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EMERGENCY CHLORINATION OF FARM WATER SUPPLIES

By H. C. HUGHES, Chief, Agricultural Division, Government Chemical Laboratories

TOWARDS the end of summer (and especially in a drought) the risk of water in dams, soaks, wells or tanks becoming polluted is increased. Bore water is much less likely to be affected unless the bore is poorly sited near a farm building, such as a shearing or milking shed, a pig pen, or a septic tank system.

As with all troubles prevention is better than cure. Stock should not be allowed to drink directly from the source of water supplies. Dams and soaks should be fenced, wells and tanks covered and stock watered by pumping or siphoning to tanks or troughs.

These are the precautions a farmer ideally should take to protect the farm water supply; but what can be done if money or time have prevented fencing or pumping, or neglect or accident have allowed stock directly into water? What steps should be taken if water is fouled by droppings or urine or an animal has drowned or foundered in the water?

First Action
Whatever the water source the cause of the pollution should be removed. Carcasses or rotting algae should be carted away and burned if possible, or buried.

Stock losses
If water pollution is believed to contribute to stock losses emergency chlorination can be carried out. However, pollution may not be the cause. Disease or stress may be responsible for deaths near the water supply and salt poisoning is possible in dams or soaks when evaporation has concentrated the salts in the water (see Department of Agriculture Bulletin 3082). Only an examination of the dead animal by a veterinary officer will confirm the cause of death.

Chlorination
Chlorine demand
All waters have a "chlorine demand" which is the amount of chlorine used in a given time by reaction with matter dissolved or suspended in the water. Water can be disinfected if an amount of chlorine in excess of the chlorine demand is added and allowed to remain for sufficient time.

Water can be treated by assuming a chlorine demand for comparatively clear clean water of 10 parts per million and 100 parts per million for badly fouled water. This can be adjusted later if necessary.

Time of day
Chlorination compounds once dissolved are decomposed rapidly by sunlight and heat, so water should be treated in the evening.

Chlorination chemicals
The chemicals required can be purchased from stock firms, pharmacies, agents for swimming pools, or, if household bleach is used, from grocers.

Bleaching powder is known also as chloride of lime or tropical chloride of lime. It contains about 30 per cent. available chlorine and is stable only while kept in airtight containers which have not been opened.

Calcium hypochlorite, or high test hypochlorite, contains about 70 per cent. available chlorine. It is in a granular form more stable than bleaching powder but should be used within two months of the container being opened.
Amounts of chemicals required to give various chlorine doses per 1,000 gallons of water

<table>
<thead>
<tr>
<th>Chlorine Dose</th>
<th>Bleaching powder (33½ per cent.)</th>
<th>Calcium hypochlorite (70 per cent.)</th>
<th>Sodium hypochlorite (10 per cent.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p.p.m.</td>
<td>oz.</td>
<td>grammes</td>
<td>oz.</td>
</tr>
<tr>
<td>1</td>
<td>⅛</td>
<td>14</td>
<td>⅛</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>140</td>
<td>2½</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>285</td>
<td>4½</td>
</tr>
<tr>
<td>50</td>
<td>25</td>
<td>710</td>
<td>11½</td>
</tr>
<tr>
<td>100</td>
<td>50</td>
<td>1420</td>
<td>23</td>
</tr>
</tbody>
</table>

Sodium hypochlorite is made up into a number of bleach solutions containing up to 15 per cent. available chlorine, but laundry bleach is usually 3 to 5 per cent. This solution is not stable and decomposes with age.

Organic chlorination compounds intended for swimming pools are more stable to sunlight when dissolved than the others, but are more expensive and are not advised for emergency chlorination of drinking water.

**Method**

The required amount of chemical calculated from the table can be made into a concentrated solution and sprayed or sprinkled directly, either from the banks or from a dinghy or raft. Correct mixing is hard to achieve as too-vigorous stirring will bring up sediments from the bottom which will use the chlorine. Any algae in a dam or soak will be killed by the chlorine and this will complicate the problem. Suspended solids can shield embedded bacteria from the action of the chlorine.

For these reasons batch-wise chlorination is more efficient.

