Results of Antimicrobial Efficacy Demonstration Test of "earthplus™" Processed Films Conducted at Bach Mai Hospital, Hanoi City, Vietnam

Extracted from JICA(Japan International Cooperation Agency) Feasibility Survey Project Report

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Bach Mai Hospital - Hanoi, Vietnam: Overview

Bach Mai Hospital in Hanoi is Vietnam's largest hospital. With over 3,000 beds, it stands as one of the country's premier comprehensive medical facilities, addressing a wide range of healthcare needs. As the core hospital of the capital city, it plays a vital role in Vietnam's healthcare system.

Vietnam, Hanoi
Bach Mai Hospital

This project was selected for JICA's (Japan International Cooperation Agency) "Feasibility Study" program under Japan's Ministry of Foreign Affairs in 2016. We conducted approximately two years of research activities at Bach Mai Hospital in Hanoi, Vietnam, focusing on infection prevention.

The bactericidal efficacy evaluations presented below were conducted after our proposal for a novel ceramic composite-based antimicrobial agent—with no precedent outside of pharmaceutical applications—initially faced difficulty in being understood. Following the hospital director's directive, evaluations were performed in the hospital laboratory on drug-resistant strains of Staphylococcus aureus, Klebsiella pneumoniae, and Acinetobacter, all clinically isolated within the hospital. These evaluations were conducted with evaluation personnel from both Bach Mai Hospital and Shinshu Ceramics Co., Ltd. in attendance.

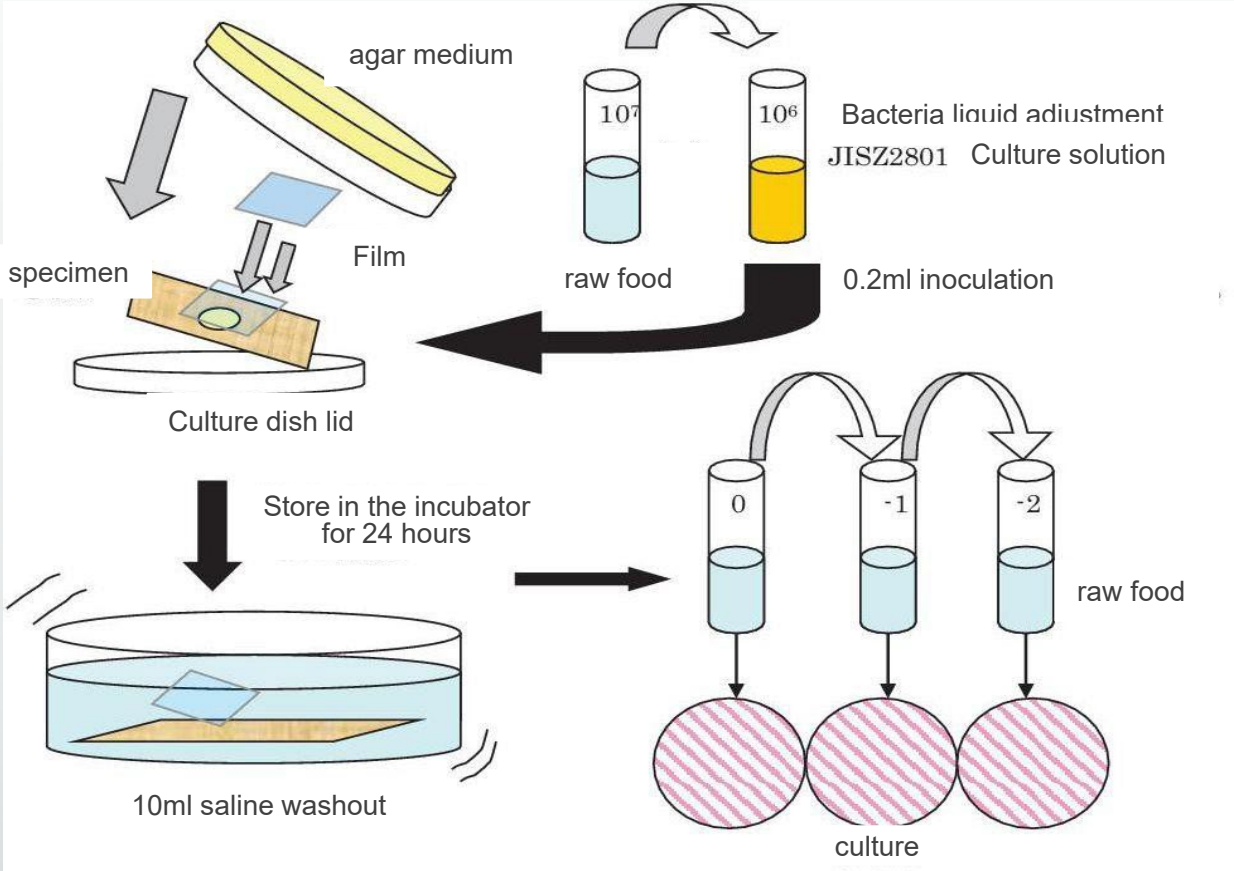
The test samples were 100 μm thick polyester films coated with a paint formulation of "earthplus™," which incorporates Nano-Silver as the active component—a proprietary technology of Shinshu Ceramics Co., Ltd.

