



One Health Diagnostics™

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# Detection and Enumeration of Total Viable Bacteria from Various Surfaces using Hygiena's MicroSnap SX-TVC (MicroSnap Surface Xpress™ (SX)) for Total Viable Count) and Comparison to the Standard ISO 18593:2018 Method

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## INTRODUCTION:

Many foodborne illnesses originate from mesophilic bacteria (1). Foodborne illnesses are linked to inadequate storage temperature, cross-contamination of equipment, and unclean work surfaces (2). Food manufacturing plants and hospitals are common areas where these foodborne illnesses start. Certain pathogens have the potential to form biofilms on surfaces that potentially risk for further spread of infection (3). To prevent these foodborne illnesses from occurring, there needs to be thorough cleaning and hygiene procedures in place to prevent further contamination events (3). To ensure that these hygiene procedures are adequate, an environmental screening for microorganisms is an important part of safety and quality (3).

Hygiena's MicroSnap Surface Xpress™ Total Viable Count (SX-TVC) device is a self-contained rapid bioluminescent test for the detection and enumeration of aerobic bacteria from a surface, providing results in 4-5 hours. The simple procedure requires a short incubation period facilitating the growth of bacteria followed by a detection step. During incubation in enrichment media, bacteria numbers increase, and potential sample interference is reduced.

## PURPOSE:

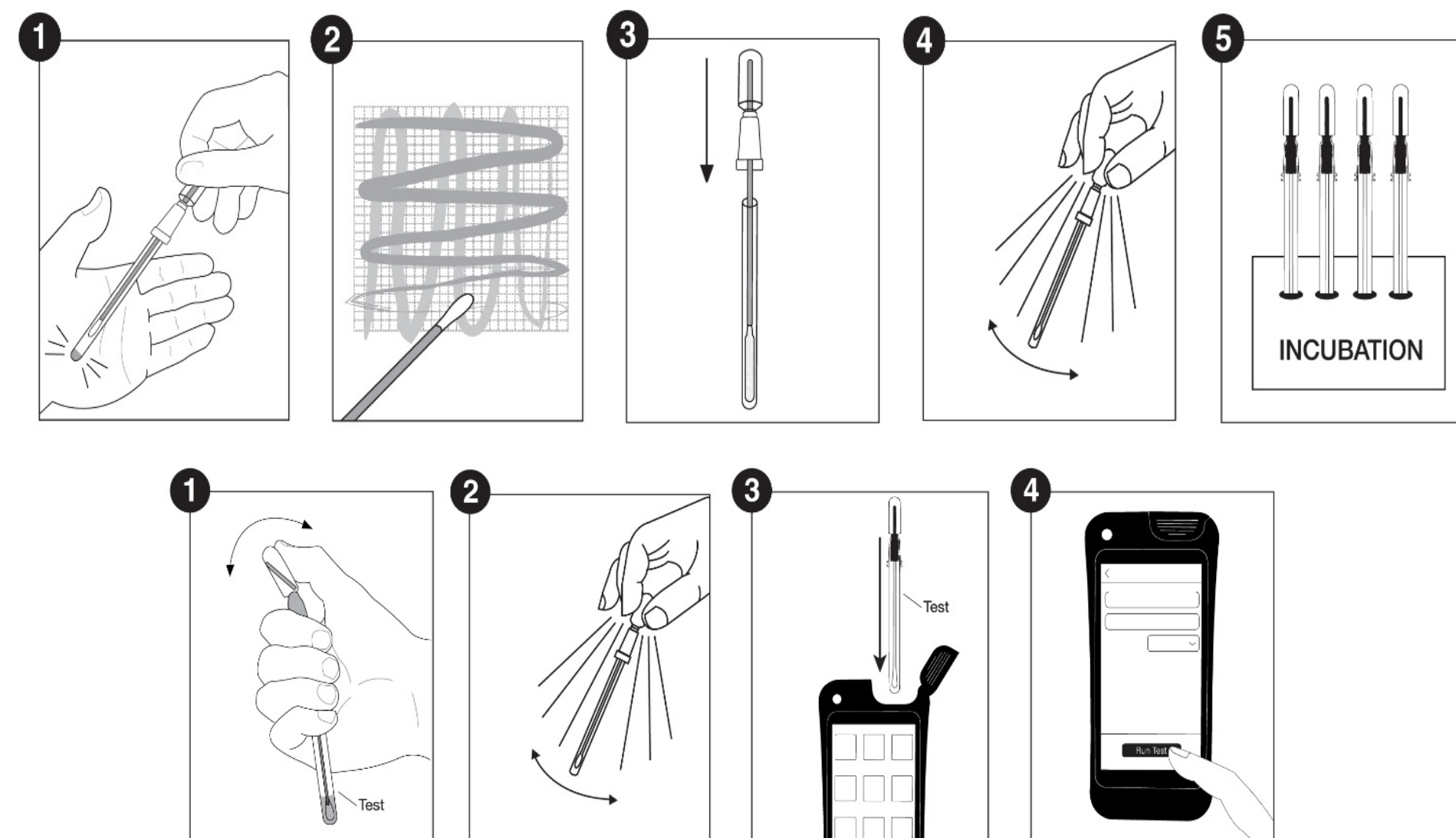
To demonstrate detection of Total Viable Bacteria from 5 different surface matrices and comparison to the ISO 18593:2018 method in an unpaired study.

