CERTIFICATION

AOAC Research Institute

Performance Tested Methods[SM]

Certificate No.

022401

The AOAC Research Institute hereby certifies the method known as:

Tianlong Biolum Portable ATP Hygiene Monitoring System

manufactured by

Xi'an Tianlong Science and Technology Co., Ltd.
No.4266, Shanglin Road, Weiyang District
Xi'an, 710021, Shaanxi
P.R. China

This method has been evaluated in the AOAC Research Institute *Performance Tested Methods*[SM] Program and found to perform as stated in the applicability of the method. This certificate indicates an AOAC Research Institute Certification Mark License Agreement has been executed which authorizes the manufacturer to display the AOAC Research Institute *Performance Tested Methods*[SM] certification mark on the above-mentioned method for the period below. Renewal may be granted by the Expiration Date under the rules stated in the licensing agreement.

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Signature for AOAC Research Institute

Issue Date March 04, 2024
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METHOD NAME
Tianlong Biolum Portable ATP Hygiene Monitoring System

CATALOG NUMBER
A001H

INDEPENDENT LABORATORY
Q Laboratories
1930 Radcliff Drive
Cincinnati, OH 45204

APPLICABILITY OF METHOD
Target organism – Adenosine Triphosphate (ATP)

Matrixes – Stainless steel (304)

Performance claims – The Biolum Portable ATP Hygiene Monitoring System when used with the ATP Test Swab is effective at monitoring on-site cleanliness of stainless steel in food and beverage industries with an LOD of 0.9 fmol ATP.

ORIGINAL CERTIFICATION DATE	**CERTIFICATION RENEWAL RECORD**
February 29, 2024	**New Approval 2024**
METHOD MODIFICATION RECORD	**SUMMARY OF MODIFICATION**
NONE	**NONE**
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NONE	**NONE**

PRINCIPLE OF THE METHOD (1)
The Biolum Portable ATP Hygiene Monitoring System when used with the ATP Test Swab is a bioluminescence assay for monitoring hygiene and cleanliness standards. The ATP Test Swab contains recombinant luciferase reagent. When ATP is present the recombinant luciferase in the reagent catalyzes the oxidation of the substrate D-luciferin. The oxidation reaction generates photons emitting fluorescence. The Biolum Portable ATP Hygiene Monitoring system is a fluorometer which can measure the fluorescence admitted by the ATP Test Swab and is reported in RLUs (2, 3).

DISCUSSION OF THE VALIDATION STUDY (1)
For an ATP test to function well as a rapid hygiene monitoring tool, it must be sensitive to pure analyte, be capable of detecting ATP from and in the presence of food and microbial spoilage, and must give proportional reproducible results.
ATP test swabs have shown good linearity and sensitivity in pure analyte studies in both studies from independent laboratory and method developer. But some difference worth pondering that the Mean RLU from method developer studies and independent laboratory studies was 0 and 0.6 at 0 ATP, fmol/assay, respectively. The difference in background readings may be due to the different quality of water used, as the independent laboratory used LC/MS grade water and the developer's study used the laboratory's own sterile water.
For the food matrix and microbial evaluations, the ATP Test Swab was able to detect ATP from a variety of food and microbial sources. Detection of ATP was possible at dilutions of 1:1000 or lower for all food matrixes tested from the method developer studies. This sensitivity to low levels of food/beverage residue shows that ATP hygiene monitoring is a far more accurate check of cleaning performance than simply looking for a dirty surface. The results from microbial matrix testing validate the microbial testing data by showing that ATP Test Swab can successfully recover and measure microbial ATP from gram positive bacteria (*S. aureus*), gram negative bacteria (*E. coli*), and yeast (*S. cerevisiae*). In each case there is a linear dose-response with correlations of >90% for all organisms tested in both wet and dry conditions.
The s_r and RSD_r values were relatively higher in the matrix and microbial study than in the pure analyte studies. There can be variation from sample homogenization, sample spreading, sample drying, sample swabbing, non-sample ATP from the environment, and differing environmental conditions during drying that all factor into the RLU results. In all cases, the ATP Test Swab readings from the surface testing were in proportion to the dilution of food or organism type.
Although inhibition was observed in the three classes of sanitizers, ATP was successfully detected on the Biolum Portable ATP Hygiene Monitoring System and ATP Test Swab. Unintelligibly, Peracetic acid can behave incoherently under different ATP levels. Perhaps this is not true inhibition or enhancement, but Peracetic acid makes the testing system unstable and leads to volatile data. The three sanitizers used in the developer's study are commonly used in the food processing and healthcare industries. For this study, the sanitizers were not rinsed off the surfaces prior to obtaining the test sample. Common industry practice is to rinse after sanitizing, then proceed to collecting the surface test sample.
An important point to draw from both the food and microbial matrix data is the successful detection of all matrixes after drying. This demonstrates that there is not a dramatic decrease in ATP availability due to ATP instability on surfaces or when exposed to drying. ATP remains stable when dried on surfaces and will not simply become negative overtime when left without cleaning. To get a negative result by surface ATP hygiene monitoring, the ATP must be physically removed by diligent cleaning. Absence of regular well performed cleaning will lead to positive RLU results from surfaces monitored by ATP testing regardless of the industrial location.

