



Is there Legionella bacteria
in your water pipes?

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Legionnaires' disease claims victims

In Sweden at least 500 people are estimated annually to fall ill with Legionnaires' disease. Legionnaires' disease is a kind of pneumonia, which is caused by bacteria of the Legionella group. Approximately one out of ten who fall ill dies from the disease. The most common reason is lack of correct diagnosis _ legionella bacterias do not react to the usual medical treatment of pneumonia, which is the frequent, but wrong diagnosis. In most cases the victims are persons whose resistance is reduced by smoking, old age, ill-health or certain medical treatments.

Even though Legionnaires' disease is not considered a major problem, the problem is unnecessary. Legionella bacteria are spread through water mist (aerosols) from unsuitably designed water systems. There is a risk that the number of cases will increase in modern society.

The disease causes suffering to the individual and draws its defects resources for medical care.

Stop Legionnaires' disease!

An unnecessary disease

Legionnaires' disease is unnecessary. The necessary conditions for the disease have been created by ourselves through unsuitable technical systems in our houses. Through tiny airborne drops of water (aerosols) from for example showers we get Legionella bacteria into our lungs and infect us. The infection does not, however, transmit may get from one person to another.

Found in water

Legionella bacteria occur naturally in lakes, watercourses and subsoil water. There they do not constitute a hazard to people. However, in unsuitably designed water systems they may multiply rapidly and thus become problem.

Thrive at 40°

The bacteria thrive in stagnant water at temperatures of about 40 degrees centigrade. At this temperature they can multiply and reach a dangerous proportions.

Complex systems

The bigger and more complicated a water pipe system is, the greater the risk for the growth of Legionella bacteria.

Hot water

By taking advantage of the knowledge of how water- and heating installations ought to be designed the growth of Legionella bacteria can be prevented. Basically, it is a question of keeping installations clean, the cold water cold and the hot water hot.

Bacteria spreads through water mists

People can be infected by Legionnaires' disease from inhaling water mists (aerosols) containing Legionella bacteria. However, to drink such water is not dangerous. Water mists can occur anywhere if water is taken from pipes.

Showers and taps

Showers are considered to be the most common way of spreading the disease. Aerators on water taps also spread water aerosols.

Whirlpool baths

Whirlpool baths can spread Legionella bacteria. The water temperature is ideal for the growth of bacteria and the air bubbles give rise to water aerosols.

Other sources

Many cases of Legionnaires' disease have been attributed to cooling towers (inter alia for air-conditioning). Water mists from cooling towers have been sucked into ventilation systems and spread through the outside air sucked into ventilation systems. Other sources are humidifiers, ornamental fountains, high pressure washes and vegetable dampers in shop counters.

You can not catch Legionnaires' disease by drinking water.

When you are constructing a new building

These are the rules to follow

According to Swedish Building Regulations all cold and hot water installations in new buildings must be constructed so that Legionella bacteria and other microorganisms can not multiply and reach hazardous levels.

What materials shall be used and how the water system shall be designed in order to meet requirements are the builders responsibility.

Not less than 50 degrees at water taps

The hot water temperature must not be less than 50°C at water outlets. Consequently, the temperature from calorifiers must be higher. How much higher depends on the length of the pipes, their insulation etc.

Risk of scalding

The temperature at water outlets must not be above 65°C because of the risk of scalding. In some showers, e.g. for persons who are unable to regulate the temperature themselves, the temperature must not exceed 38°C.

50 degrees in hot water circulation pipes

In larger buildings, where hot water circulation pipes are installed, the return water must have a temperature of at least 50°C.

