BEACON WATER TREATMENTS LIMITED

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http://www.hse.gov.uk/legionnaires/

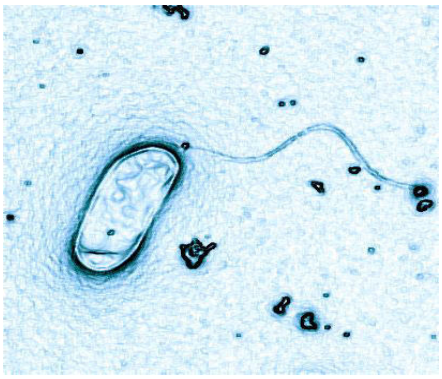
Legionnaires' Disease

LEGIONNAIRES' DISEASE

DEFINITIONS, SOURCES, ROUTE OF INFECTION, HIGH RISK SYSTEMS, CONTROL MEASURES, SAMPLES

DEFINITION

Legionnaires' Disease is a potentially fatal lung infection which can be caught by inhaling water droplets that contain the bacteria *legionella pneumophila.*



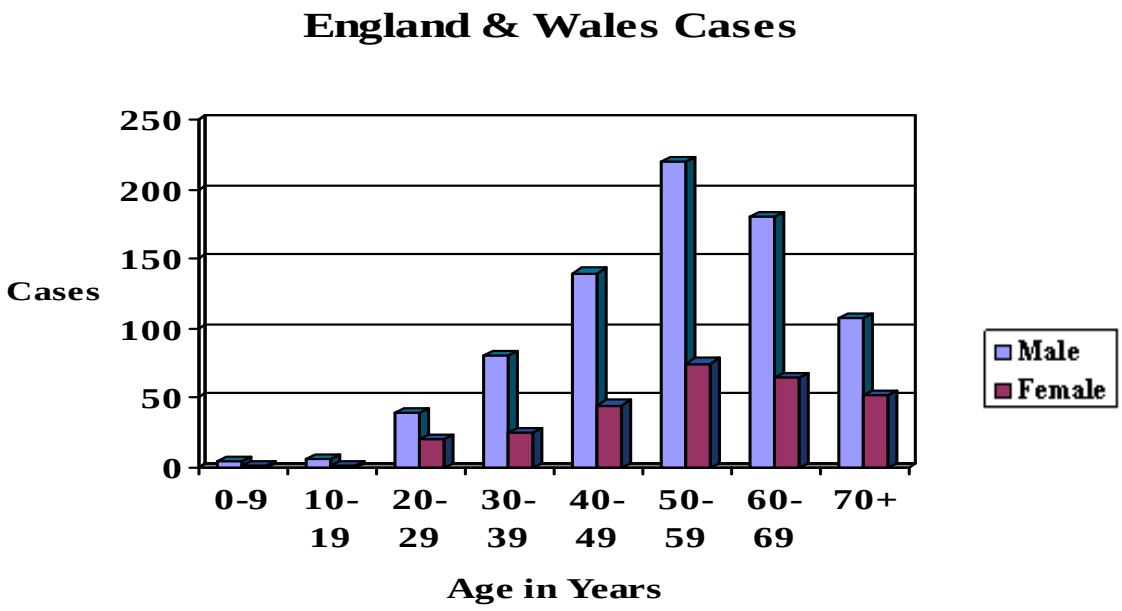
The Legionella bacteria, which is transmitted through water, was named in 1976, when attendees at an American Legion conference in Philadelphia became ill with what appeared to be pneumonia, and some actually died. During the course of treating these men the doctors discovered that they did not have pneumonia. They were actually infected with a previously unknown bacteria. This bacteria was therefore named legionella (after the first known people to become infected) pneumophila (as the illness was similar to pneumonia).

It is fairly safe to say that people have probably been dying from legionnaires disease for the last 200 years as the bacteria thrives in large man made water systems which would have started to appear during Victorian industrialisation with the construction of large hotels, hospitals, leisure centres etc. However the disease would have been incorrectly diagnosed as pneumonia which was often fatal in the 19th and 20th century.

Many different species of legionella have been identified. The different categories are called ‘sero groups’.

Sero group 1 is the species that may cause legionnaire’s disease.

This graph illustrates cases of legionella in the UK and the susceptibility of the various age groups.



SOURCES

The most likely source of legionella in domestic water systems is from the incoming water supply.