Table 1. Raw and Calculated Data for the Pure Analyte LOD (1)

		ATP, fmol/assay						
		0	1	5	25	100	500	1500
Method developer	Mean RLU[a]	0.6	2.4	9.7	50.3	237.4	1152.8	3549.8
	s_r[b]	0.052	0.052	1.16	2.91	13.42	110.88	320.01
	RSD_r[c]	86.07	21.52	11.95	5.78	5.65	9.62	9.01
	Mean fmol[d]	2.45	3.22	6.30	23.47	102.59	488.27	1520.58
	s_r[e]	0.22	0.22	0.49	1.23	5.67	46.89	135.32
	RSD_r[f]	8.90	6.79	7.78	5.24	5.53	9.60	8.90
Independent laboratory	Mean RLU	0	9	21	91.8	404.1	1967	6239
	s_r	0	6.77	13.86	15.15	41.38	250.85	824.09
	RSD_r	N/A	75.18	65.98	16.50	10.24	12.76	13.21
	Mean fmol	0	2.18	5.08	22.19	97.70	475.45	1508.40
	s_r	0	1.64	3.35	3.66	10.00	60.65	199.23
	RSD_r	N/A	75.18	65.98	16.50	10.24	12.76	13.21

[a] Average RLU from 10 replicates per ATP level.
[b] s_r calculated from 10 replicates per ATP level.
[c] RSD_r calculated from 10 replicates per RLU level.
[d] Average ATP (femtomoles) from 10 theoretical replicates per ATP level.
[e] s_r calculated from 10 predicted replicates per RLU level.
[f] s_r calculated from 10 predicted replicates per RLU level.

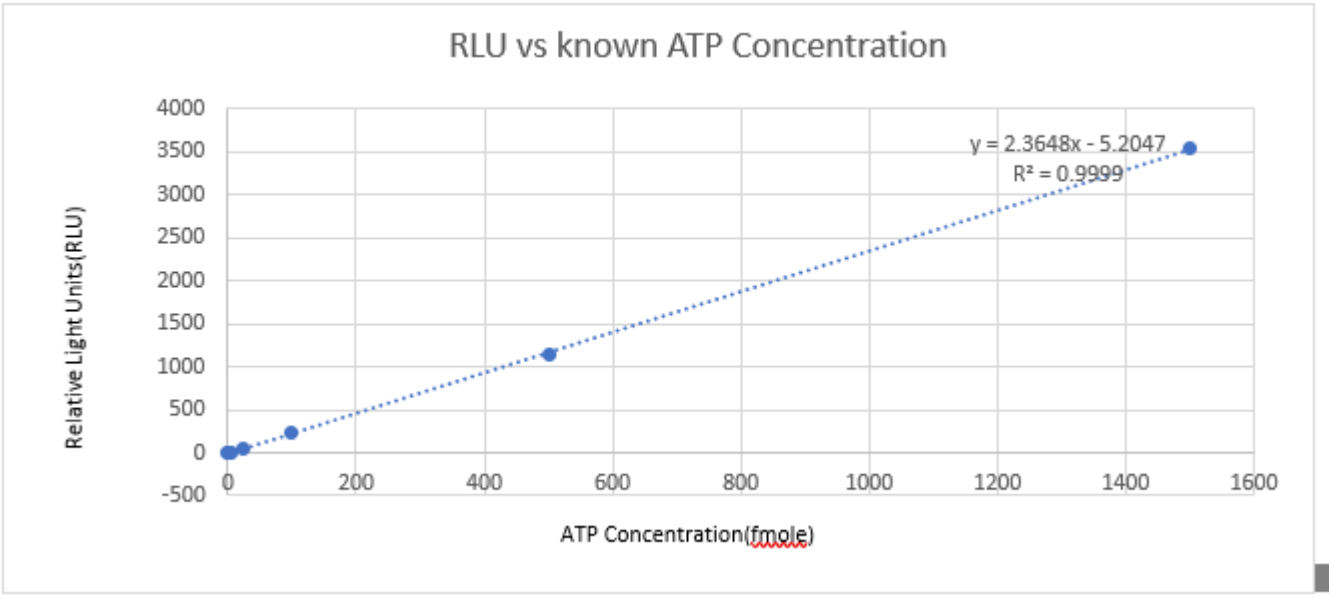

Figure 1. Regression Analysis of RLUs to Determine ATP Concentration in Method Developer Study (1)