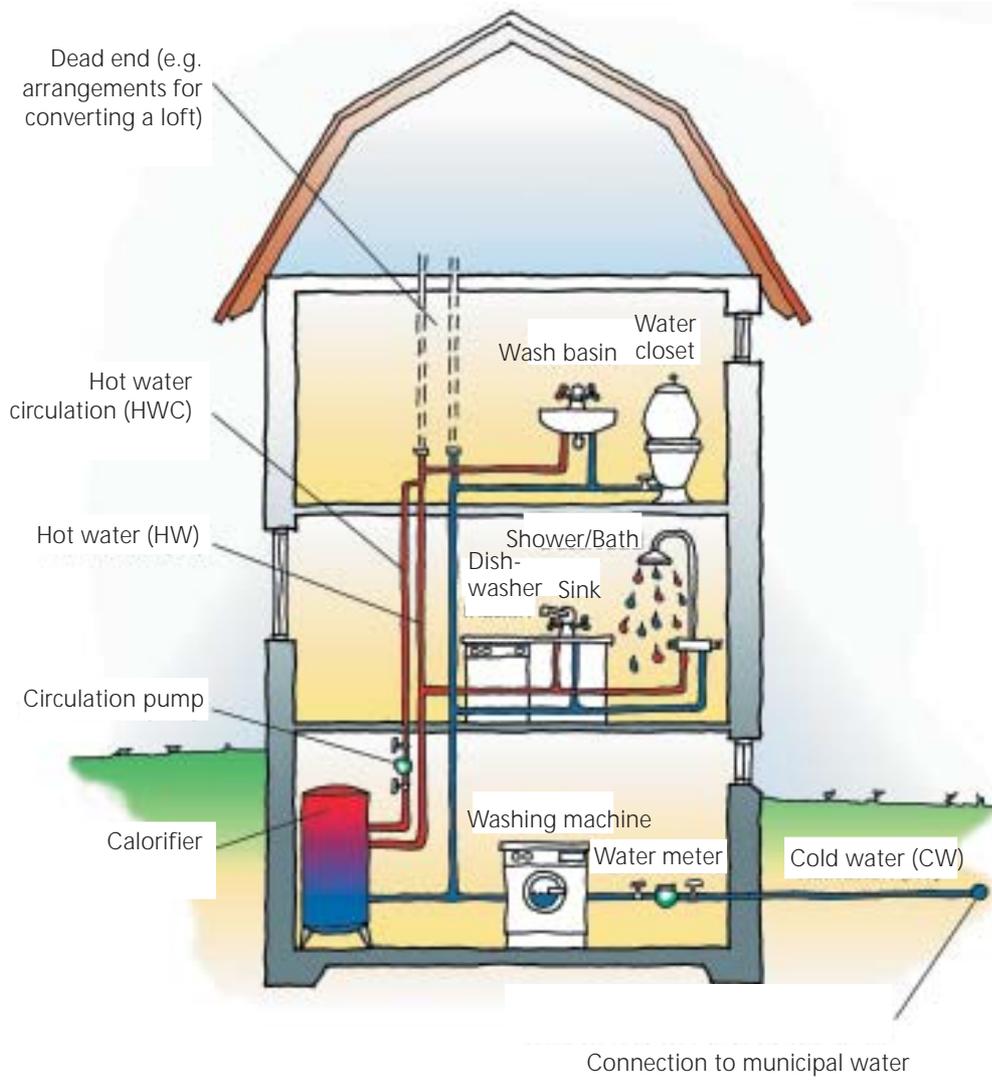
As a consequence the hot water may need to have a much higher temperature, for example if the distance between the last water tap and the calorifier or water heater is considerable.

Keep the cold water cold

The building regulations also require that the cold water (drinking water) must not be unintentionally heated. Above 20°C bacteria can multiply in water that is stagnant for a long time.

Requirements regarding water supply systems are given in Boverket's Building Regulations Clauses 6:61 and 8:42. Requirements regarding the quality of drinking water are set out in the Ordinance on Drinking water from the National Food Administration, SLV FS 1989:30, H318.

Example of a water supply installation



Noteworthy hints

Here are a few hints which may help to meet the requirements when constructing a new building:

- Make the system as simple and as easy to operate as possible. Make sure that the operating instructions deal with the risk of legionellosis.
- In calorifiers and other containers where hot water is stationary, the temperature should not be less than 60°C. If the heating device in the calorifier produces a lower temperature (e.g. heating with heat pumps or solar heat), it should be possible to increase the temperature to 60°C (for example with an electric water heater).
- Layers of tepid water at the bottom of calorifiers are dangerous breeding grounds for Legionella. Lamination may occur if the heating device is placed some distance from the bottom. It should therefore be possible to read the temperature in the calorifier from a thermometer placed near the bottom.
- It should be possible to clean the insides of calorifiers. Deposits and micro-organisms such as algae and amoebas are excellent nurseries for Legionella. (There the bacteria will find both nourishment and protection.)
- Avoid dead end pipes since water in them becomes stationary. In this environment Legionella bacteria thrive and it is extremely difficult to get rid of the bacteria.