Evaluation test method

Experiment 1. Laboratory Evaluation

<Overview> The antimicrobial efficacy of Earthplus films was jointly evaluated against 12 clinical isolates including drug-resistant bacteria isolated at Bach Mai Hospital (2 strains of Staphylococcus aureus, 5 strains of Klebsiella pneumoniae, and 5 strains of Acinetobacter), using the microbiology department (bacteriology laboratory) at Bach Mai Hospital.

<Methods> Measurements were conducted according to JIS Z2801 (ISO 22196) method. For one strain of Staphylococcus aureus, testing was performed with n=3, while for the remaining 11 strains, simplified evaluation was conducted with n=1.



Type of bacteria evaluated

NO.	Bacterial species	Control number	Resistance	McF
1	Staphylococcus aureus	69545	MSSA	1.53
2	Staphylococcus aureus	34586	MRSA	1.62
3	Streptococcus pneumoniae	13490	Cepha R Quinoline R	1.04
4	Streptococcus pneumoniae	34593	Sensitive	1.04
5	Streptococcus pneumoniae	34596	Sensitive	1.58
6	Streptococcus pneumoniae	52885	All R Carbapenem(＋)	1.01
7	Streptococcus pneumoniae	39969	All R Carbapenem(＋)	1.03
8	Acinetobactor	47605	All R	1.39
9	Acinetobactor	47545	All R	1.16
10	Acinetobactor	47588	All R	1.15
11	Acinetobactor	47552	All R	1.24
12	Acinetobactor	47597	All R	1.18

Evaluation results

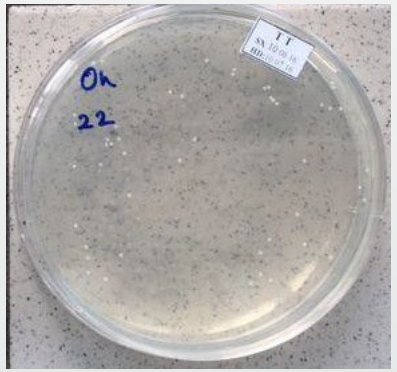
NO		Immediately after inoculation0Hr (cfu/16cm^2)	24Hr (cfu/16cm^2)
1	earthplus™		＜10
	control	6.3×10^5	5.5×10^5
2	earthplus™		＜10
	control	8.7×10^5	6.2×10^5
3	earthplus™		＜10
	control	4.3×10^5	6.0×10^7
4	earthplus™		＜10
	control	5.6×10^5	N / D
5	earthplus™		＜10
	control	8.6×10^5	3.2×10^7
6	earthplus™		＜10
	control	1.5×10^5	2.0×10^7
7	earthplus™		＜10
	control	N/D(＜1.0×10^4)	N / D

NO		Immediately after inoculation 0Hr (cfu/16cm^2)	24Hr (cfu/16cm^2)
8	earthplus™		＜10
	control	4.7×10^5	1.0×10^8
9	earthplus™		＜10
	control	3.0×10^4	2.9×10^7
10	earthplus™		＜10
	control	1.4×10^5	1.1×10^8
11	earthplus™		＜10
	control	2.0×10^5	1.0×10^8
12	earthplus™		＜10
	control	9.0×10^4	1.0×10^8

Bacterial species: Staphylococcus aureus
Control number 69545　(McF. 1.53)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	6.25×10^5	5.50×10^5