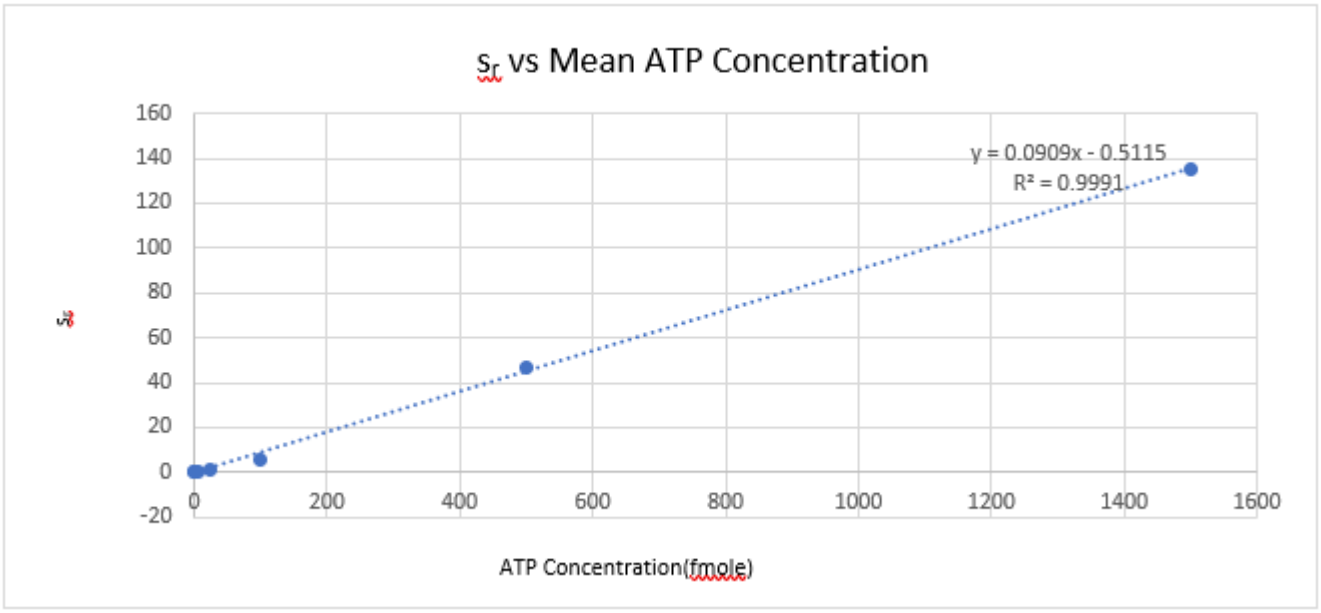

Figure 2. Regression Analysis used to Calculate LOD in Method Developer Study (1)

