

AQUAVIAL™ PRO500



**FAST, ACCURATE & EASY-TO-USE
MICROBIAL WATER TESTING**



APPLICATIONS

**MUNICIPAL WATER INFRASTRUCTURE
COOLING TOWERS
PLUMBING
POOLS AND SPAS
DENTAL WATER LINES
FOOD AND PHARMACEUTICAL
WATER SYSTEMS IN HOSPITALS
PRIVATE WELLS
WATER SYSTEMS IN HOTELS**

CURRENT PROBLEM

LABORATORY BASED
(requires clean laboratory conditions)

DELAYED RESULTS
(available days after testing)

INDIRECT METHODS FOR IN FIELD TESTING
(analysis of disinfectant or enzyme levels rather than microbial level)

AQUAVIAL™ PRO SOLUTION

PORTABLE

NO EQUIPMENT REQUIRED



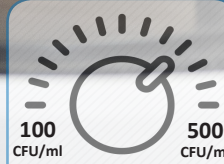
FAST
(15-30 min)



DIRECT TESTING METHOD

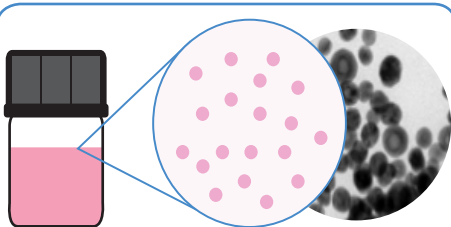
BROAD SPECTRUM

TUNABLE DETECTION RANGE



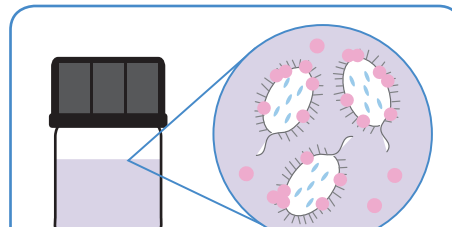
HOW DOES AQUAVIAL WORK

Aquavial PRO uses our proprietary surface cell wall recognition technology to detect and quantify microorganisms in water. The functionalized gold nanoparticles in our reagent attach to specific areas of the cell surface, which results in a change in their Surface Plasmon Resonance (SPR) properties. This leads to a change in color from pink to purple at low cell concentration (500 to 2,000 CFU/ml), and from purple to clear at high cell concentration (over 2,000 CFU/ml).



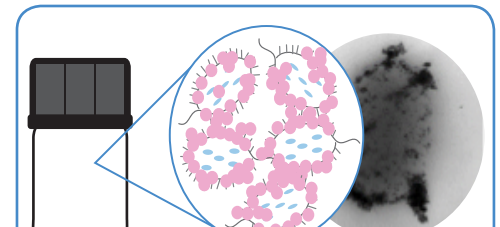
Clean water

Pink: Only nanoparticles present, no contamination.



Contaminated water

Purple: Aggregation of nanoparticles with bacteria cells.



Highly contaminated water

Clear: The clearer the colour, the higher the microorganism count in the water, as all nanoparticles have been attached to bacteria cells.



COMPARISON WITH OTHER METHODS

	Aquavial™ PRO	ATP	HPC	Flow Cytometry
Rapidity	15-30 min	2 min	1-10 days	2-4 hours
Ease of use	Very easy	Very easy	Complex	Complex
Permeabilization of cell necessary	No	Yes	No	No
The robustness of assay chemistry	High	Low	Low	High
The assay sensitive to water chemistry	Low	High	Low	Low
The overall reproducibility	High	Low	Low	High
Specificity to bacteria	High	Low	High	Low
Corellation with total viable cell count	High	Low	Low	High
Cost of equipment	None	High	Medium	Very High

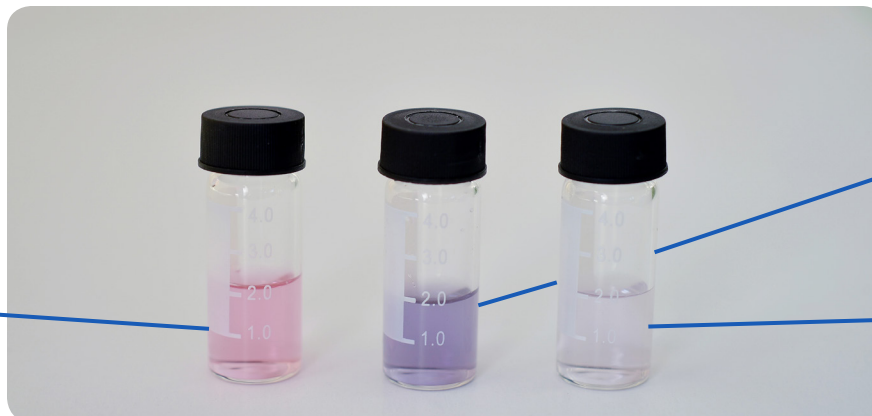
The table shows a comparison of different technologies and methods used to quantify bacterial load in water.