0hr



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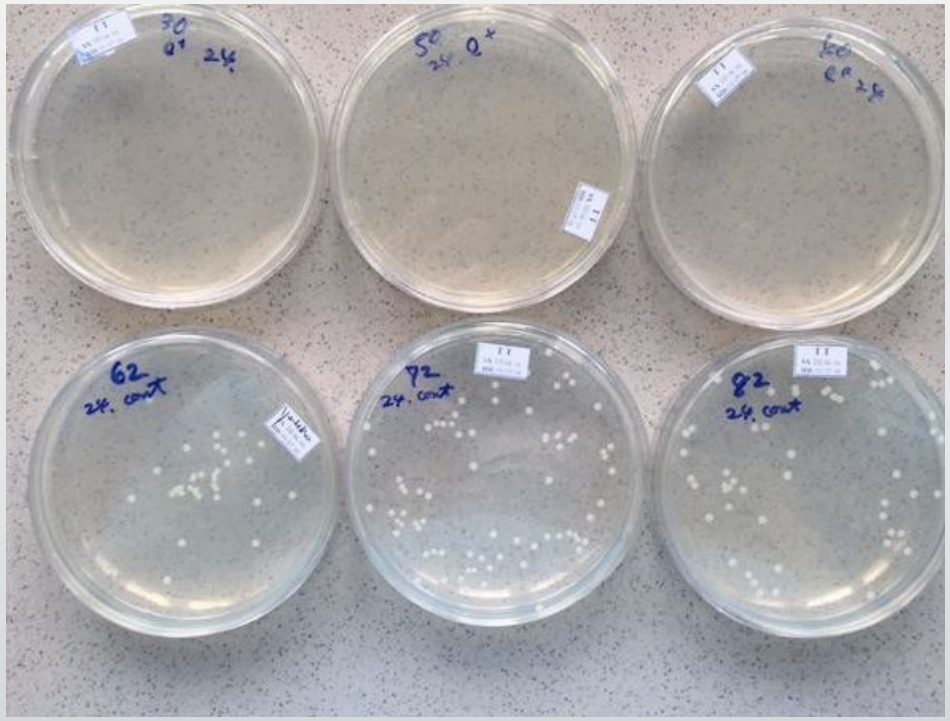
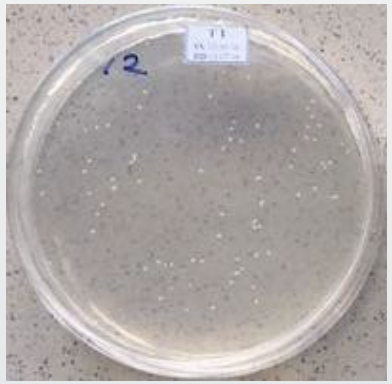


Bacterial species: Staphylococcus aureus
Control number 34586　(McF. 1.62)

	Immediately after inoculation0Hr (cfu/16cm^2)	24Hr (cfu/16cm^2)
earthplusTM		＜10
Control	8.70×10^5	6.20×10^5

0hr



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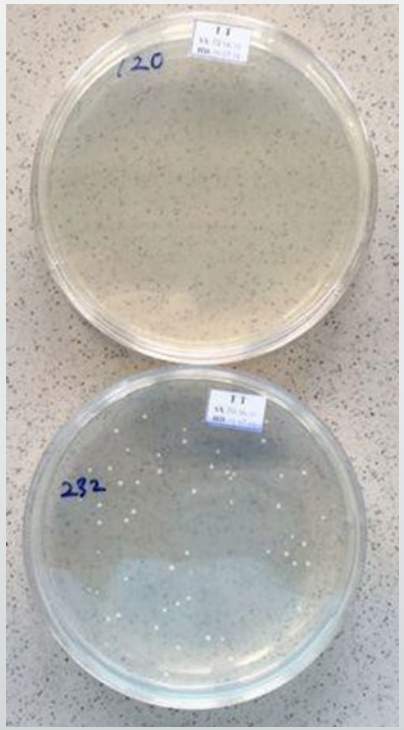
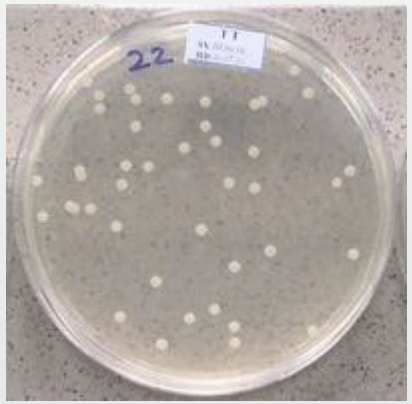