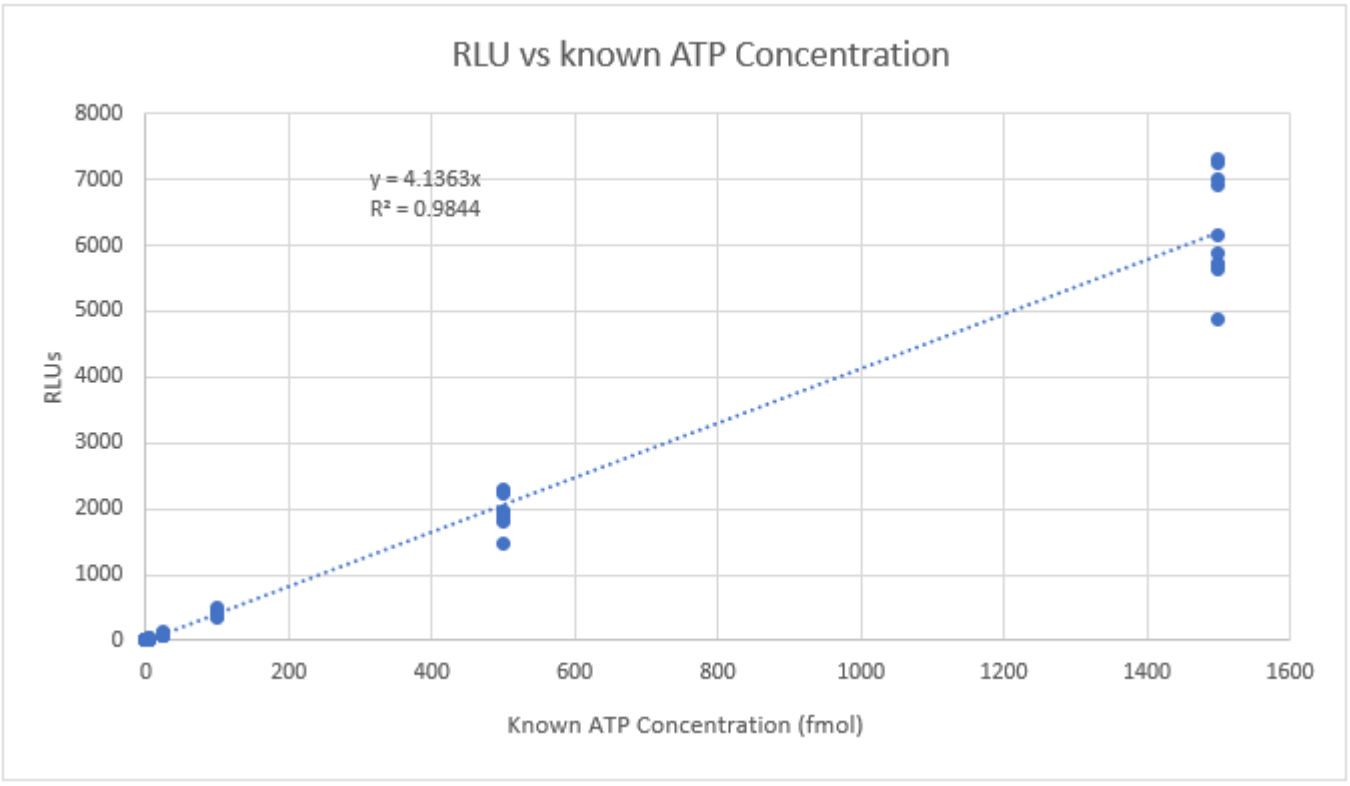

Figure 3. Regression Analysis of RLUs to Determine ATP Concentration in Independent Laboratory Study (1)

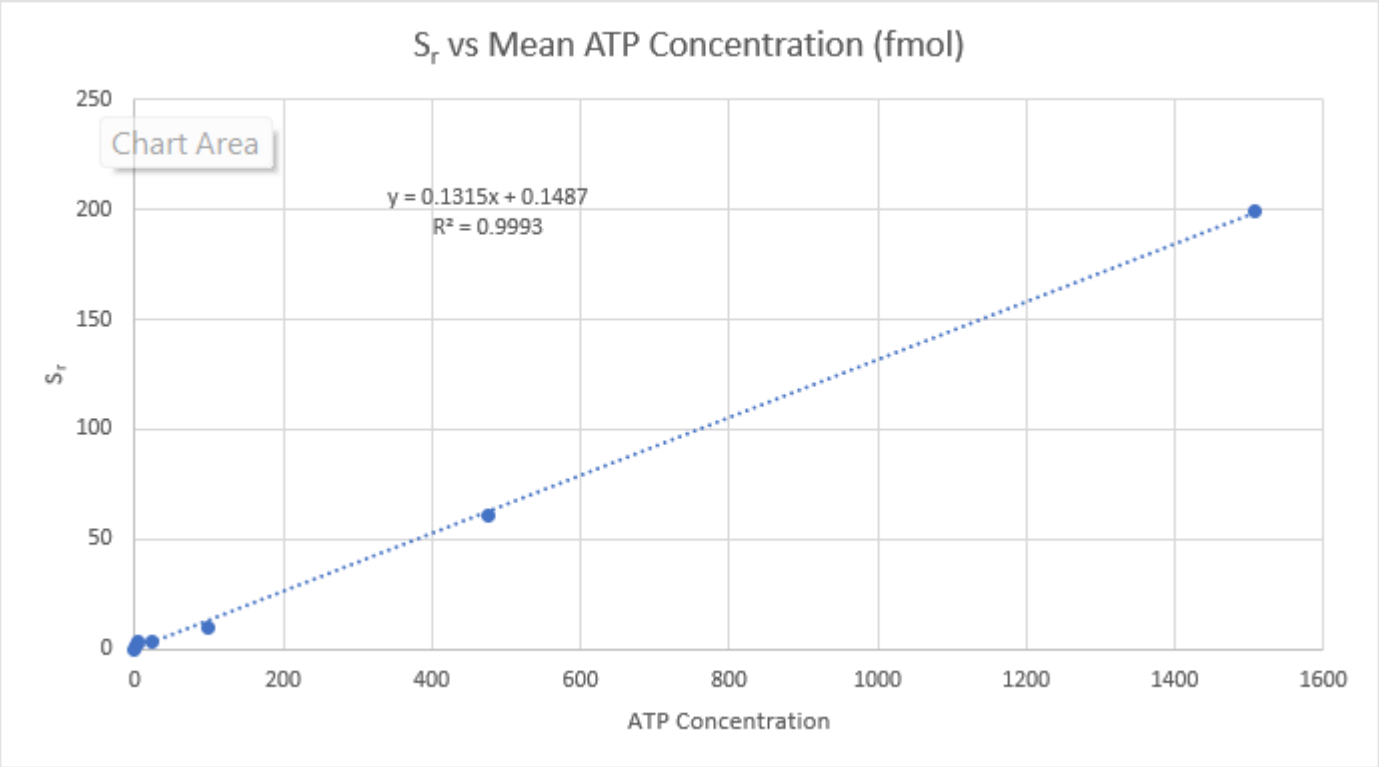

Figure 4. Regression Analysis used to Calculate LOD in Independent Laboratory Study (1)