In larger premises: install thermometers also in hot water circulation pipes and adjust the appropriate water flow in the pipes.

Remember to limit the risk of scalding. At 50°C it takes more than 5 minutes, at 52°C – 1.5 minutes, at 57°C – 10 seconds, and at 65°C only 1 second, to get a third degree burn. However, it is possible to regulate the temperature of the hot water in single-lever mixers and thermostat mixers. You can have 50°C in the water from a tap even if the water in the pipes is higher.

Beware of the possibility that there may be Legionella in your water. Prevent the bacteria from multiplying.

Old systems

Check the water system

For existing buildings, the building regulations which were in force at the time they were constructed apply. This means that current regulations regarding inter alia water temperatures are not mandatory for buildings constructed earlier than 1994. However, if the building is modernized it may be otherwise. According to the Environmental Law the water system, irrespective of its age, must not be a health hazard for those who live in the building.

A few words of Advice

- Measure the temperature of the hot water at the taps. In dwellings the water temperature should be 50°C at all taps.
- Be especially observant of the temperature in calorifiers, heats exchangers and hot water circulation pipes. Do not keep hot water at low temperatures. Install thermometers in the water system, placed for easy reading.
- Clean calorifiers regularly. Bacteria thrive in the sediment at the bottom of calorifiers.
- Remove dummy pipes. A rule of thumb is that remaining parts of piping must not be longer than the diameter of the pipe.
- Let the shower water run freely with hot water if it has not been used for a while, for example showers in holiday houses or when you have been away from the house or arrive at a hotel.

Disinfection

A water analysis is required to find out whether water systems contain Legionella bacteria. If high proportions of Legionella bacteria are found in the water pipes an extensive decontamination is necessary. There are several different methods, i.e. chlorinating the water heavily, adding silver and copper ions, chlorine dioxide treatment and heat decontamination.

Heat decontamination

The simplest and probably the most effective method of decontamination is to raise the temperature of the water to at least 70°C and let the water run in the pipes for about 5-30 minutes. The time needed depends on the size and then design of the pipe system. Mind the risk of scalding. After the decontamination a new analysis of the water should be made. However, not even such a measure will reach all hotbeds of bacteria, for example dummy pipes are not included.

Contact the public Environment and Health Committee in your municipality for more detailed information on decontamination.

Who has the responsibility?

Building legislation

The person who constructs or has someone to construct i.e. works, is responsible for meeting the demands of laws and regulations.

The owner of the building is responsible for maintaining the building and its installations so that it's function as intended.

The local Building Committee is the supervisory authority there you can get information on what rules apply in each case. The Committee may intervene if the mandatory provisions in the building regulations are not met.

The Swedish Board of Housing, Building and Planning, Boverket is responsible for the general supervision of planning and building activities and controls the application of the building legislation. The Board has the right to issue technical requirements for constructions works and installations.

The provisions of the Environmental Law regarding hygiene

The public Environment and Health Committee is the supervisory authority. They provide information on for example which rules apply in in your house. The Committee may also intervene directly and take action against the person who owns or rents a dwelling or premises.

The National Board of Health and Welfare is responsible for general supervision in accordance with the Environmental Law. The Board must also evaluate, follow up and co-ordinate the advisory service and support the municipal agencies. The National Board of Health and Welfare has the right to issue regulations on actions against communicable diseases such as legionellosis.

Other legislation

Legal action can be taken with the support of several laws against persons responsible and also as a result of binding agreements. Examples: the Land Law, the Criminal Law, Law on Damages, contract agreements

Facts about Legionella bacterium

The bacteriae was discovered in 1976

Legionella bacteria, which can cause i.e. Legionnaires' disease was discovered in 1976 after an outbreak of pneumonia among the participants of a convention for war veterans (legionnaires) in what was thought to be Philadelphia, USA.