Bacterial species: Streptococcus pneumoniae
Control number 13490　(McF. 1.04)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	8.70×10^5	6.20×10^5

0hr



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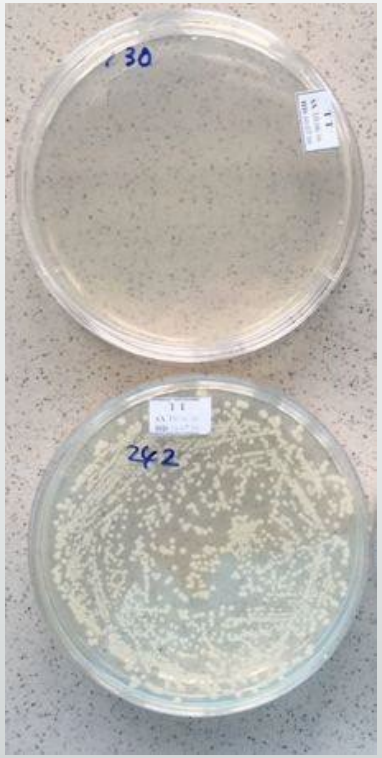
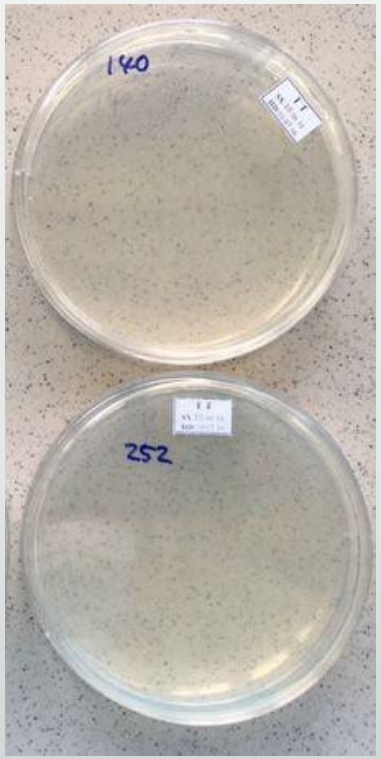


Bacterial species: Streptococcus pneumoniae
Control number 34593　(McF. 1.04)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	8.70×10^5	N / D

0hr

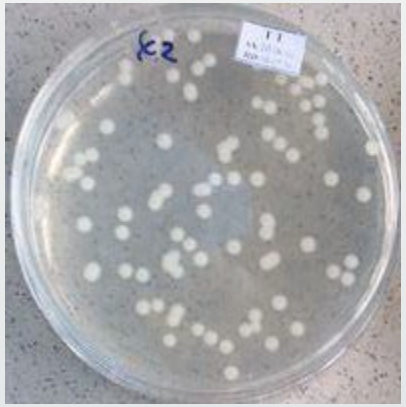
24hr



Bacterial species: Streptococcus pneumoniae
Control number 34596　(McF. 1.58)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	8.60×10^5	3.2×10^7

0hr



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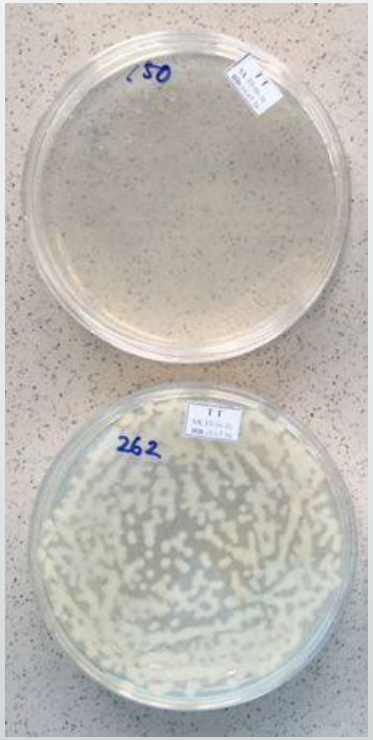
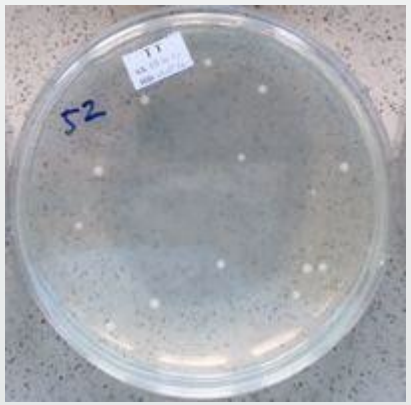


