levels
Manganese	<1	>2	Limited detrimental effects
Sulphate	<100	>250	Diarrhoea in young pigs at high levels. Limited effects and adaption possible at lower levels
Magnesium	<400	n/a	Limited detrimental effects
Calcium	Max. 1,000	n/a	Limited detrimental effects

Table 2. Evaluation of the water quality for pigs based on TDS

Total dissolved solid (mg/l)	Comments
<1,000	No risk to pigs
1,000–2,999	Satisfactory for pigs. Mild diarrhoea may occur in pigs not adapted to it
3,000–4,999	Satisfactory for pigs. May cause temporary refusal of water and temporary diarrhoea
5,000–6,999	Reasonably safe for pigs. Higher levels should be avoided for pregnant/lactating pigs
7,000–10,000	Unfit for pigs. Risky for pregnant, lactating or young pigs, or those exposed to health stress/water loss
>10,000	Not recommended for use

- Pigs are tolerant of variable pH levels
- pH can have detrimental effects on products added to water. For example, chlorination gives a reduced water sanitisation effect at high water pH (alkaline water > pH7) and the solubility of many medicines added to water is pH-dependent
- An acceptable range of pH in the primary water supply is pH 5–8 in terms of pig health, but acidification of drinking water to hydroxide (OH_4) appears to gives benefits to intestinal health in pigs

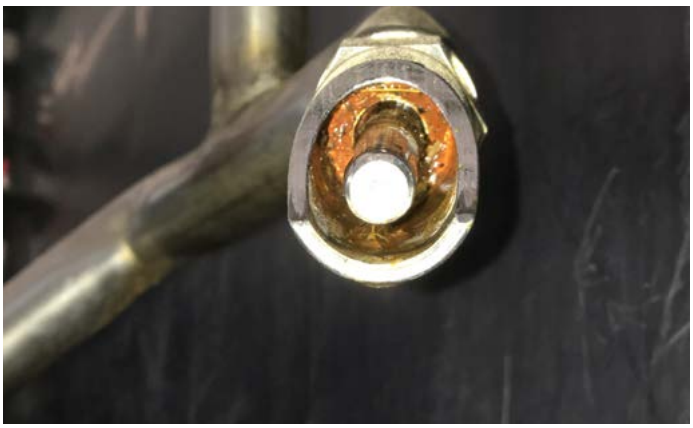
Testing your water will identify whether there are any concerning levels of minerals. A common way of addressing high mineral content in the supply source is through filtration. The basic requirements of a filter is to remove gross debris from the incoming water. The finer filtration process deals with excessive levels of mineral contamination. Filtration and reverse osmosis are commonly used in the UK to clean up local water supplies.

It is recommended that you always seek professional advice when selecting the appropriate method of removing contaminants from your water supply.

Cleaning water systems

Once established, biofilm (slime) is difficult to eliminate, because particles containing bacteria and minerals break off, and effectively seed the downstream area. Therefore, regular cleaning is required. Biofilm tends to efficiently establish in waters with high calcium, magnesium, iron and manganese levels. Build-up can reduce recommended flow rates.

Refer to the *Key figures for pig accommodation in England – legislative requirement* guide.



Biofilm in a drinker

Health and safety statement

Before carrying out any water sampling or treatment, conduct a health and safety risk assessment; this will cover, for example, working with water under pressure, chemicals and proximity to electrical equipment and supplies. A Control of Substances Hazardous to Health (COSHH) assessment will be needed where any chemicals are involved.

When cleaning a water system, you should always:

1. Consider a site survey
   - Full layout of existing pipework (source to each drinker)
   - Identify/eliminate dead ends, unused pipework or inadequate flow rates
   - Mark static water storage (tanks)
   - Break pipework to look for sediment and biofilm
2. Take water samples at the source, static water storage (tanks), midline and end of line (drinker)

   Refer to the *Standard Operating Procedures: Water sampling for microbiology, minerals, flow rate and water temperature* and *Water sampling for microbiology (Farm assurance requirement)* factsheets.
3. Dose the water with sanitiser, in the best position to achieve a full system clean. Always check individual supplier's instructions. Antimicrobial products of the same type can differ in product form, delivery method, frequency of treatments and concentrations between suppliers.
4. Heavily contaminated area may require 'shock dosing' with a high concentration of a suitable chemical. Shock treatment is suitable to treat specific areas of the unit, e.g. separate farrowing rooms or weaner areas, which are 'all-in, all-out'.

   Refer to the *Shock water treatment guide.*
5. Carry out ongoing maintenance level of dosing, dependent on initial water quality at a lower level than shock dosing, following the manufacturer's guidance
   - Regularly check concentration level of sanitiser present at the drinker. Test 'dip' strips can be used for some chemicals
   - Sanitisation products may have an effect on further products added to the water, e.g. antibiotics and vaccines. Check manufacturer's guidance on compatibility

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