The UK has strict water quality guidelines and we have some of the best quality water in Europe. However it is important to realise that the incoming mains water is not sterile, there will always be a low level of background bacteria.

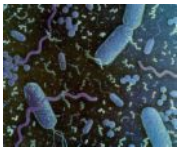
Bacteria levels are generally expressed as colony forming units per millilitre (cfu/ml). This is basically a statement of the total number of viable organisms in 1ml of water.

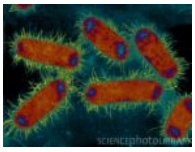
The acceptable parameters are as follows.

Less than 10 cfu/ml after 2 days incubation at 37°C
Less than 100 cfu/ml after 3 days incubation at 22°C

A bacteria count of 2 cfu/ml after a 2 day incubation is therefore well within the limits set by the EU.

However, 2 viable bacteria per millilitre is 2,000 per litre and 2,000,000 per cubic metre, so it can be seen that the incoming water supply is not sterile. There is no cause for concern as we all harbour huge bacteria populations on and within our own bodies and it is a question of controlling the harmful species. The background bacteria population will consist of many different organisms including legionella.

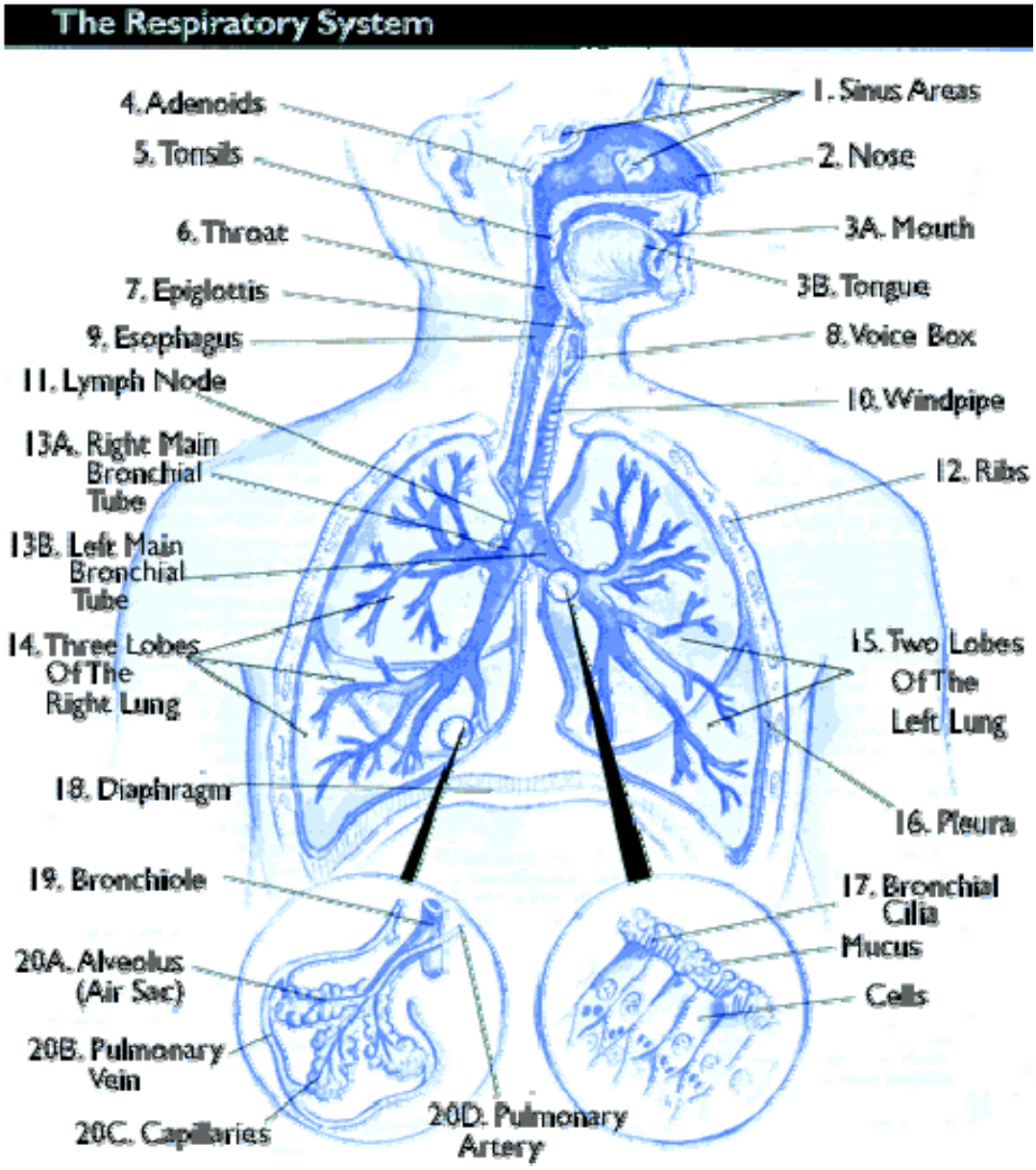





As long as the water system is maintained within current guidelines the levels of legionella will not be able to grow to a point where there is a danger if infection occurring.

