Growing Bacteria Under Cleanroom Conditions

Hygiene is the top priority when testing drinking water for Legionnaire's disease. For German hospitals, nursing homes and homes for the elderly, swimming baths and other public institutions, regular tests by certified laboratories of drinking water for Legionnaire's disease are prescribed. A part of the water samples taken in the Nuremberg conurbation arrive at the team led by Peter Daum in the Municipal Water Treatment and Environmental Analysis Laboratory Nuremberg, Germany.

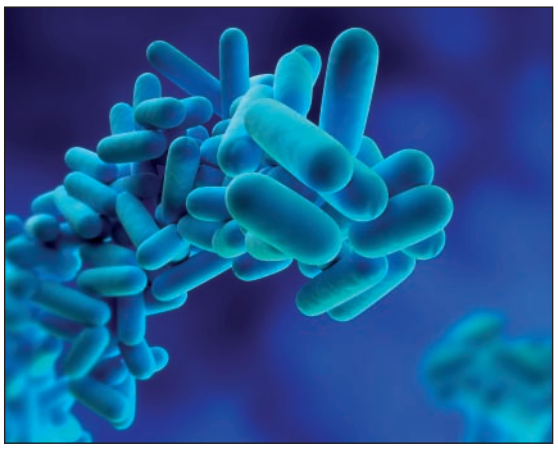
"Hygiene is the top priority when testing drinking water for Legionnaire's disease"

Author Details:

Ina Falkner
Marketing-on-Demand for
Memmert GmbH + Co. KG
Germany
Email: sales@memmert.com

INCREASED MEASURES AGAINST LEGIONNAIRE'S DISEASE

In 1999 the Environmental Analysis Laboratory Nuremberg put into operation the first Memmert CO_2 incubator for growing legionellae. Almost 10 years later it is being joined by the latest INCO2 generation of appliances – and with good reason. With the increased awareness of the danger of these bacteria in warmed up water, with which humans come into contact through drinking, bathing, showering or for medical applications, the number of samples taken and tested has also increased. Coming into contact with the bacteria is not in itself dangerous; it is rather the breathing in of droplets of water, or aerosols, containing the bacteria, into the lungs that can lead to the life-threatening Legionnaire's disease. Legionellae prefer water temperatures between 25°C and 45°C and prosper in quiet places where there is no movement and turbulence. Numerous types can be found everywhere in natural lakes and rivers and get into the drinking water supply through ground water, but it is only our rising standard of living that has turned Legionella pneumophila in particular, which is responsible for an estimated 90% of all cases of Legionnaire`s disease, into a worldwide hazard. Because where hygiene standards are poor, or where there are structural flaws in technical systems for the supply of warm water, it can find ideal conditions to propagate. Legionnaire's disease, a form of pneumonia, is therefore a genuine disease of affluence, the name of which goes back to an epidemic in 1976 in which 182 former American soldiers were taken ill, of whom 29 died.



3D model of L. pneumophilia.

STERILISATION PROTECTS EMPLOYEES AND SAMPLES

Benedikt Schaefer from the German Federal Environmental Office in Bad Elster, a proven expert on drinking water and a member of the Water Standards Committee, points out the need for extremely careful hygiene measures during the legionellae tests. Two reasons are crucial for this recommendation: the health of employees should not be exposed to even the slightest risk of contaminated aerosols, at the same time the sample quality is ensured over the long incubation period of up to 10 days. Help in the form of being absolutely germ-free can only be provided in this situation by sterilisation. The chamber of the INCO2, including the ventilation system, the water trays and all the sensors, can be sterilised in a 4-hour programme at 160°C. The infrared sensor for the CO_2 measurement was designed by the Memmert engineers specially so that it can withstand these high temperatures without problem, and is thus sterilised.

Memmert CO_2 incubator INCO 2

100% SAFETY ACROSS THE ENTIRE PROCESS

About 1,000 water samples reach the Environmental Analysis Laboratory Nuremberg every year. An estimated 25% of these contain legionellae, whereby the DVGW spreadsheet W551, in which the procedure for taking samples is regulated, only suggests, outside high-risk areas in hospitals, that the test intervals should be more frequent if the legionellae concentration is more than 100 CFU (colony-forming units) per 100ml, and stipulates further measures and tests only when the concentration is more than 1000 CFU. For 7 to 10 days the samples are incubated at 36°C (± 2°C), 2.5% CO_2 and 95% relative humidity. Once samples have been taken, they can no longer be reproduced, of course, and for this reason the safety and reliability of the appliances is the highest priority. In the nine years in which the CO_2 incubator has been running for Peter Daum and his team, almost non-stop, there has not been a single breakdown, and the test of temperature precision, performed twice a year by the internal quality assurance team, always yielded optimal values. All Memmert appliances have an acoustic alarm, and this clearly audible warning signal is set off if the door is opened for too long or if there is a failure of the central supply, such as CO_2 gas and power supply. One of the numerous safety functions allowing the employees in Nuremberg to quietly concentrate on their work.