Legionella pneumophila

The bacteriae was named *Legionella pneumophila* (the one who loves lungs). The discovery made it possible to explain previous outbreaks of disease. Since then tens of thousands of cases of Legionnaires' disease have been reported around the world. Today the Legionella bacteriae group consists of some 40 known species.

Occurs in nature

Legionella bacteriae occur naturally in by water. The proportion is often so small that the bacteria cannot be detected in an analysis. At temperatures below 20 degrees centigrade the bacteria are dormant and do not multiply. Between 20 and 45 degrees centigrade they multiply and they thrive at around 38 degrees centigrade.

Nourishment and protection

Legionella bacteria need both nourishment for their growth and other microorganisms to give them mechanical protection. On the inner surface of pipes and at the bottom of calorifiers different microorganisms form a bio film. Legionella bacteria gets into this biofilm. In actual practice it is impossible to make the water completely free of nourishment and microorganisms.

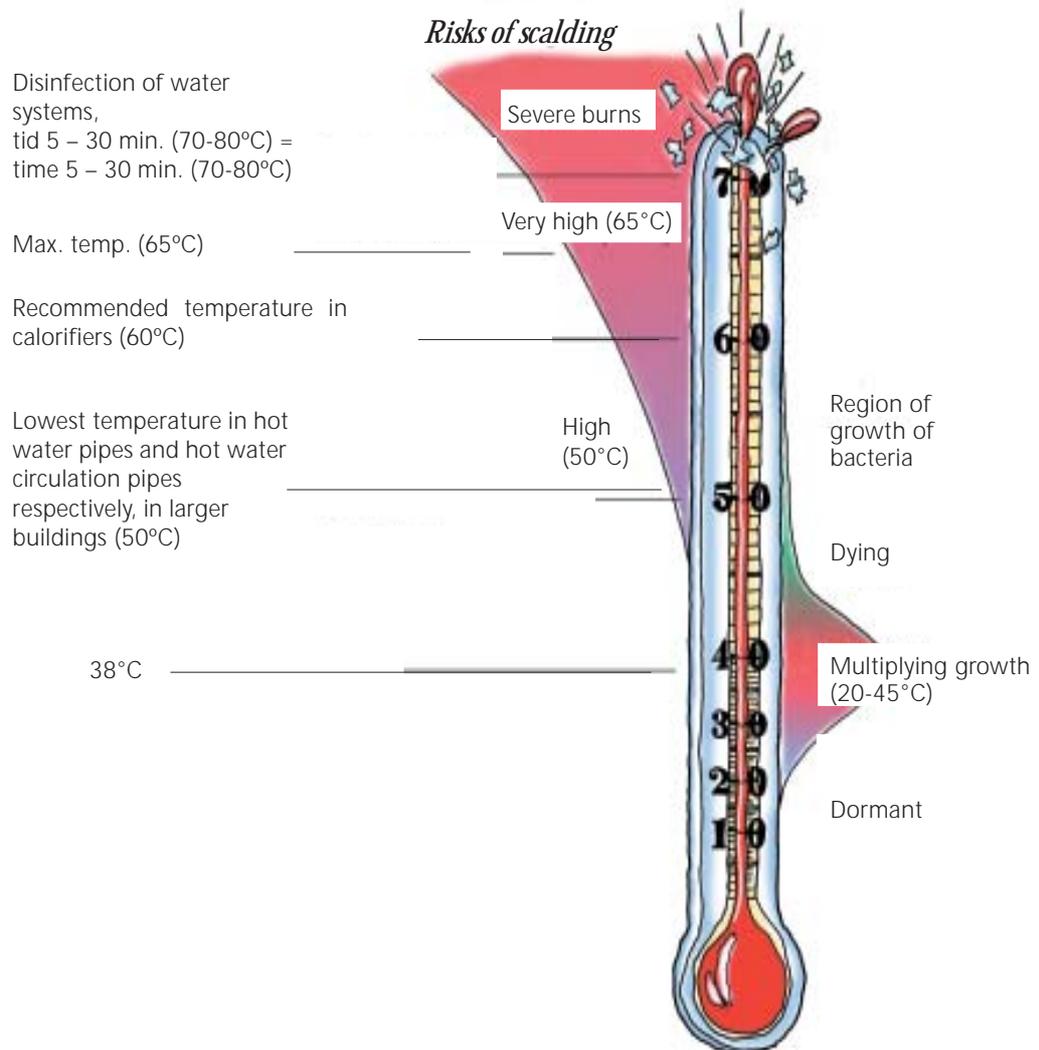
A slow death for the bacteriae

- At 50 degrees centigrade it can take several hours before all Legionella bacteria have been rendered hamrless.
- At 60 degrees centigrade the bacteria perish in some ten minutes.
- At 70 degrees centigrade it takes less than 1 minute.

These figures apply to bacteria that exist free in water. Bacteria on the inner surfaces of pipes and in sediments takes longer to kill the bacteria.

Body temperature is ideal for Legionella bacteria. This is not how it should be. Technical systems in buildings can also promote their existence. The objective must be to construct and manage technical systems so that Legionella bacteria are unable to multiply.

The most effective remedy against legionella is to keep the cold water cold and the hot water hot.



Facts about Legionnaires' disease

Severe form of pneumonia

Legionnaires' disease is a form of pneumonia caused by bacteria of the Legionella group. The bacteria are spread by inhaling of water drops (aerosols) from for example showers. The infection is a consequence of technical systems. However, person-to-person transmission of the disease does not occur.

Legionella bacteria can also cause a flu-like illness, Pontiac fever, which normally resolves by itself, usually within two to five days.

Legionellosis is the umbrella name for Legionnaires' disease and Pontiac fever.

Symptoms

The symptoms of Legionnaires' disease is are first flu-like. High fever, chills, headache, muscle aches, diarrhoea and stomach-ache can occur. Dry coughing, breathing difficulties and other lung symptoms will follow. Other bodily functions may be affected, as well as the patient's consciousness.

Most people do not fall ill