Bacterial species: Streptococcus pneumoniae
Control number 52885　(McF. 1.01)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	1.50×10^5	2.0×10^7

0hr



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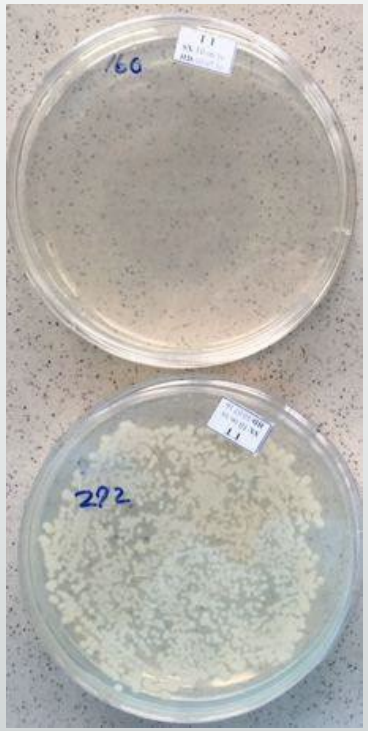
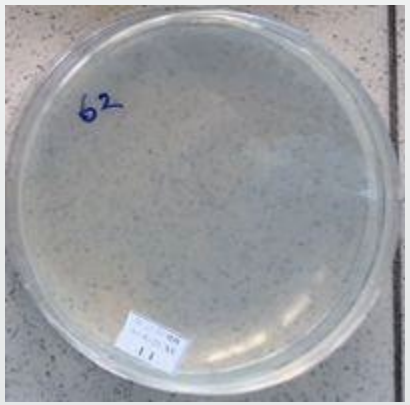


Bacterial species: Streptococcus pneumoniae
Control number 39969　(McF. 1.04)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	N / D(＜1.0×10^4)	N / D

0hr



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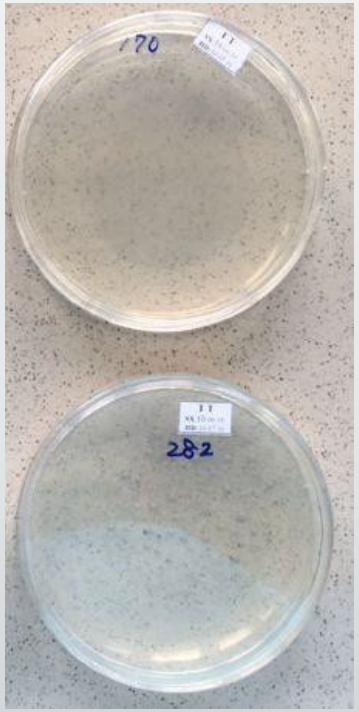
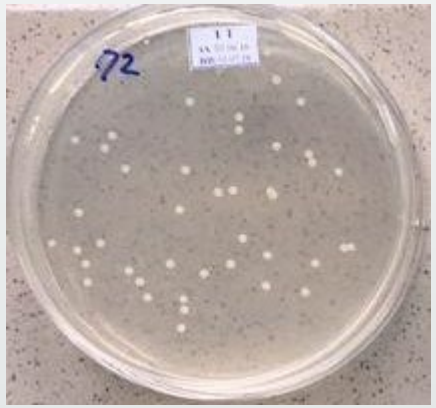


Bacterial species: Acinetobactor
Control number 43605　(McF. 1.39)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	4.7.0×10^5	1.0×10^8