Just like the clear presentation of the current states for humidity and temperature in the display, which continuously shows the correct progression of the incubation in the laboratory – with the newest generation of CO_2 incubators from the company Memmert, down to the level of the water container. To ensure that the samples do not dry out, the electronic control of the INCO2 regulates not only temperature and CO_2 content, but also the relative humidity. Ideally the humidity content in the chamber should always be between 90% and 95% relative humidity.

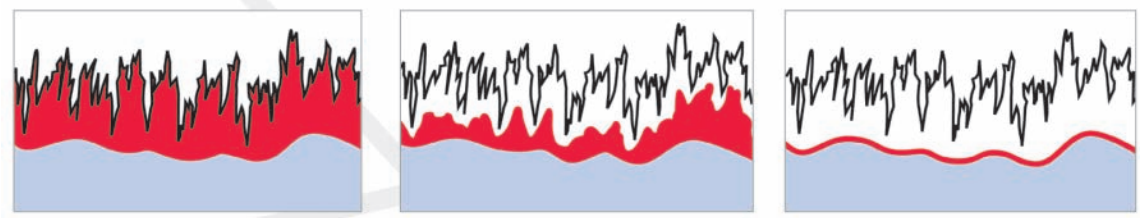
FUTURE-COMPLIANT DOCUMENTATION

Asked about future developments in the field of standards and regulations for legionellae tests in the laboratory, Benedikt Schaefer mentions the subject of

documentation. The validation of processes will become ever more significant, which is why suitable software solutions will have to be available to meet these requirements. Today the INCO2 is already fitted in its standard form with a whole series of convenient and time saving functions and interfaces for programming, data storage and the documentation of processes.

ELECTROPOLISHING: SMALL CAUSE, LARGE EFFECT

The surface roughness of conventional stainless steel can neither be felt with the fingers nor seen with the bare eye. And yet in some circumstances they can provide a large surface for germs only a few micrometers in length. For working with biological materials the stainless steel chambers of all Memmert CO_2 incubators INCO2 are therefore additionally smoothed by electrolysis for working with biological materials – a procedure that is standard in the manufacture of medical instruments, in order to remove the micro roughness on the metallic surface. At the same time the corrosion resistance of the metal is increased by this procedure. For the employees in the laboratory, cleaning and disinfection are also simpler due to the extremely smooth surfaces, and considerably more effective with respect to hygiene.



Progressive flattening of a metal surface through electropolishing

HUMIDITY CHAMBER HCP AS AN ALTERNATIVE TO THE INCO2

Even if the currently valid DIN EN ISO 11731-2:2007 no longer stipulates that samples must be fumigated with CO_2, it does announce a recommendation to the extent that carbon dioxide can promote the growth of certain legionellae. For laboratories that do not use CO_2, the Memmert humidity chamber HCP represents a comparable alternative to the INCO2. This also offers all the advantages of the INCO2 mentioned above, such as sterilisability, safety and controllability - the rH concentration can be set via the active humidity control between 20% and 95%.

Trace Elemental Analysis Reaches New Levels

Millipore Corporation announced the availability of the Q-POD® Element unit. Designed for use with the Milli-Q®Integral and Milli-Q Advantage systems from Millipore, the device ensures delivery of ultrapure water with extremely low levels of elemental contamination (single ppt or sub-ppt level) for laboratories performing trace and ultra-trace elemental analysis.

By eliminating problems due to backgrounds with high elemental contamination, water produced by the Q-POD Element device can help scientists achieve greater sensitivity and reproducibility in their work. Ultrapure water with minimum elemental contamination is typically required for use in blanks, standard solutions, sample dilutions and plasticware rinsing by researchers working with IC, ICP-MS and GF-AAS analytical instruments.

"With elemental contamination levels of between 10-100 times lower than any other product on the market, Millipore's Q-POD Element unit will help move ultra-trace elemental analysis to new levels," said Jean-François Pilette, Millipore Lab Water Group Product Manager. "It is the most advanced solution available today for production of ultrapure water with the lowest elemental trace contamination—at high flow rate—and at a reasonable cost," he added.

Equipped with a footswitch for hands-free water delivery, the Q-POD Element unit is ideal for use in a Class 1000 clean room environment. The unit supplies water in the volumes required by the user (up to 1.5L/min), which avoids water storage as well as the associated contamination risks. Scientists working under a Class 100 laminar flow hood can activate delivery with the footswitch and seamlessly continue their work without stopping to dispense ultrapure water manually.

Q-POD Element water quality was verified by independent laboratories specialising in ultra-trace analysis. These validation test results are available upon request.