All humans run the risk of being infected with Legionella bacteria. If they will develop Legionnaires' disease depend mostly on the amount of bacteria and the patient's resistance. Most people exposed to the bacteria do **not** fall ill.

Risk groups

Smokers and the elderly are groups at high risk. Men are infected more often than women. Persons whose immune systems are suppressed, above all transplant patients, but also cancer patients, who are given cytotoxic treatment run the greatest risk.

Uncertain numbers

Legionnaires' disease is a notifiable disease. Physicians have to report all detected cases to the County Medical Officer of Communicable Disease Control, the Swedish Institute for Infectious Disease Control and the public Environment and Health Committee in the municipality.

Uncertain statistics

During 1990 – 1998 between 36 – 87 cases of Legionnaires' disease have been reported annually in Sweden. About one fifth of these have been infected in hospitals and about one fourth during travels abroad. The rest have been infected in normal environments for example at home. The real number infected is, however, estimated to be at least 10 times higher than the number of reported cases.

Most patients recover

Why not more cases are discovered probably depends on the fact that most of the patients recover despite the fact that they have only been treated for ordinary pneumonia. They would probably have recovered even without treatment. Furthermore, hospitals rarely make a detailed analysis of the cause of death of patients who die of pneumonia.

One out of ten patients dies

Legionnaires' disease is treated by antibiotics. The death rate of the disease is approximately the same as for other kinds of serious pneumonia, that is 10 – 15 per cent.

BOVERKET INFORMS

Legionella and Legionnaires' disease

Legionnaires' disease is a kind of pneumonia that is caused by bacteria of the Legionella group. The bacteria exist in small numbers in lakes, rivers and ground water.

In unsuitably designed water systems the bacteria can multiply and reach dangerous proportions. They may then infect persons through water mists from for example showers.

By following the relevant building regulations and using knowledge about how water- and heating systems should be designed and operated, the problem of growth of Legionella bacteria can be managed.

This brochure is intended for property owners and interested parties. It gives information about Legionella and Legionnaires' disease and hints on what to bear in mind when building a new house operating an old water system.

On Boverket's web site on internet further information can be found as well as examples of inventories and check lists for the assessment of the risk of Legionella in water systems.

Web site: www.boverket.se