ROUTE OF INFECTION

Legionnaires' Disease is contracted by inhaling droplets of water that contain high levels of the bacteria legionella pneumophila. The size of the droplet is very important and is accepted to be within 2-5 microns. If the droplet is too small it cannot contain any legionella, and if it is too big it cannot be drawn into the lungs without causing coughing. It is essential that the legionella penetrates deep into the lungs for infection to occur.

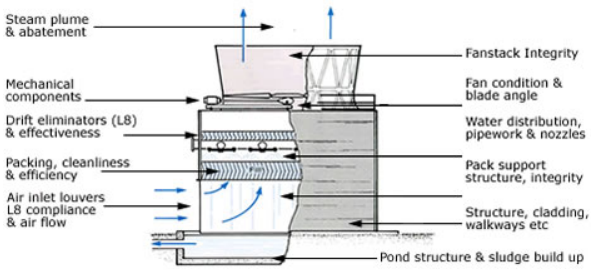


It can therefore be seen that water systems that produce small droplets of water have the highest risk rating and require the most attention.

HIGH RISK SYSTEMS

The highest risk systems are generally considered to be:

i) Evaporative Cooling Systems

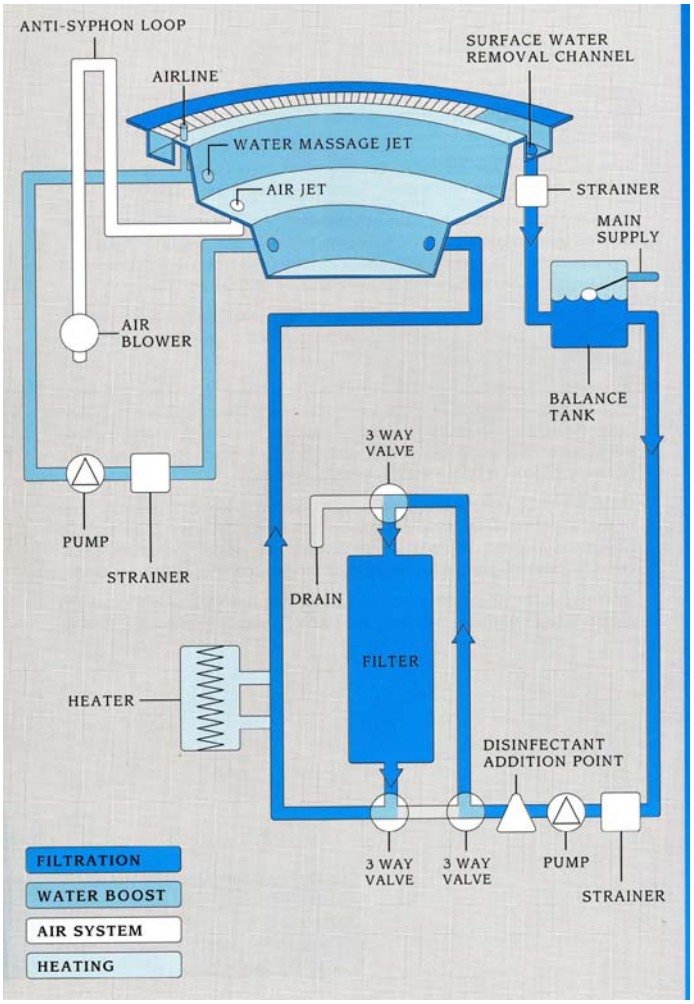


ii) Spa Baths

Both of these installations generate warm droplets of water as part of their normal operation, and both have been implicated in outbreaks of legionnaires' disease.

If Jacuzzi/spa baths have been installed in the facility they require particular attention.

Spa baths must be treated and monitored in the same way as a swimming pool with the additional task of regular draining and cleaning. When the spa is cleaned it is essential that the balance tank is also cleaned.