**Batch-wise chlorination**

Efficient chlorination can only be achieved by treatment of smaller volumes in containers, preferably covered tanks. Emergency containers such as drums or troughs could be used for smaller amounts. Calculating the rates of addition, mixing, and ensuring a correct dose are all easier when smaller volumes of water are treated.

A smell of chlorine from the water the morning after treatment is an indication that sufficient chlorine has been present long enough to be effective.

Alternatively a chlorine test kit as used for swimming pools can be used to test the water if one is available. A residual chlorine of at least 0.1 p.p.m. after two hours contact indicates sufficient chlorination.

**Domestic supplies**

If water is drawn from a dam or soak the batch-wise procedure already described should be used.

If the water comes from a well it can be pumped dry, the walls and bottom cleaned as much as possible and sprinkled with powder or sprayed with concentrated solution, and washed down again after some hours. Steps should be taken to ensure contamination does not recur. The first refill of water should also receive a small dose of chlorine as a further precaution.

While chlorination of water not to be used for drinking is not strictly necessary, it is reassuring.

**Taste and smell**

Recently chlorinated water will almost certainly have a taste. After standing and aeration the taste due to chlorine alone will diminish but the “antiseptic” or “chemical” taste due to reaction with organic matter in the water may persist.

This is the penalty to be paid for the treatment. Levels of chlorine in the water when it is sufficiently palatable to drink are not harmful.
Alternative treatments for drinking water

Remember that boiling all water for drinking is possibly an easier means of purification. Disinfecting tablets based on iodine are also available from pharmacies.

What chlorination does and does not do

Not all disease causing organisms are killed by treatment and only efficient chlorination will kill the susceptible organisms. Through its germicidal effect chlorine kills bacteria responsible for most forms of food poisoning, gastro-enteritis, para-typhoid fever and dysentery. However, one shock dose will not ensure against all diseases which could result from pollution or contamination, and it is impossible to satisfactorily treat fouled muddy banks which could rapidly recontaminate the water.

Chlorination gives other benefits as it destroys some taste and odour producing organisms, kills algae and slime organisms, and aids precipitation of iron. But some tastes are intensified and dead algae must be removed. Chlorination does not affect toxins causing botulism produced by organisms which grow on putrefying carcases or rotting vegetable matter:—this is another reason for the removal of such contaminations.

REMEMBER CHLORINATION'S BENEFICIAL EFFECTS ARE NOT LONG LASTING AND DOSING MUST BE CONTINUOUS IF CONTAMINATION IS CONTINUOUS.

Water analyses

Analysis of water for chlorine demand, salt content or in connection with any water use or treatment is carried out by the Government Chemical Laboratories, 30 Plain Street, Perth. Advice on emergency problems will be given by phoning 23 1443 or, in appropriate cases, the Local Health Inspector.

Simple salinity tests can be obtained at district offices of the Department of Agriculture.

Chlorination is a last resort measure. Pollution prevention should be the first.

ANIMAL HEALTH

Although water supplies on many farms in Western Australia are severely contaminated this has caused few stock losses.

Department of Agriculture recommendations on chlorination of stock water supplies are:

- Chlorination is not worthwhile unless there are signs of sickness in the stock. Paratyphoid (salmonellosis) is the disease most likely to be caused by contaminated water and this may be indicated by an outbreak of scouring. But there are other causes of scouring (salty water has been the most common in recent weeks) and veterinary confirmation should be sought.
- It is best to treat water in batches, in tanks or troughs, because there is less organic matter present and less chance of re-contamination. It is also easier to calculate the volume of water to be treated.
- Large-scale chlorination—such as in a contaminated dam—is not practical because large amounts of organic matter interfere with the disinfectant.

- In heavily contaminated water, treatment would have to be repeated daily to be fully effective. Tests at the Animal Health Laboratory indicate that unless the source of contamination is removed the paratyphoid organism can return to its pre-treatment level within 24 hours.
- If chlorination is considered necessary and it is impossible to treat in batches the dam (or soak) should be treated on three consecutive evenings with 5 lb. of bleaching powder per 1,000 gallons (about 160 p.p.m.). Stock should be removed during treatment.

A single treatment of 1,000 yards of water at this rate costs about $100. In most cases the money would be better spent on equipment to allow batch-wise treatment.

NOTE: 1 cubic yard of water = 168.75 gallons.