Table 2. Raw and Calculated Data for the Stainless Steel Matrix Study – Wet Sampling (1)

	Dilution[a]	Replicate										Mean RLU[b]	s_r[c]	RSD_r[d]
		1	2	3	4	5	6	7	8	9	10			
Raw Mutton	Sterile water	1	2	4	3	3	4	5	3	2	3	3.00	1.15	38.49
	10^{-5}	3	3	4	5	3	2	2	3	1	4	3.00	1.15	38.49
	10^{-4}	7	9	12	9	9	7	12	8	6	10	8.90	2.02	22.75
	10^{-3}	36	58	43	50	62	55	42	39	59	62	50.60	9.91	19.59
	10^{-2}	551	468	510	319	609	650	711	496	631	644	558.90	114.80	20.54
Doughnut Residue	Sterile water	4	5	5	3	6	5	4	2	5	4	4.30	1.16	26.97
	10^{-5}	8	6	8	7	9	6	7	4	6	6	6.70	1.42	21.17
	10^{-4}	11	15	9	8	6	12	11	9	10	8	9.90	2.51	25.40
	10^{-3}	89	92	93	56	74	81	62	79	101	92	81.90	14.46	17.65
	10^{-2}	742	660	823	509	743	711	697	850	692	860	728.70	103.75	14.24
Sweetened Yogurt	Sterile water	4	5	5	3	2	5	2	4	5	4	3.90	1.20	30.70
	10^{-5}	3	3	2	6	4	5	3	4	3	3	3.60	1.17	32.61
	10^{-4}	12	17	10	6	29	15	31	18	12	9	15.90	8.28	52.07
	10^{-3}	75	89	125	86	77	63	109	121	65	78	88.80	22.22	25.02
	10^{-2}	522	331	657	780	492	547	785	621	505	643	588.30	138.54	23.55
100% Orange Juice	Sterile water	3	3	2	1	4	3	5	2	3	1	2.70	1.25	46.36
	10^{-6}	4	5	5	3	1	2	4	3	5	2	3.40	1.43	42.05
	10^{-5}	11	24	17	15	9	7	14	12	8	10	12.70	5.08	39.99
	10^{-4}	72	48	66	112	46	62	89	74	64	77	71.00	19.32	27.21
	10^{-3}	509	766	447	468	652	511	372	620	436	504	528.50	117.69	22.27
Smoked Sausage	Sterile water	6	4	3	5	6	3	2	5	1	5	4.00	1.70	42.49
	10^{-4}	6	5	4	4	5	2	6	2	3	5	4.20	1.48	35.14
	10^{-3}	37	42	20	36	42	29	22	38	19	44	32.90	9.63	29.28
	10^{-2}	197	166	157	203	211	235	184	177	236	247	201.30	30.99	15.39

[a] *Final dilution of matrix applied to 4" x 4" surface area.*

[b] *Average of the number of replicate surface areas tested per dilution.*

[c] *Standard deviation of repeatability based on the number of replicate surface areas tested per dilution.*

[d] *Relative standard deviation of repeatability, (s_r/ mean x 100), expressed as a percentage.*

Table 3. Raw and Calculated Data for the Stainless Steel Matrix Study – Dry Sampling (1)