## REGISTERED TRADEMARKS:

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## METHODS:

Stainless-steel, concrete, plastic, ceramic, and rubber coupons (100 cm<sup>2</sup>) were inoculated with *S. aureus*, *B. cereus*, *S. Typhimurium*, *L. monocytogenes*, and *E. coli*, respectively, at four different CFU levels and then allowed to dry for 18-24 h. After drying, samples were collected from the surfaces using MicroSnap SX-TVC; the devices were incubated at 32 °C and tested at 4 and 5 hours, respectively. BAM Ch.3 plus ISO 18593:2018 methods were performed alongside these validations in an unpaired study to determine the recovered CFU levels from the surface post-drying.



## RESULTS AND SIGNIFICANCE:

The CFUs gathered by MicroSnap SX-TVC were collected at 4 h and 5 h, respectively, and compared with BAM Ch. 3 plus ISO 18593:2018 to determine equivalency. The 4-hour results showed that among the four different spike levels (10-100, 100-1,000, 1,000-10,000, & 0 CFUs), the difference of mean between the two methods were within half a log of each other, and the 90% confidence interval fell within the equivalency range. The 5-hour incubation results demonstrated that most spiked levels fell within the equivalency range and the difference of means were within half a log of the reference method results, confirming that the two methods are similar for detection of total viable bacteria from the matrices. The MicroSnap SX-TVC can be used as a simple, rapid, and accurate method to measure Total Viable Bacteria from the five different matrices as compared to traditional methods.

## RESULTS:

Table 1. Matrix study: MicroSnap Surface Express: Total results vs reference method results (4-hour incubation)

Matrix	Target cont. level/test area <sup>a</sup>	MSX Total		BAM Ch. 3		DOM <sup>d</sup>	SE <sup>e</sup>	90% CI <sup>f</sup>		95% CI	
		Mean <sup>b</sup>	s <sub>r</sub> <sup>c</sup>	Mean	s <sub>r</sub>			LCL <sup>g</sup>	UCL <sup>h</sup>	LCL	UCL
Stainless steel <i>Staphylococcus aureus</i> ATCC 6538	0	0.04	0.00	0.09	0.13	-0.06	0.06	-0.18	0.06	-0.21	0.10
	95 CFU/mL	2.28	0.13	1.97	0.11	0.31	0.08	0.16	0.46	0.13	0.49
	5.32 x 10 <sup>2</sup> CFU/mL	2.53	0.23	2.49	0.04	0.03	0.12	-0.20	0.27	-0.26	0.33
	6.22 x 10 <sup>3</sup> CFU/mL	3.56	0.21	3.76	-0.19	-0.19	0.13	-0.44	0.05	-0.49	0.11
Rubber <i>Escherichia coli</i> ATCC 8739	0	0.48	0.26	0.32	0.28	0.34	0.20	-0.27	0.58	-0.40	0.71
	40 CFU/mL	1.59	0.44	1.47	0.39	0.12	0.35	-0.43	0.57	-0.63	0.73
	2.07 x 10 <sup>2</sup> CFU/mL	2.83	0.21	2.28	0.17	0.54	0.22	0.20	0.68	0.29	1.42
	2.20 x 10 <sup>3</sup> CFU/mL	3.35	0.47	3.31	0.17	0.04	0.22	-0.41	0.49	-0.53	0.62
Plastic <i>Salmonella abaster</i> ATCC 35640	0	0.21	0.76	0.06	0.23	-0.15	0.36	-0.92	0.62	-1.15	0.85
	31 CFU/mL	2.18	0.17	1.97	0.21	0.20	0.12	-0.03	0.44	-0.09	0.50
	9.06 x 10 <sup>2</sup> CFU/mL	3.21	0.40	2.84	0.34	0.37	0.24	-0.08	0.62	-0.19	0.94
	9.74 x 10 <sup>3</sup> CFU/mL	3.91	0.38	3.98	0.09	-0.06	0.18	-0.45	0.32	-0.57	0.44
Concrete <i>Bacillus cereus</i> ATCC 11778	0	0.66	0.26	0.47	0.32	0.19	0.18	-0.16	0.54	-0.25	0.63
	12 CFU/mL	0.93	0.07	1.02	0.23	-0.08	0.13	-0.55	0.38	-0.90	0.56
	1.14 x 10 <sup>2</sup> CFU/mL	1.98	0.41	2.03	0.18	-0.05	0.20	-0.46	0.36	-0.57	0.47
	2.26 x 10 <sup>3</sup> CFU/mL	2.63	0.21	3.33	0.17	-0.69	0.12	-0.62	-0.46	-0.98	-0.41
Ceramic <i>Listeria monocytogenes</i> ATCC 19116	0	0.83	0.21	0.86	0.12	0.03	0.11	-0.20	0.26	-0.27	0.33
	19 CFU/mL	1.48	0.18	1.25	0.19	0.23	0.11	0.01	0.45	-0.05	0.51
	1.56 x 10 <sup>2</sup> CFU/mL	2.05	0.16	2.19	0.09	-0.14	0.08	-0.30	0.02	-0.34	0.07
	1.22 x 10 <sup>3</sup> CFU/mL	2.75	0.27	3.08	0.11	-0.33	0.13	-0.59	-0.06	-0.66	0.01
	1.26 x 10 <sup>4</sup> CFU/mL	4.09	0.06	4.10	0.02	0.01	0.03	-0.06	0.05	-0.08	0.06

