

REPORT ON TEST RESULTS

# 시험결과보고서



**KTR** 한국화학융합시험연구원

# KTR

## Test Report

TBK-2020-003878

Book Sterilizer

Bactericidal test

President of KTR

*Kwon Oh-jung*

**Test outline**

Test title : Bactericidal test  
Test no. : TBK-2020-003878  
Test method : Client Provided Test method

**Sponsor**

N a m e : SUNKYUNG INDUSTRY CO., LTD  
A d d r e s s : 1, Seounsandan-ro 3-gil, Gyeyang-gu, Incheon  
Representative: Jong-Suk Kim

**Test facility**

N a m e : Korea Testing & Research Institute  
A d d r e s s : 98, Gyoyukwon-ro, Gwacheon-si, Gyeonggi-do, Korea

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This report is presented for the article that was submitted by the sponsor.

June 29, 2020



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## 1. Summary

This test was performed to assess the bactericidal effect of the test article provided by the sponsor according to Client Provided Test Method. The test was performed by inoculating the test carrier with *E. coli* (Gram negative) and *S. aureus* (Gram positive).

The carrier [Semitransparent Glass, 2.5 × 1.5 cm] inoculated with an inoculation solution was placed in the Inner top and bottom of the test article and was operated for 2 minutes. Then, the number of viable cells was counted to calculate the log reduction of each strain. Under the conditions of this test, the log reduction values of the test article [Book Sterilizer] were as follows.

*E. coli* (top / bottom) : > 4.76 and > 4.76

*S. aureus* (top / bottom) : 4.95 and 4.95

### 1.1. Test schedule

Total test period June 10, 2020 to June 29, 2020

## 2. Equipment & materials

### 2.1. Test equipment

Autoclave	(Coretech, Korea)
Dry oven	(Jisico, Korea)
Water bath	(Polyscience, USA)
Incubator	(Mettler, Germany)
pH meter	(Thermo Orion, USA)
Vortex mixer	(ThermoFisher, USA)
Sterile pipette	(Falcon, USA)
Petri dish	(SPL, Korea)
Volumetric flask	(Myung Sung, Korea)
Mechanical shaker	(Jisico, Korea)
Clean bench	(Sugong Tech, Korea)
Colony counter	(Dukwoo Science, Korea)

### 2.2. Test materials

#### 2.2.1. Test strains

*Escherichia coli* ATCC 25922

*Staphylococcus aureus* ATCC 6538

#### 2.2.2. Media and reagents

Tryptic soy broth (DIFCO, USA)  
Tryptic soy agar (DIFCO, USA)  
SCDLP Broth (Eiken, JAPAN)  
Slide glass (Marienfeld, Germany)  
Sterile distilled water

### 3. Test method

#### 3.1. Test method

##### 3.1.1. Pre-incubation of test strain

Test strains were taken from slant culture media, inoculated on Tryptic soy broth and incubated at  $(35 \pm 1) ^\circ\text{C}$  for (18 - 24) hours.

##### 3.1.2. Preparation of test inoculum

The pre-incubated culture was adjusted to a concentration of  $(1.0 - 9.9) \times 10^7$  CFU/mL using sterile saline.

##### 3.1.3. Test procedure

0.02 mL of the inoculation solution was inoculated to the sterilized carrier [Semitransparent Glass,  $2.5 \times 1.5$  cm], and then dried within 30 minutes before use. The carrier inoculated with an inoculation solution was placed in the Inner top and bottom of the test article and was operated for 2 minutes. Then, the inoculum was put into 10 mL of SCDLP Broth and treated with an ultrasonication for 5 minutes and with a vortex for 30 seconds to recover the test organisms. The control group was measured in the same manner as the test group by using pre-operated carrier.

##### 3.1.4. Recovery of the test organisms

The neutralized test solution was serially diluted, and 1 mL of each dilution was dispensed into Petri dishes in duplicate. (15 - 25) mL of the Tryptic soy agar prepared in advance at  $(45 - 50) ^\circ\text{C}$  was dispensed into Petri dishes, then the dishes were solidified at room temperature. The solidified Petri dishes were inverted and cultured at  $(35 \pm 1) ^\circ\text{C}$  for (24 - 48) hours.