	Dilution[a]	Replicate										Mean RLU[b]	s_r[c]	RSD_r[d]
		1	2	3	4	5	6	7	8	9	10			
Raw Mutton	Sterile water	2	2	1	3	4	4	3	3	3	2	2.70	0.95	35.14
	10^{-5}	1	3	2	3	4	2	3	2	3	3	2.60	0.84	32.43
	10^{-4}	5	4	7	11	6	8	9	11	8	6	7.50	2.37	31.58
	10^{-3}	16	28	31	35	42	21	15	17	41	22	26.80	10.15	37.88
	10^{-2}	194	154	109	177	205	243	179	185	160	178	178.40	34.83	19.53
Doughnut Residue	Sterile water	2	2	3	3	4	1	3	3	2	2	2.50	0.85	33.99
	10^{-5}	8	5	6	3	2	8	9	4	5	5	5.50	2.27	41.33
	10^{-4}	5	5	6	9	4	7	9	5	6	7	6.30	1.70	27.03
	10^{-3}	62	58	47	95	82	62	50	79	97	82	71.40	17.96	25.16
	10^{-2}	434	361	258	404	334	372	429	510	393	460	395.50	70.23	17.76
Sweetened Yogurt	Sterile water	2	2	1	3	2	4	3	2	1	3	2.30	0.95	41.25
	10^{-5}	4	5	1	4	4	3	4	2	3	3	3.30	1.16	35.14
	10^{-4}	15	14	9	11	17	9	10	13	12	11	12.10	2.64	21.85
	10^{-3}	64	56	39	64	71	47	48	52	48	50	53.90	9.77	18.12
	10^{-2}	317	259	430	375	309	533	476	261	458	482	390.00	99.14	25.42
100% Orange Juice	Sterile water	1	3	3	2	3	3	2	4	5	2	2.80	1.14	40.55
	10^{-6}	3	2	5	5	2	1	3	3	3	3	3.00	1.25	41.57
	10^{-5}	8	9	6	12	6	11	9	9	10	5	8.50	2.27	26.74
	10^{-4}	42	30	35	67	39	48	50	44	32	48	43.50	10.77	24.77
	10^{-3}	319	398	227	234	362	260	300	311	275	399	308.50	62.29	20.19
Smoked Sausage	Sterile water	2	4	2	2	4	3	3	1	2	3	2.60	0.97	37.16
	10^{-4}	3	3	2	1	4	3	3	5	3	2	2.90	1.10	37.95
	10^{-3}	12	20	14	16	21	19	14	17	12	24	16.90	4.04	23.91
	10^{-2}	60	48	45	67	32	71	44	40	39	57	50.30	12.86	25.56

[a] *Final dilution of matrix applied to 4" x 4" surface area.*
[b] *Average of the number of replicate surface areas tested per dilution.*
[c] *Standard deviation of repeatability based on the number of replicate surface areas tested per dilution.*
[d] *Relative standard deviation of repeatability, (s_r/ mean x 100), expressed as a percentage.*

Table 4. Raw and Calculated Data for the Microbial Study – Wet Sampling (1)

	Dilution[a]	CFU/mL[b]	Replicate										Mean RLU[c]	s_r[d]	RSD_r[e]
			1	2	3	4	5	6	7	8	9	10			
E. coli (BNCC[f] 133264)	10^{-3}	6.7×10^{5}	3521	4608	3396	3921	4760	5019	2761	3572	5008	4635	4120.10	787.36	19.11
	10^{-4}	6.7×10^{4}	620	481	947	529	625	607	326	711	855	767	646.80	182.30	28.18
	10^{-5}	6.7×10^{3}	136	65	59	92	68	45	71	103	55	127	82.10	31.12	37.90
	10^{-6}	6.7×10^{2}	5	6	4	2	6	5	9	3	7	4	5.10	2.02	39.70
	10^{-7}	6.7×10^{1}	3	2	3	5	5	4	7	4	6	6	4.50	1.58	35.14
S. aureus (BNCC 186335)	10^{-3}	3.6×10^{5}	3025	2247	1673	2869	2431	3657	2480	2611	3505	3329	2782.70	615.89	22.13
	10^{-4}	3.6×10^{4}	288	365	480	197	356	433	507	359	612	630	422.70	137.53	32.54
	10^{-5}	3.6×10^{3}	22	15	48	30	17	52	41	46	52	31	35.40	14.28	40.35
	10^{-6}	3.6×10^{2}	4	5	3	7	5	9	2	4	3	3	4.50	2.12	47.14
	10^{-7}	3.6×10^{1}	1	4	6	5	3	6	4	5	5	3	4.20	1.55	36.89
S. cerevisiae (BNCC 187280)	10^{-3}	1.2×10^{5}	7736	5230	6991	5743	4326	5005	7163	3365	4613	3708	5388.00	1497.20	27.79
	10^{-4}	1.2×10^{4}	2590	3215	892	3004	2418	1603	2535	1961	2304	2262	2278.40	672.15	29.50
	10^{-5}	1.2×10^{3}	632	711	459	320	656	673	540	391	233	246	486.10	181.86	37.41
	10^{-6}	1.2×10^{2}	57	112	89	76	59	92	101	65	121	61	83.30	23.18	27.82
	10^{-7}	1.2×10^{1}	10	11	27	15	18	19	14	10	11	6	14.10	6.01	42.61
	10^{-8}	1.2×10^{0}	4	5	5	2	3	7	2	5	6	9	4.80	2.20	45.85

[a] Final dilution, made from 10^8 CFU/mL cell suspensions of each organism, applied to 4" x 4" surface area.
[b] Estimated cell concentration applied to the surface, based on 10^8 CFU/mL cell suspension starting material.
[c] Average of the number of replicate surface areas tested per dilution.
[d] Standard deviation of repeatability based on the number of replicate surface areas tested per dilution.
[e] Relative standard deviation of repeatability, (s_r/mean x 100), expressed as a percentage.
[f] BNCC = BeNa Culture Collection, Beijing, China.

