Aquagenx® Compartment Bag Test (CBT)
Most Probable Number (MPN) Table

Aquagenx MPN Table

The Aquagenx Compartment Bag Test MPN Table (Table 2) is based on the World Health Organization (WHO) "Guidelines for Drinking Water Quality," 4th Edition. MPN of *E. coli* per 100 mL is estimated from the combination of positive (blue color) and negative (no blue color) compartments in the Aquagenx Compartment Bag. MPN of total coliforms per 100 mL is estimated from the combination of positive (blue fluorescence under UV light) and negative (no blue fluorescence under UV light) compartments in the Compartment Bag.

MPN values are estimations of concentrations of bacteria. The MPN value for the Compartment Bag Test is estimated by the combination of positive and negative compartments in our Compartment Bag. The technology behind the Aquagenx Compartment Bag Test replaces numeric tables for MPN and Upper 95% Confidence Level values with a simple color-match scoring chart in our MPN Table.

MPN Values and Upper 95% Confidence Level

The Most Probable Number method is based on Poisson distribution and Bayesian statistics. The Poisson distribution and MPN principles describe the probability of having or not having one or more bacteria in a volume of water that is subjected to culturing for the presence or absence of those bacteria.

For every MPN testing method, such as the Aquagenx Compartment Bag Test, multiple test tubes, or other MPN testing methods, there is both an MPN value and an Upper 95% Confidence Level (CL). The two go hand-in-hand and are inseparable.

The Upper 95% CL is the highest possible MPN value that could be present in the water sample if the same sample is tested repeatedly many times. That is, the "true" concentration of bacteria in the sample will be at or below the 95% CL. It represents a worst-case upper limit of the quality of the water that would not be exceeded 95 times out of 100 on average if the same sample is analyzed over and over again.

In the Aquagenx MPN Table, there are multiple instances of MPN values where the corresponding 95% CL is less than the preceding row. This is because a positive large compartment, for example, provides very different information about certainty than a positive small compartment. When we combine a particular pattern of positive and negative compartments, we get a unique combination of certainty that leads to different 95% CLs (sometimes large, sometimes small, sometimes with a slightly higher MPN, sometimes slightly lower).

For example, in rows 17 and 18 in the Aquagenx MPN Table, the MPN values are 3.4 and 3.9 respectively, and the 95% CLs are 12.53 and 10.43. Note in row 17 the 56 mL compartment is positive, but in row 18 the 56 mL compartment is negative. The larger compartment has provided a greater level of uncertainty in the former and not in the latter.

Given some MPN values and their upper 95% CLs can span two WHO health risk levels (Table 1), we needed terminology to distinguish between the MPN values and upper 95% CLs that stay within the same health risk level. We felt such test results need to be designated separately. Therefore, we added the "Probably" and "Possibly" terms in the Intermediate and High Risk levels for these distinctions. As a result, the Aquagenx MPN Table provides more granularity within the four main WHO health risk categories for drinking water

WHO Guidelines for Drinking Water Quality, Table 5.4, Fourth Edition, 2017

		Sanitary inspection risk score (susceptibility of supply to contamination from human and animal faeces)			
		0–2	3–5	6–8	9–10
E.coli classification (as decimal concentration/100)	< 1				
	1–10				
	11–100				
	> 100				

Low risk: no action required	Intermediate risk: low action priority	High risk: higher action priority	Very high risk: urgent action required

Table 1

Aquagenx® Most Probable Number Table for Drinking Water

Row Number:	Compartment Number 1 (10mL)	2 (30mL)	3 (56mL)	4 (3mL)	5 (1mL)	MPN/100mL	Upper 95% Confidence Level/100mL	WHO Health Risk Category Based on MPN and Upper 95% Confidence Level
1						0.0	2.87	Low Risk/Safe
2						1.0	5.14	Intermediate Risk/ Probably Safe
3						1.0	4.74	
4						1.1	5.16	
5						1.2	5.64	
6						1.5	7.81	
7						2.0	6.32	
8						2.1	6.85	
9						2.1	6.64	
10						2.4	7.81	
11						2.4	8.12	
12						2.6	8.51	
13						3.2	8.38	
14						3.7	9.70	
15						3.1	11.36	Intermediate Risk/ Possibly Safe
16						3.2	11.82	
17						3.4	12.53	
18						3.9	10.43	
19						4.0	10.94	
20						4.7	22.75	
21						5.2	14.73	
22						5.4	12.93	
23						5.6	17.14	
24						5.8	16.87	
25						8.4	21.19	
26						9.1	37.04	
27						9.6	37.68	
28						13.6	83.06	High Risk/Possibly Unsafe
29						17.1	56.35	
30						32.6	145.55	High Risk/Probably Unsafe
31						48.3	351.91	
32						>100	9435.10	Unsafe
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Table 2