0hr



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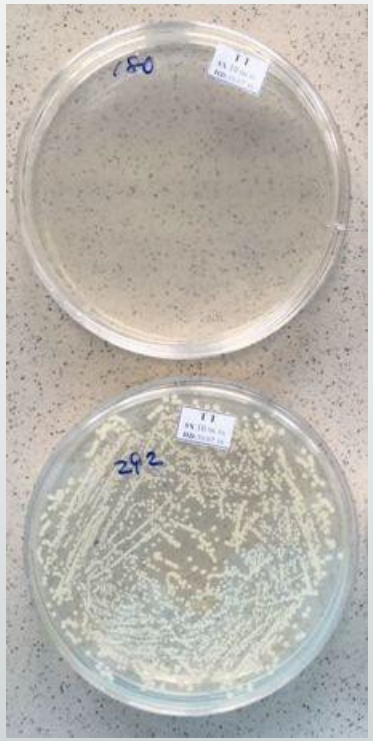
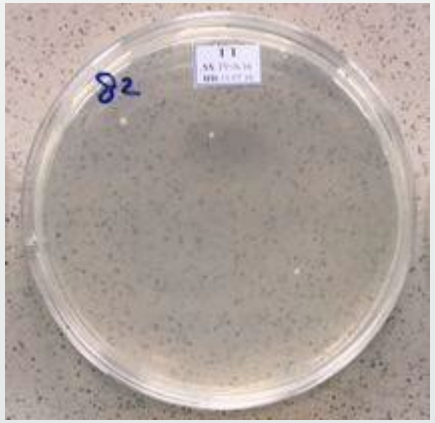


Bacterial species: Acinetobactor
Control number 47545　(McF. 1.16)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	3.0×10^4	2.9×10^7

0hr



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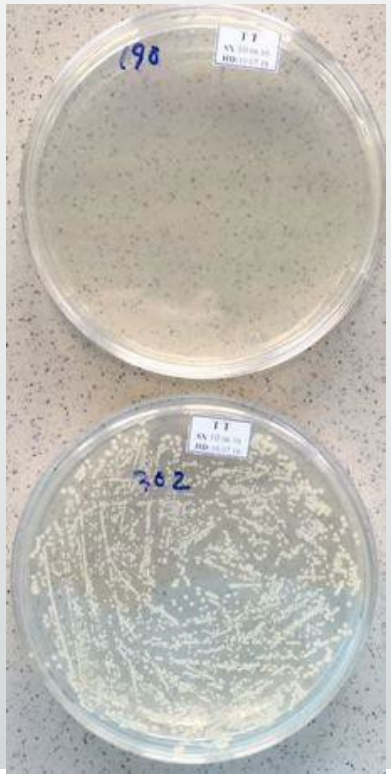
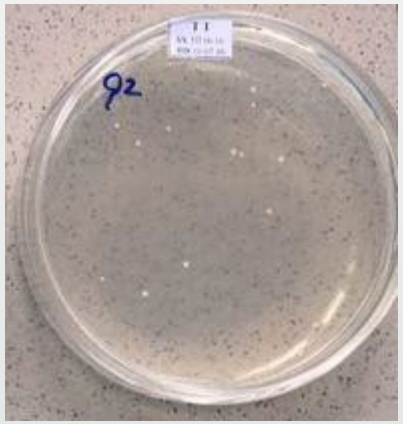


Bacterial species: Acinetobactor
Control number 47588　(McF. 1.15)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	1.4×10^5	1.1×10^8

0hr



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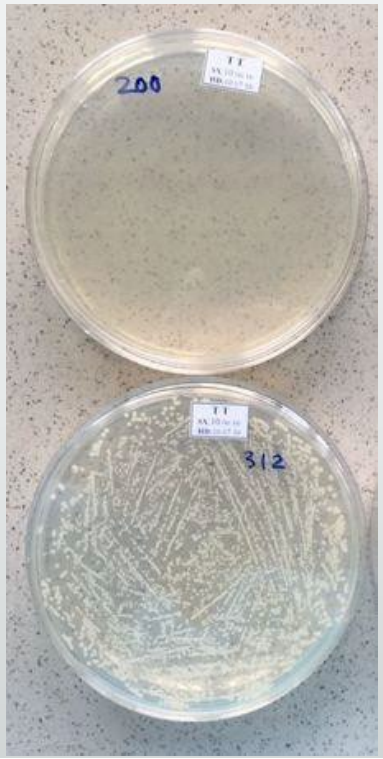
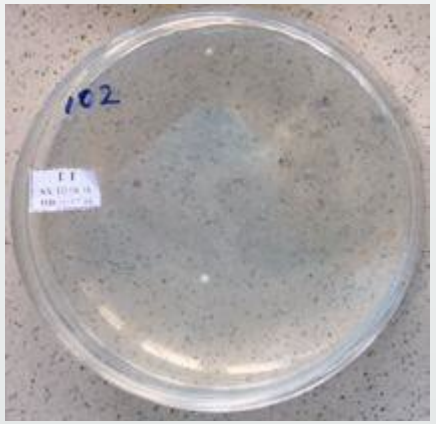