##### 3.1.5. Result observation

After incubation, observation of the number of viable cells was carried out by selecting a Petri dish showing a (30 - 300) CFU. If the number of viable cells is observed only at the lowest dilution, the number of viable cells was counted regardless of the observation range. If colonies were formed on the medium, the result was expressed as the number of viable cells multiplied by the dilution factor. If colonies were not formed on the medium, the dilution factor in dilution state was multiplied, and the result was expressed as less than 10 ( $\ll 10$ ). The number of viable cells was determined according to [Equation 1] of section 3.2, and the log reduction was determined by using [Equation 2].



### 3.2. Calculation of result

#### 3.2.1. Viable cell count [Equation 1]

$$N = C \times D$$

N : the number of viable cells

C : the number of colonies (mean of the 2 plates)

D : dilution factor

#### 3.2.2. Log reduction [Equation 2]

$$\text{Log reduction (LR)} = \log(A) - \log(B)$$

A : log of viable bacteria in the control group (pre-operating)

B : log of viable bacteria in the test group (post-operating)

Log values are expressed up to the 2 decimal place, and If - value is derived, mark it as 0.0.



## 4. Result

### 4.1. Bactericidal test with *E. coli*

The number of viable cells in the control group(pre-operating) was  $5.8 \times 10^5$  CFU/carrier, the number of viable cells in the test group(post-operating, top) was  $< 10$  CFU/carrier, the number of viable cells in the test group(post-operating, bottom) was  $< 10$  CFU/carrier.

### 4.2. Bactericidal test with *S. aureus*

The number of viable cells in the control group(pre-operating) was  $9.0 \times 10^5$  CFU/carrier, the number of viable cells in the test group(post-operating, top) was 10 CFU/carrier, the number of viable cells in the test group(post-operating, bottom) was 10 CFU/carrier.

## 5. Conclusion

Under the conditions of this test, the log reduction<sup>1)</sup> values of the test article [Book Sterilizer] were as follows.

*E. coli* (top / bottom) :  $> 4.76$  and  $> 4.76$

*S. aureus* (top / bottom) : 4.95 and 4.95

<sup>1)</sup> Interpretation of the results

Log reduction	Percent (%) reduction
$\geq 1$	$\geq 90$ %
$\geq 2$	$\geq 99$ %
$\geq 3$	$\geq 99.9$ %
$\geq 4$	$\geq 99.99$ %
$\geq 5$	$\geq 99.999$ %

## 6. References

- 6.1. ASTM E2315-16, Standard guide for assessment of antimicrobial activity using a time-kill procedure
- 6.2. JIS Z 2801 : 2012, Antibacterial products-Test for antibacterial activity and efficacy
- 6.3. KS K 0693 : 2016, Method of Antibacterial Test of Textile Materials
- 6.4. Ministry of Food and Drug Safety Notification No. 2020-18.



## 7. Tables

Table 1. Test result against *E. coli*

(Unit : mean log)

Classification	The number of cells (CFU/carrier)	Log value	LR*
Control group (pre-operating)	$5.8 \times 10^5$	5.76	
Test group (post-operating, top)	< 10	< 1.00	> 4.76
Test group (post-operating, bottom)	< 10	< 1.00	> 4.76

Table 2. Test result against *S. aureus*

(Unit : mean log)

Classification	The number of cells (CFU/carrier)	Log value	LR*
Control group (pre-operating)	$9.0 \times 10^5$	5.95	
Test group (post-operating, top)	10	1.00	4.95
Test group (post-operating, bottom)	10	1.00	4.95

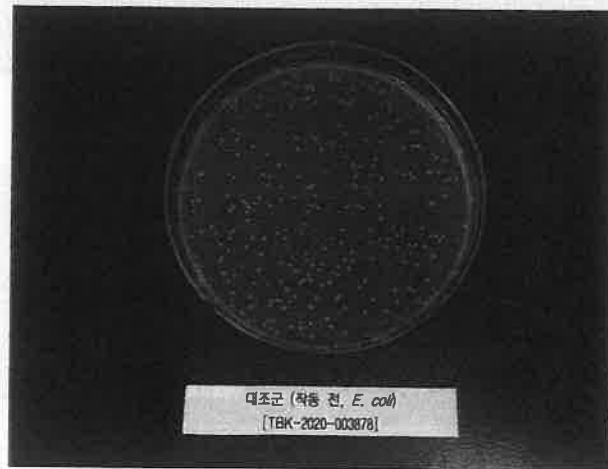
\* Log reduction (LR) =  $\log(A) - \log(B)$

A : log of viable bacteria in the control group (pre-operating)

B : log of viable bacteria in the test group (post-operating)