If a legionella infection is suspected or confirmed in a spa bath it should be closed and super-chlorinated immediately.

The other main area of concern in a typical building is, of course, showers.

Showers obviously produce droplets of water and can infect individuals with legionella whilst they shower if the water system has been allowed to become infected.

The following is an extract from a newspaper report in 2006

> *A father of two died from Legionnaires' disease caused by a dirty hospital shower head after being told by doctors he had beaten cancer. Daryl Eyles, 37, died the day he was due to be discharged from the Royal United hospital in Bath after months of chemotherapy for leukaemia.*
>
> *An inquest in Bristol heard how the security officer, from Whiteway, contracted the disease after using a shower on the hospital ward during his fourth and final chemotherapy session in February 2004. Doctors had told him he had achieved "complete remission" and should have made a full recovery.*

This demonstrates the need for a full and comprehensive legionella control programme.

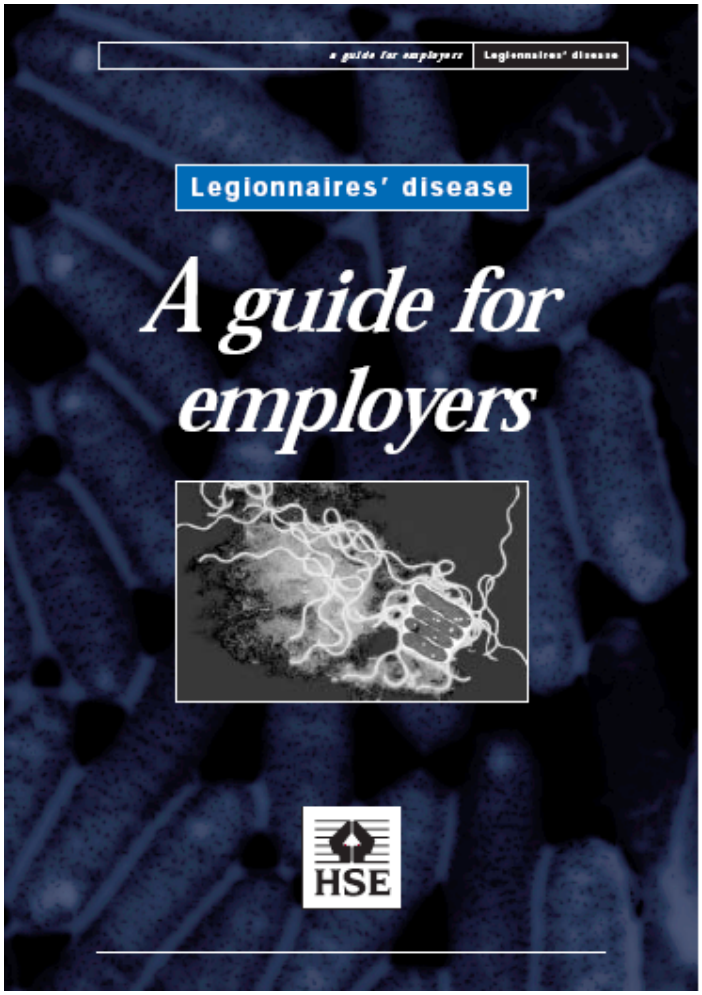
The main cause of problems with showerheads is a build up of limescale, especially in hard water areas such as London.

If showerheads are not regularly cleaned and descaled, the limescale can accumulate on the showerhead which provides a site for bacteria growth.

CONTROL MEASURES

All control measures for legionella are defined within L8, a document published by the Health and Safety Commission. A free guide and summary is available from their website, with links to order a full copy of L8 if required.

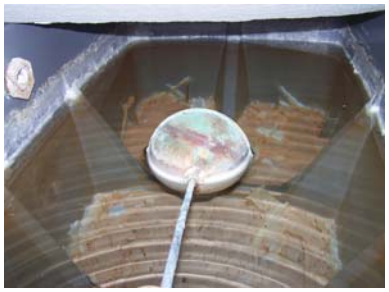
www.hse.gov.uk/legionnaires



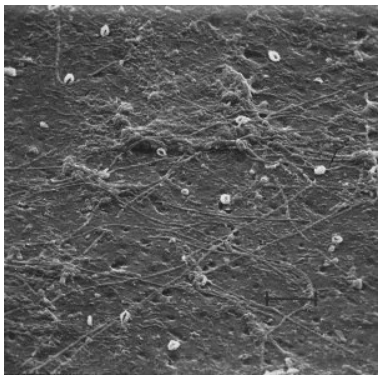
As stated previously, water system cleanliness is the first line of defence against colonisation by legionella. This starts with the cold water storage tank in the centre.