Bacterial species: Acinetobactor
Control number 47552　(McF. 1.24)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	2.0×10^4	1.1×10^8

0hr



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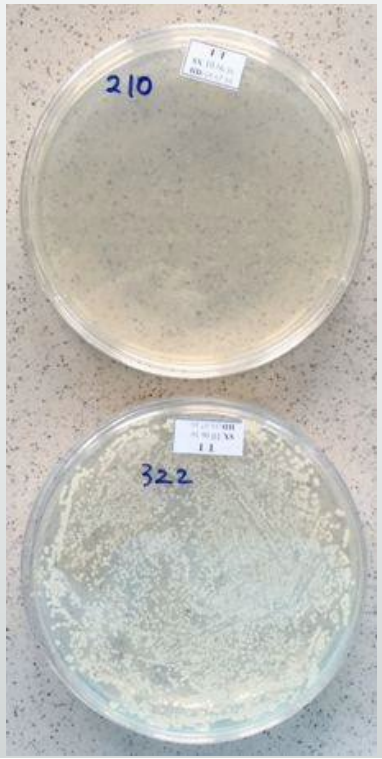

Bacterial species: Acinetobactor
Control number 47597　(McF. 1.18)

	Immediately after inoculation0Hr　(cfu/16cm^2)	24Hr　(cfu/16cm^2)
earthplusTM		＜10
Control	9.0×10^4	1.0×10^8

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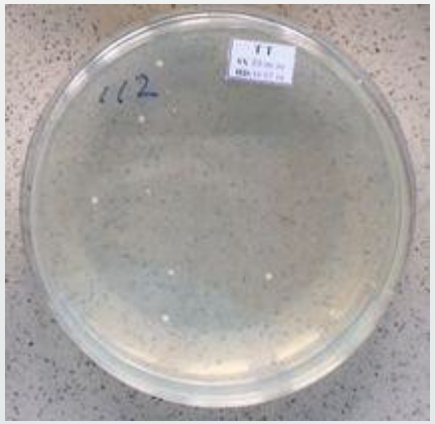