Table 2. Matrix study: MicroSnap Surface Express: Total results vs reference method results (5-hour incubation)

Matrix	Target cont. level/test area <sup>a</sup>	MSX Total		BAM Ch. 3		DOM <sup>d</sup>	SE <sup>e</sup>	90% CI <sup>f</sup>		95% CI	
		Mean <sup>b</sup>	s <sub>r</sub> <sup>c</sup>	Mean	s <sub>r</sub>			LCL <sup>g</sup>	UCL <sup>h</sup>	LCL	UCL
Stainless steel <i>Staphylococcus aureus</i> ATCC 6538	0	0.25	0.16	0.10	0.13	0.15	0.09	-0.03	0.32	-0.07	0.36
	95 CFU/mL	2.08	0.36	1.96	0.10	0.11	0.17	-0.25	0.47	-0.36	0.57
	5.32 x 10 <sup>2</sup> CFU/mL	2.60	0.31	2.49	0.15	0.11	0.15	-0.21	0.42	-0.29	0.50
	6.22 x 10 <sup>3</sup> CFU/mL	3.74	0.10	4.00	0.11	-0.26	0.07	-0.39	-0.13	-0.42	-0.10
Rubber <i>Escherichia coli</i> ATCC 8739	0	0.78	0.28	0.32	0.28	0.46	0.18	0.12	0.6	0.04	0.81
	40 CFU/mL	1.88	0.25	1.47	0.39	0.41	0.34	-0.12	0.63	-0.71	0.97
	2.07 x 10 <sup>2</sup> CFU/mL	2.66	0.13	2.28	0.17	0.38	0.12	0.13	0.64	0.05	0.71
	2.20 x 10 <sup>3</sup> CFU/mL	3.56	0.2	3.31	0.17	0.24	0.12	0.02	0.47	-0.04	0.53
Plastic <i>Salmonella abaster</i> ATCC 35640	0	0.26	0.26	0.06	0.23	-0.2	0.17	-0.56	0.16	-0.67	0.27
	31 CFU/mL	1.91	0.7	1.97	0.22	-0.06	0.33	-0.56	0.63	-0.98	0.84
	9.06 x 10 <sup>2</sup> CFU/mL	3.07	0.3	2.84	0.34	0.22	0.2	-0.16	0.61	-0.25	0.71
	9.74 x 10 <sup>3</sup> CFU/mL	3.88	0.26	3.98	0.09	-0.09	0.12	-0.36	0.17	-0.44	0.25
Concrete <i>Bacillus cereus</i> ATCC 11778	0	0.76	0.2	0.47	0.32	0.29	0.17	-0.04	0.62	-0.13	0.71
	12 CFU/mL	1.27	0.1	1.02	0.23	0.26	0.11	0.03	0.48	-0.03	0.55
	1.14 x 10 <sup>2</sup> CFU/mL	2.45	0.34	2.03	0.18	0.43	0.19	0.08	0.48	-0.1	0.95
	2.26 x 10 <sup>3</sup> CFU/mL	3.86	0.12	3.33	0.17	0.55	0.3	0.11	0.55	0.38	0.78
Ceramic <i>Listeria monocytogenes</i> ATCC 19116	0	0.74	0.14	4.05	0.08	0.12	0.07	-0.02	0.26	-0.05	0.3
	19 CFU/mL	1.26	0.19	1.25	0.19	0.01	0.12	-0.22	0.24	-0.27	0.29
	1.56 x 10 <sup>2</sup> CFU/mL	1.57	0.26	2.19	0.09	-0.61	0.12	-0.56	-0.03	-0.92	-0.29
	1.22 x 10 <sup>3</sup> CFU/mL	2.55	0.16	3.08	0.11	-0.53	0.09	-0.44	-0.04	-0.74	-0.32
	1.26 x 10 <sup>4</sup> CFU/mL	4.04	0.17	4.1	0.02	-0.06	0.08	-0.22	0.11	-0.27	0.16

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