Cold water storage tanks are the first area of concern, as poorly designed and maintained storage tanks may allow an initial colonisation of legionella. It can be seen that these tanks are dirty, corroded and lack proper lids.



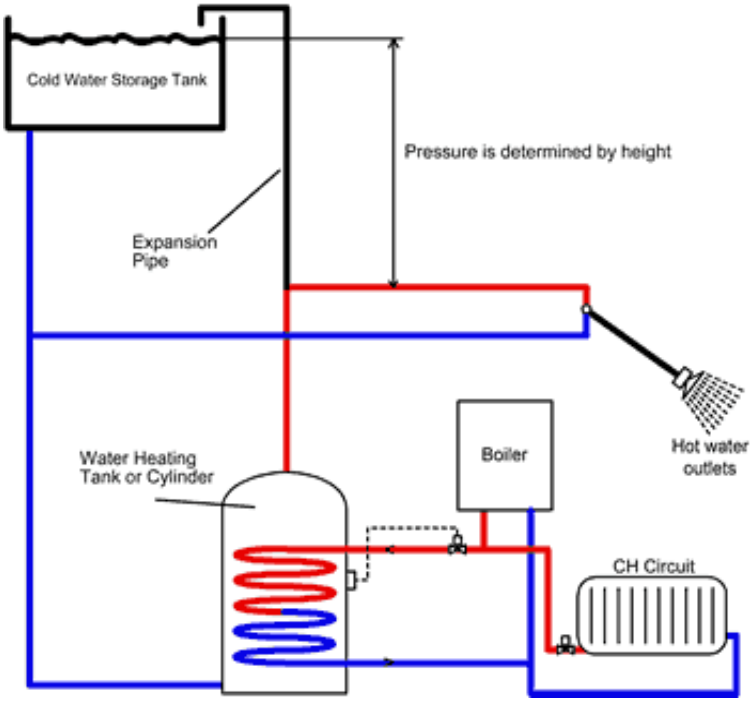
Slime (or biofilm) can occur in tanks and pipework and this can provide a safe haven for legionella to grow. It is therefore important to check tanks for slime as well as obvious dirt and debris on the tank floor.



Legionella growing in biofilm

Below is an illustration of a typical tank that complies with the guidelines, it has a secure cover, it is insulated and the lid vent and overflow are fitted with insect screens. This is a small domestic style tank but the same principles apply for all cold water storage tanks which feed showers, basins, toilets etc.

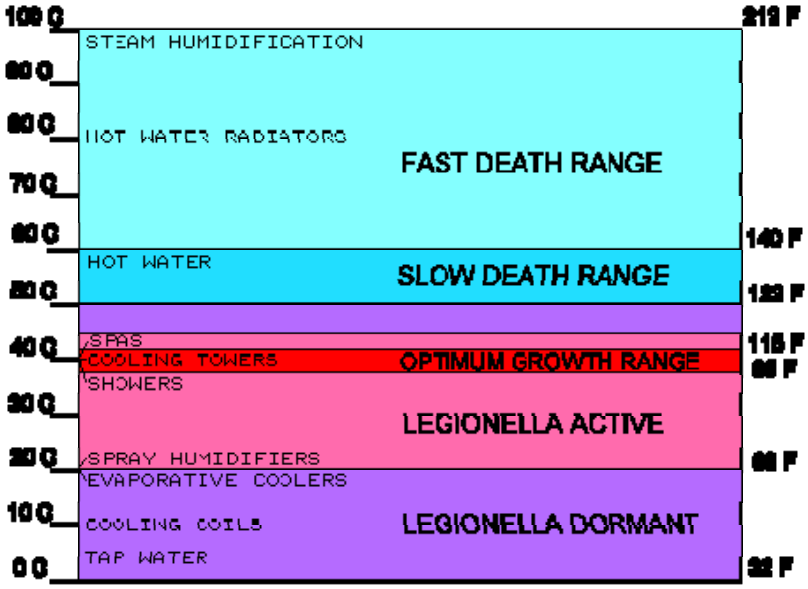
This schematic illustrates that the cold water storage is at the start of the domestic water system and as such it is essential that it is maintained in accordance with L8.