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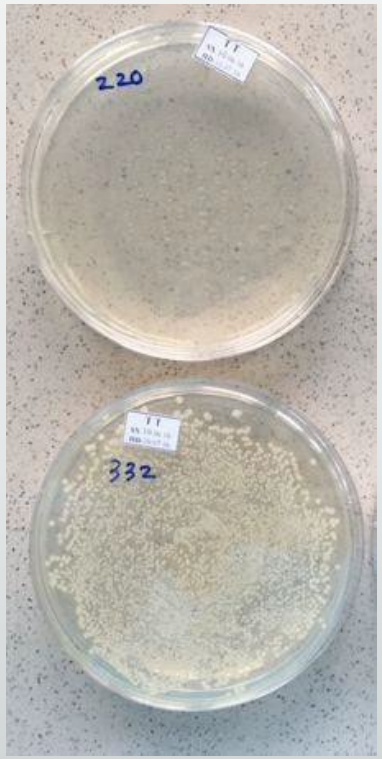
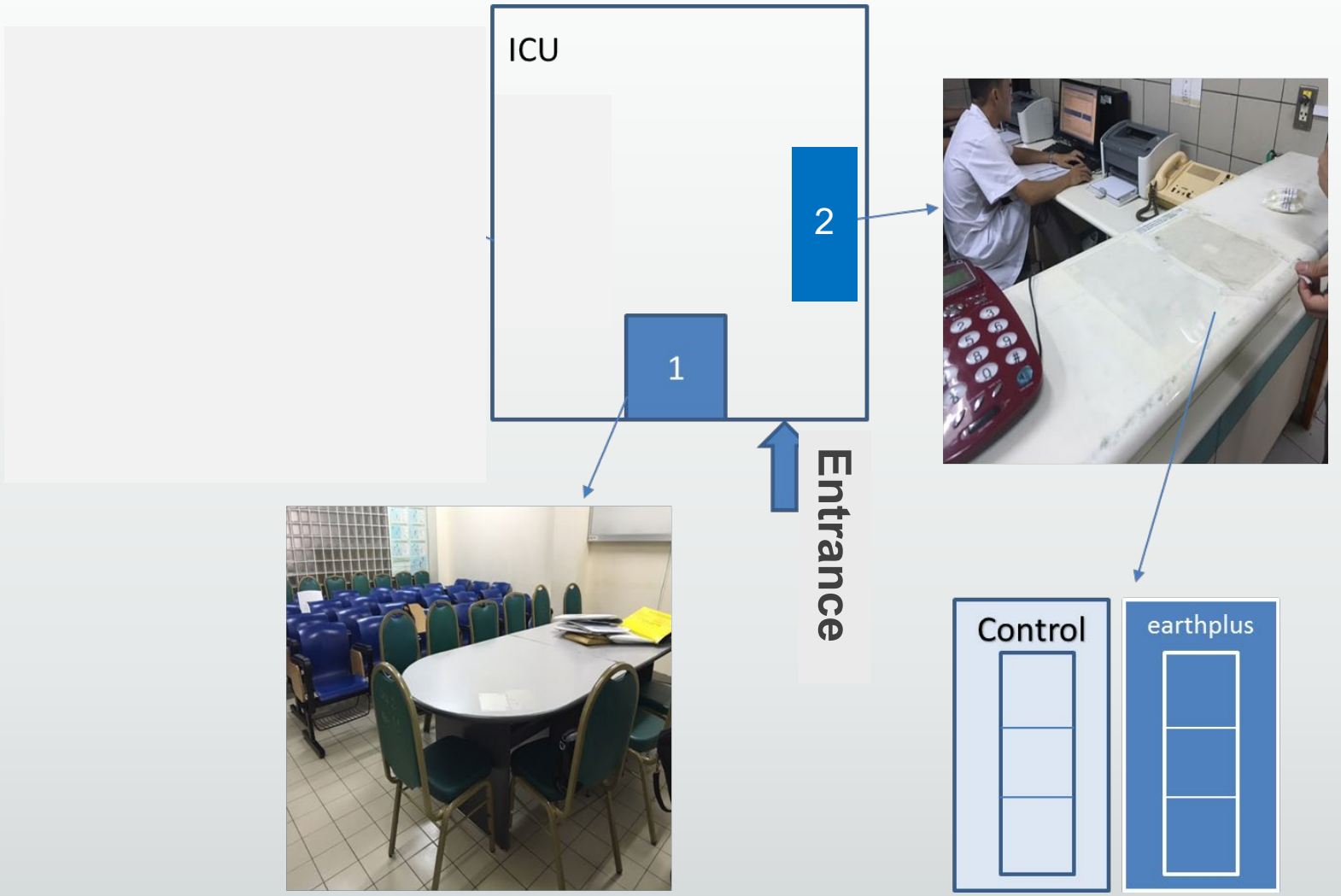


Experiment 1 Summary

Evaluation was conducted using the JIS Z2801 (ISO 22196) method. No bacterial growth was observed on earthplus™ films. Bacterial growth was observed on unprocessed films.

ICU conference room counter, table sampling position

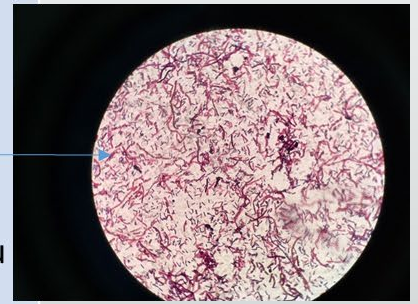


Controlling germs on ICU conference room tables

	earthplus	Control
1 Conference room table	 50cfu 31cfu 27cfu	 Over 300cfu Over 300cfu Over 300cfu

Gram stain

Gram stain



	earthplus	Control
2 **counter**	 26cfu 24cfu 18cfu	 57cfu 76cfu 124cfu

Experiment 2 Summary

It was confirmed that the number of colonies grown on Earthplus films was lower compared to unprocessed films. The reduced bacterial count on environmental surfaces could be one of the factors that may lower the risk of cross-infection.