Table 5. Raw and Calculated Data for the Microbial Study – Dry Sampling[a] (1)

	Dilution[a]	CFU/mL[b]	Replicate										Mean RLU[c]	s_r[d]	RSD_r[e]
			1	2	3	4	5	6	7	8	9	10			
E. coli (BNCC[f] 133264)	10^{-3}	6.7×10^{5}	2201	1604	890	1735	1671	1365	2513	1534	784	629	1492.60	603.24	40.42
	10^{-4}	6.7×10^{4}	235	347	310	276	85	176	113	257	366	124	228.90	100.17	43.76
	10^{-5}	6.7×10^{3}	61	44	27	50	35	29	43	31	20	53	39.30	13.02	33.13
	10^{-6}	6.7×10^{2}	3	3	4	7	2	3	3	4	3	2	3.40	1.43	42.05
	10^{-7}	6.7×10^{1}	3	3	4	5	5	3	2	5	6	7	4.30	1.57	36.44
S. aureus (BNCC186335)	10^{-3}	3.6×10^{5}	2431	1560	1026	1145	1328	899	947	1366	1005	934	1264.10	464.82	36.77
	10^{-4}	3.6×10^{4}	326	249	340	211	269	233	440	196	342	180	278.60	81.82	29.37
	10^{-5}	3.6×10^{3}	42	24	33	57	19	22	36	45	22	27	32.70	12.31	37.65
	10^{-6}	3.6×10^{2}	7	8	4	3	5	4	7	5	5	3	5.10	1.73	33.90
	10^{-7}	3.6×10^{1}	3	3	4	5	3	3	3	3	4	5	3.60	0.84	23.42
S. cerevisiae (BNCC187280)	10^{-3}	1.2×10^{5}	5325	4355	2906	6128	3467	5633	3174	3365	4613	2504	4147.00	1249.04	30.12
	10^{-4}	1.2×10^{4}	1762	1523	1290	911	815	1147	1553	1691	1304	973	1296.90	332.83	25.66
	10^{-5}	1.2×10^{3}	433	165	220	196	232	264	185	147	253	322	241.70	84.58	34.99
	10^{-6}	1.2×10^{2}	52	29	47	40	36	51	55	37	40	59	44.60	9.63	21.59
	10^{-7}	1.2×10^{1}	6	6	7	5	5	7	8	3	3	4	5.40	1.71	31.72
	10^{-8}	1.2×10^{0}	6	2	5	5	5	4	3	3	4	6	4.30	1.34	31.10

[a] Final dilution, made from 10^{8} CFU/mL cell suspensions of each organism, applied to 4" x 4" surface area.
[b] Estimated cell concentration applied to the surface, based on 10^{8} CFU/mL cell suspension starting material.
[c] Average of the number of replicate surface areas tested per dilution.
[d] Standard deviation of repeatability based on the number of replicate surface areas tested per dilution.
[e] Relative standard deviation of repeatability, (s_r/mean x 100), expressed as a percentage.
[f] BNCC = BeNa Culture Collection, Beijing, China.

Table 7. Raw and Calculated Data for the Selectivity (1)

Abbreviation	Name[a]	RLU at 2500 fmol compound,0 fmol ATP	RLU at 2500 fmol compound,25 fmol ATP
NA[b]	analyte-free water	1	60
ATP	Adenosine 5'-triphosphate sodium salt hydrate	6720	6956
dATP	2'-deoxyadenosine 5'-triphosphate sodium salt	431	557
UTP	Uridine 5'-triphosphate trisodium salt	2	63
GTP	Guanosine 5'-triphosphate sodium salt	1	64
TTP	Thymidine 5'-triphosphate sodium salt	2	65
dUTP	2'-Deoxyuridine 5'-triphosphate sodium salt	1	63
CTP	Cytidine 5'-triphosphate	2	65
dGTP	2'-deoxyguanosine 5'-triphosphate trisodium salt	1	61
ITP	Inosine 5'-triphosphate trisodium salt	1	62
dIMP	2'-deoxyinosine 5'-monophosphate sodium salt	1	62
dCTP	2'-deoxycytidine 5'-triphosphate disodium salt	1	63
ADP	adenosine diphosphate (bacterial origin)	96	157
AMP	adenosine monophosphate	0	62

[a] Sourced from Takara Bio Inc. (Beijing, China) and Shanghai Aladdin Biochemical Technology Co., LTD. (Shanghai, China).
[b] Not applicable.