Temperature is also a critical element is legionella control.

Legionella is an environmental bacteria and exists at low levels in natural water courses. It can breed to dangerous levels if the water temperature is allowed to remain in the high risk range of 20-45°C.

The diagram below illustrates the range of temperatures within which Legionella survives and can breed to dangerous levels.



As legionella occurs in nature it can tolerate a comparatively wide temperature span of 20°C to 45°C for growth. Below 20°C the organism ceases to multiply but can survive dormant for up to a year in tap water, although the cells will slowly decrease in number. At above 50°C the organism dies with increasing speed, remaining viable for approximately 27 minutes at 54°C, six minutes at 58°C, between two and four minutes at 60°C, one to one and a half minutes at 70°C, and around 30 seconds at 80°C.

One of the main control measures for controlling Legionella in domestic water systems is routine monitoring of the water temperatures from hot and cold taps, using a hand held thermometer.

The basic limits are that cold water should be stored at less than 20C and cold water taps should be at less than 20C after 2 minutes running. Hot taps should reach 50C after 1 minutes running (unless they are fitted with thermostatic control valves).
It is recommended that ‘sentinel’ taps are used to monitor a water system; these are defined as the nearest and furthest outlets on a water system.

In addition to temperature control showers must be cleaned, disinfected and descaled.

Cold water storage tanks must be inspected and should comply with respect to this document and L8.

Another area of concern is redundant pipework that has been ‘capped off’ allowing water to stagnate and legionella to grow; below is a typical redundant spur or ‘dead leg’.

If you are aware of pipework such as the one shown above you should arrange for an estimate to have it removed.

Stagnation and little used taps and showers are also associated with legionella infection.

If you are aware of taps and showers which are rarely used these must be flushed on a regular basis.

If there are areas which are no longer required then the water services should be isolated and removed. This picture shows a shower area now used for storage and is therefore creating a deadleg and infection site on the system.

STERILISATION

Beacon can complete system disinfection works, often without disrupting access and use of the water system. Please contact us for details.

LEGIONELLA SAMPLING AND RESPONSE TO FAILURES

We would recommend that we take legionella samples every quarter from around the domestic hot and cold water system.

Legionella analysis is completed to a very high standard of accuracy, and the results are expressed as colony forming units per litre (cfu/l); a thousand times more sensitive than normal bacteria TVC analysis.

If a positive result is obtained remedial action is required.

Low positives of 1,000 cfu/l or less will require the addition of slow release chlorine tablets to the cold water storage tanks, details as below.

Higher positives may require the infected areas to be taken out of service until remedial actions have been completed and the system has been retested.

A ‘presumptive’ result suggests that the sample may contain legionella, but the laboratory have to carry out more work before it can be confirmed.

Please note: If a single shower in a block gives a positive reading then all the showers in that area must be taken out of service, not just the shower that failed. If legionella is in one shower it will be in all the showers in that particular area.

NOTE: It takes two weeks for a legionella sample to be processed before a negative result can be confirmed. A rapid test is available but this costs in excess of £200 per sample.

USE & APPLICATION OF
SLOW RELEASE CHLORINE TABLETS FOR LOW LEGIONELLA POSITIVES

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Low level bacterial infections in domestic water systems can be managed by the use of slow release chlorine tablets.

The basic principle is that the tablets are placed in the water storage tanks, and the chlorinated water finds its way throughout the hot and cold water systems.

NB: These tablets should not be used for drinking water systems.

The tablets should be added to the water via a floating chlorine dispenser. This will prevent corrosion in metal tanks; and will also provide a measure of control as the slots in the dispenser can be restricted as required.

The addition of the tablets must be monitored with a pool test chlorine kit. The aim is to achieve 1-3ppm free chlorine in the cold water (the hot will be much lower as the chlorine degrades at high temperature).

The rate at which the tablets dissolve is governed by the water consumption and temperature, but as a rough guide add 1 tablet per 3,000ltrs (600 gallons) of water. Monitor the levels after 24 hours and increase or restrict the dispenser as necessary, adding extra tablets if required.

It is important that you do not remove the dispenser when the legionella infection has gone, as the tablets will smell; just leave in the tank to gradually dissolve.

If greater accuracy and/or long term dosing is required, it is advisable to consider the installation of a fully automatic dosing system. Please contact our office for additional information on 01933 410066 or via beaconwt@ukf.net