## 8. Attachment

### 8.1. Pictures of the test results



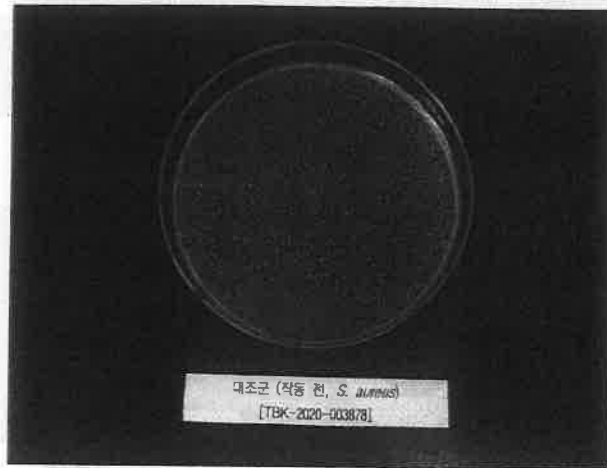
Control group (pre-operating, *E. coli*)  
[TBK-2020-003878]



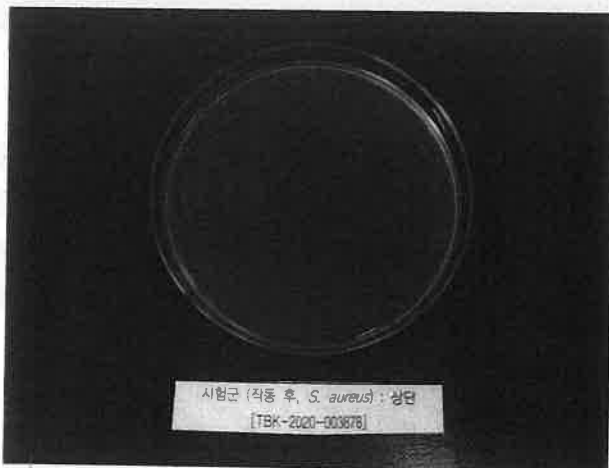
Test group (pre-operating, *E. coli*) : top  
[TBK-2020-003878]



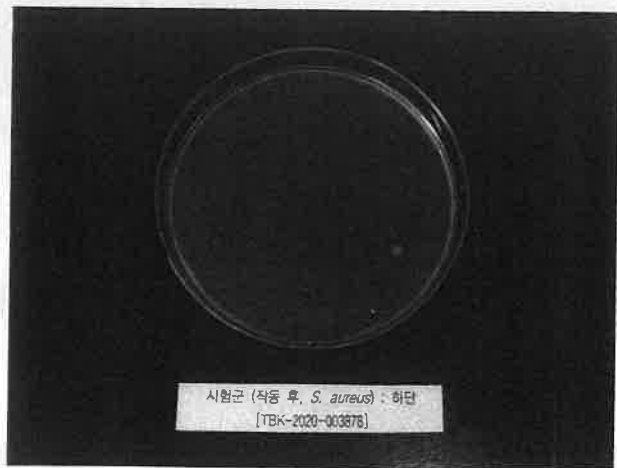
Test group (pre-operating, *E. coli*) : bottom  
[TBK-2020-003878]



Control group (pre-operating, *S. aureus*)  
[TBK-2020-003878]

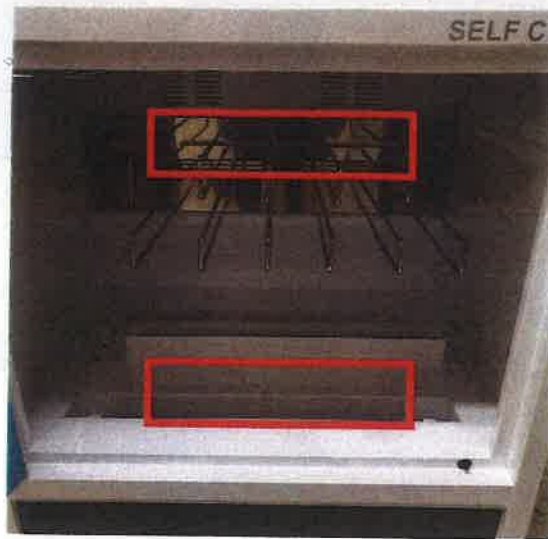


Test group (pre-operating, *S. aureus*) : top  
[TBK-2020-003878]



Test group (pre-operating, *S. aureus*) : bottom  
[TBK-2020-003878]

8.2. Picture of the test article



Position of the carrier



TBK-2020-003878

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