Table 11. Raw and Calculated Data for the Stainless Steel Matrix Study in Independent Laboratory Study – Sweetened Yogurt Residue (1)

Target RLU	Wet Sampling					Dry Sampling				
	Sample No.	RLU	Mean[a]	s_r[b]	RSD_r[c]	Sample No.	RLU	Mean	s_r	RSD_r
<10	71	1	5.10	3.21	63.00	71	9	6.00	2.40	40.06
	72	2				72	7			
	73	8				73	8			
	74	2				74	6			
	75	11				75	10			
	76	3				76	5			
	77	4				77	4			
	78	6				78	3			
	79	7				79	4			
	80	7				80	4			
10-30	81	17	22.90	5.45		81	20	24.80	5.43	
	82	26				82	18			
	83	29				83	19			

	84	28				84	28			
	85	26			23.78	85	32			
	86	14				86	31			21.90
	87	20				87	25			
	88	29				88	24			
	89	18				89	20			
	90	22				90	31			
	91	53				91	61			
	92	55				92	61			
	93	88				93	58			
	94	86				94	88			
30-100	95	53	65.10	16.49	25.33	95	74	73.90	11.98	16.21
	96	53				96	87			
	97	49				97	87			
	98	79				98	75			
	99	52				99	65			
	100	83				100	83			

Table 11. Raw and Calculated Data for the Stainless Steel Matrix Study in Independent Laboratory Study – Sweetened Yogurt Residue – Continued (1)

Target RLU	Wet Sampling					Dry Sampling				
	Sample No.	RLU	Mean[a]	s_r[b]	RSD_r[c]	Sample No.	RLU	Mean	s_r	RSD_r
	101	154				101	171			
	102	140				102	142			
	103	139				103	141			
	104	117				104	210			
100-300	105	200	151.60	21.64	14.27	105	224	171.30	28.41	16.58
	106	139				106	162			
	107	159				107	188			
	108	158				108	154			
	109	148				109	173			
	110	162				110	148			
	111	644				111	638			
	112	754				112	833			
	113	815				113	673			
	114	791				114	674			
300-1000	115	681	729.40	73.32	10.05	115	830	739.60	83.63	11.31
	116	809				116	851			
	117	757				117	790			
	118	673				118	771			
	119	605				119	648			
	120	765				120	688			

[a] The mean result of 10 replicate coupons per dilution
[b] s_r calculated from 10 replicate coupons per dilution.
[c] Co-efficient of variance percentage calculated from 10 replicate coupons per dilution.

Table 12. Raw and Calculated Data for the Stainless Steel Matrix Study in Independent Laboratory Study – Doughnut Residue (1)

Target RLU	Wet Sampling					Dry Sampling				
	Sample No.	RLU	Mean[a]	s_r[b]	RSD_r[c]	Sample No.	RLU	Mean	s_r	RSD_r
	121	3				121	5			
	122	5				122	5			
	123	6				123	6			
	124	8				124	7			
<10	125	8	4.10	2.60	63.45	125	9	5.00	2.40	48.07
	126	2				126	6			
	127	4				127	6			
	128	3				128	3			
	129	1				129	2			
	130	1				130	1			
	131	30				131	21			
	132	18				132	24			
	133	25				133	23			
	134	17				134	21			
10-30	135	20	23.50	4.45		135	23	22.20	1.93	
	136	25			18.95	136	19			8.70
	137	28				137	25			
	138	20				138	24			
	139	27				139	22			

	140	25				140	20			
30-100	141	57	54.70	11.89	21.73	141	37	55.10	19.80	35.93
	142	71				142	41			
	143	45				143	41			
	144	64				144	35			
	145	71				145	52			
	146	44				146	50			
	147	38				147	47			
	148	62				148	81			
	149	46				149	86			
	150	49				150	81			

Table 12. Raw and Calculated Data for the Stainless Steel Matrix Study in Independent Laboratory Study – Doughnut Residue – Continued (1)

Target RLU	Wet Sampling					Dry Sampling				
	Sample No.	RLU	Mean[a]	s_r[b]	RSD_r[c]	Sample No.	RLU	Mean	s_r	RSD_r
100-300	151	298	246.40	38.68	15.70	151	231	247.90	33.09	13.35
	152	218				152	261			
	153	274				153	254			
	154	194				154	245			
	155	237				155	239			
	156	180				156	180			
	157	258				157	219			
	158	260				158	286			
	159	260				159	287			
	160	285				160	277			
300-1000	161	634	677.80	34.13	5.04	161	674	683.60	55.52	8.12
	162	654				162	676			
	163	621				163	678			
	164	726				164	755			
	165	678				165	790			
	166	671				166	651			
	167	690				167	648			
	168	720				168	715			
	169	686				169	645			
	170	698				170	604			

[a] The mean result of 10 wet replicate coupons per dilution.
[b] s_r calculated from 10 wet replicate coupons per dilution.
[c] Co-efficient of variance percentage calculated from 10 replicate coupons per dilution.

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2. User Manual – Biolum Portable ATP Hygiene Monitoring System User Manual. Document No. M3001, Version Biolum_Manual_TL_V1.0.002
3. Instruction Manual – Instruction Manual of ATP Test Swab. Version 2.0, 29/11/2023.