DETECTION ABILITY

The test has been verified to date using:

1. Legionella pneumophila variant Lp01,
2. Salmonella enterica ATCC10708,
3. Staphylococcus aureus ATCC 6538,
4. Escherichia coli (ATCC PTA-4752)
5. Bacillus megaterium (ATCC 21209),
6. Pseudomonas putida (ATCC 12633),
7. Saccharomyces Cerevisiae,
8. Klebsiella Pulmonae,
9. Pseudomonas aeruginosa ATCC 15442
10. Aspergillus Niger,
11. Mycobacteria terrae,
12. Candida albicans

Clean water
< 500 CFU/ml



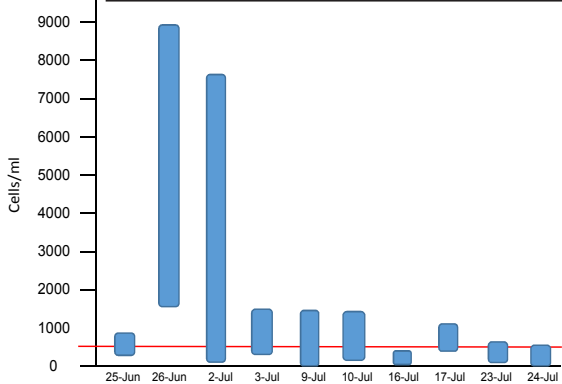
Contaminated
water
500-2000
CFU/ml

Highly
contaminated
water
> 2000 CFU/ml

COOLING TOWER MONITORING CASE STUDY

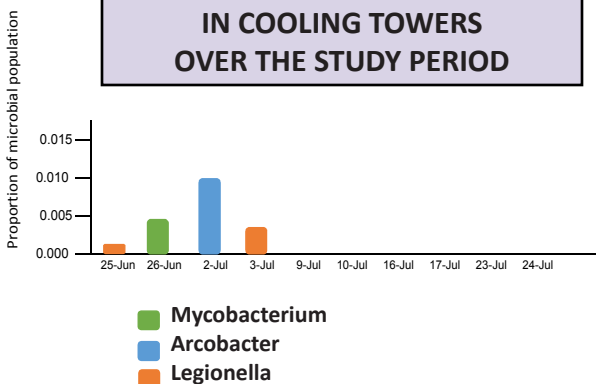
- Scope:
- 1) Determine the performance of Aquavial™ PRO in field testing conditions
 - 2) Assess the variability of microbial load in cooling towers over time
 - 3) Confirm correlation between high total microbial counts and presence of Legionella and Mycobacteria in cooling towers
- Location: University of Waterloo
- Sampling frequency: Twice a week
- Time of study: Summer of 2019
- Methods used: Heterotrophic Plate Count (HTP) using APHA9215C
Flow Cytometry (FC)
Aquavial™ PRO test
Genomic testing (16s rRNA) - Metagenom Bio

VIABLE CELL TRENDS IN COOLING TOWERS OVER THE STUDY PERIOD



Water maintained its prescribed chemical parameters when treatment was unchanged over the course of the study. However, the count of viable cells measured through standard* methods spiked several times over the period of the study.

PATHOGENIC BACTERIA TRENDS IN COOLING TOWERS OVER THE STUDY PERIOD



Over 1,143 species of microorganisms were identified through genomic testing, including several pathogenic or opportunistic bacteria such as Legionella, Mycobacterium and Arcobacter. The results confirmed a correlation between high microbial counts and presence of pathogenic bacteria.

Aquavial™ PRO method compared to HTP and FC for microbial cell count

Standard* viable cell range (cells/ml)	Aquavial™ test cell range (cells/ml)
0 - 16	0-500
0 - 187	0-500
0 -1,183	0-500
16-150	0-500
16-245	0-500
22-4000	0-500
27-500	0-500
32-110	0-500
32-150	0-500
183-1342	0-500
210-1450	0-500
350-830	0-500
0-750	500-2000
30-260	500-2000**
77-7650	500-2000
350-1500	500-2000
400-1010	500-2000
1500-7800	500-2000
130-665	2000-10000**
5400-10000	2000-10000

The results show that Aquavial™ PRO method produced comparable results to the standard* methods, with the exception of in two instances when it produced “false negative” results**.

* standard viable cell range was calculated using the HTP & FC methods

** the high cell range estimate produced by Aquavial measurements is attributed to presence of biofilm residues in the sample



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