

Table 1. Techniques for detecting *Legionella* in water

Feature	Culturing	PCR (Standard and qPCR)	IDEXX Legiolert	Legipid: Immunomagnetic Separation Capture Enzyme Immunoassay (IMS-CEIA)	Strip Tests (Dipsticks)
Time to results	7-14 days	8-24 hours	7 days	1 hour	30 minutes
Identification to species-level	Yes <sup>1</sup>	Yes	Yes <sup>1</sup>	No	No
Species Detected	Nearly all	<i>L. pneumophila</i> , many <i>L. spp.</i> <sup>2</sup>	Only <i>L. pneumophila</i>	100% <i>L. pneumophila</i> / 90 % <i>L. spp.</i>	Only <i>L. pneumophila</i> serogroup 1
Quantification	Yes	Yes (qPCR only)	Yes	Yes	No
Status of detected cell	Viable & culturable (based on growth)	Dead and alive (based on presence of DNA) <sup>3</sup>	Viable & culturable (based on growth)	Viable (based on envelope integrity)	Unknown
Detects VBNC (Viable But Not Culturable)	No <sup>4</sup>	Yes	No <sup>4</sup>	Yes	Yes
Interpretation of the results	Complex and subjective (pleomorphism, stains, and agglutination)	Simple and objective (does not correlate with cfu)	Simple and objective (corresponds with cfu)	Simple and objective (corresponds with cfu)	Simple and objective (no quantification)
Sample interference	Yes (accompanying organisms)	Yes, but additional steps may help	Yes (accompanying organisms)	Minimal (protocol includes washing steps)	Minimal
False positive rate	Low	Varies with sample quality <sup>3</sup>	3.5% as long as pretreatment protocol is used <sup>5</sup>	12.0% <sup>6</sup>	Unknown
False negative rate	Can be moderate without additional measures <sup>7</sup>	Low if certain measures are taken <sup>8</sup>	Assume similar to Culturing	3.4% <sup>6</sup>	Does not detect all pathogenic species
Detection readout	Visual or Mechanical, Counting	Visual or Mechanical	Visual or Mechanical, Colorimetric	Visual or Mechanical, Colorimetric	Visual, Color

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Theoretical limit of detection	100 cfu/L	100 GU/L (GU=genomic unit) <sub>9</sub>	1 cfu/100mL (potable water) <sub>5</sub>	40 -93 cfu/L <sup>10</sup>	100 cfu/L <sup>11</sup>
Simplicity of test	Laborious	Specialized	Simple	Training needed	Simple
High throughput capability	Medium	High	Medium	Medium	Medium
Multiplexing with other analytes	No	No	No	Yes	No
Cost for in-house testing	Capital investment required	Capital investment required	Capital investment required	Relatively inexpensive	Relatively inexpensive
Approximate cost per test	\$150 - 300 <sup>12</sup>	\$150 - \$500 <sup>12</sup>	\$50 <sup>13</sup>	\$28 - \$130 <sup>14</sup>	\$36 - \$100 <sup>14</sup>
Certification	CDC ELITE, others <sup>15</sup>	ISO 12869, AFNOR <sup>16</sup>	No	AOAC <sup>17</sup>	No

*Table footnotes:* <sup>1</sup> Additional identification test may be needed; <sup>2</sup> qPCR for quantification and identification of many spp., standard PCR plus sequencing for full identification of most spp.; <sup>3</sup> Measures can be taken to reduce detection of dead cells or free DNA; <sup>4</sup> Measures can be taken to enhance detection of VBNC; <sup>5</sup> According to IDEXX-commissioned report: <https://www.idexx.com/resource-library/water/legiolert-vs-iso-11731-potable-water-technical-summary.pdf>; <sup>6</sup> Bedrina et al. 2013--the 'false positive' rate included VBNC not detectable by culturing, meaning it is artificially high; <sup>7</sup> False negative rates for culturing vary--see text; <sup>8</sup> Measures can be taken to reduce sample interference; <sup>9</sup> Kirschner et al. 2016; <sup>10</sup> Colorimetric data are converted to cfu/L using a formula that was generated by correlating to culture results (see Bedrina et al. 2013; Rodríguez Albalat et al. 2014; Díaz-Flores et al. 2015); <sup>11</sup> LOD stated by manufacturers; <sup>12</sup> Includes shipping of sample to testing laboratory; <sup>13</sup> Price is for in-house testing, does not include equipment or other consumables; <sup>14</sup> Price varies depending on throughput; <sup>15</sup> See text for others; <sup>16</sup> For qPCR--see text; <sup>17</sup> AOAC: Association of Official Agricultural Chemists, a "globally recognized, 501(c)(3), independent, third party, not-for-profit association and voluntary consensus standards developing organization" that "develops analytical methods for a broad spectrum of safety interests" and is "an A2LA accredited Proficiency Testing Provider."

Legipid is distributed in the U.S. by  
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