

REFERENCES

n.d. (2022). Retrieved 3 June 2022, from https://www.accessdata.fda.gov/drugsatfda_docs/label/2011/062911s035lbl.pdf

Balouiri, M., Sadiki, M., & Ibensouda, S. (2016). Methods for in vitro evaluating antimicrobial activity: A review. *Journal Of Pharmaceutical Analysis*, 6(2), 71-79. doi: 10.1016/j.jpha.2015.11.005

Bhatt, H., & Patel, N. (2021). NATURAL DEODORANTS: A WAY TOWARDS SUSTAINABLE COSMETICS. *INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCE AND HEALTH CARE*, 3(11). <https://doi.org/10.26808/rs.ph.i11v3.01>

Callewaert, C., De Maeseneire, E., Kerckhof, F., Verliefde, A., Van de Wiele, T., & Boon, N. (2014). Microbial Odor Profile of Polyester and Cotton Clothes after a Fitness Session. *Applied And Environmental Microbiology*, 80(21), 6611-6619. doi: 10.1128/aem.01422-14

Callewaert, C., Hutapea, P., Van de Wiele, T., & Boon, N. (2014). Deodorants and antiperspirants affect the axillary bacterial community. *Archives of dermatological research*, 306(8), 701–710. <https://doi.org/10.1007/s00403-014-1487-1>

Celeiro, M., Garcia-Jares, C., Llompарт, M., & Lores, M. (2021). Recent Advances in Sample Preparation for Cosmetics and Personal Care Products Analysis. *Molecules (Basel, Switzerland)*, 26(16), 4900. <https://doi.org/10.3390/molecules26164900>

Chojnacki, M., Dobrotka, C., Osborn, R., Johnson, W., Young, M., & Meyer, B. et al. (2021). Evaluating the Antimicrobial Properties of Commercial Hand Sanitizers. *Mosphere*, 6(2). doi: 10.1128/msphere.00062-21

Clinicaltrials.gov. 2014. *A Study of Effect of Deodorant and Axillary Hair on Testosterone Absorption in Healthy Participants*. [online] Available at: <<https://clinicaltrials.gov/ct2/show/NCT01725451>> [Accessed 24 December 2021].

Cosmetics Europe. 2008. *GUIDELINES FOR THE EVALUATION OF THE EFFICACY OF COSMETICS PRODUCTS*. [online] Available at: <https://www.cosmeticseurope.eu/files/4214/6407/6830/Guidelines_for_the_Evaluation_of_the_Efficacy_of_Cosmetic_Products_-_2008.pdf> [Accessed 24 December 2021].

DeNova Research. 2021. *What are Skin Care Clinical Trials?*. [online] Available at: <<https://denovaresearch.com/skin-care-clinical-trials/>> [Accessed 24 December 2021].

Dreno, B., Araviiskaia, E., Berardesca, E., Bieber, T., Hawk, J., Sanchez-Viera, M. and Wolkenstein, P., 2014. The science of dermocosmetics and its role in dermatology. *Journal of the European Academy of Dermatology and Venereology*, 28(11), pp.1409-1417.

Dürst, U. N., Bruder, E., Egloff, L., Wüst, J., Schneider, J., & Hirzel, H. O. (1991). *Micrococcus luteus*: Ein seltener Erreger einer Klappenprothesenendokarditis [*Micrococcus luteus*: a rare pathogen of valve prosthesis endocarditis]. *Zeitschrift für Kardiologie*, 80(4), 294–298.

Eda, N., Ito, H., Shimizu, K., Suzuki, S., Lee, E., & Akama, T. (2016). A study of bacterial growth on the skin surface after a basketball game. *Clinical Case Reports And Reviews*, 1(11). doi: 10.15761/ccrr.1000189

Emery Pharma. 2021. *Time-Kill Kinetics Assay (Antimicrobial Efficacy Testing)*. [online] Available at: <<https://emerypharma.com/biology/time-kill-kinetics-assay/#:~:text=The%20Time%2Dkill%20kinetic%20assay,of%20an%20agent%20over%20time.>> [Accessed 24 December 2021].

FDA Authority Over Cosmetics: How Cosmetics Are Not FDA-Approved. (2021). Retrieved 5 September 2021, from https://www.fda.gov/cosmetics/cosmetics-laws-regulations/fda-authority-over-cosmetics-how-cosmetics-are-not-fda-approved-are-fda-regulated#What_does_the_law

Gajic, I., Kabic, J., Kekic, D., Jovicevic, M., Milenkovic, M., Mitic Culafic, D., Trudic, A., Ranin, L., & Opavski, N. (2022). Antimicrobial Susceptibility Testing: A Comprehensive Review of Currently Used Methods. *Antibiotics*, 11(4), 427. <https://doi.org/10.3390/antibiotics11040427>

Gomes, I., Malheiro, J., Mergulhão, F., Maillard, J., & Simões, M. (2016). Comparison of the efficacy of natural-based and synthetic biocides to disinfect silicone and stainless steel surfaces. *Pathogens And Disease*, 74(4), ftw014. doi: 10.1093/femspd/ftw014

Jufri, R. F. (2020). The Effect of Environmental Factors on Microbial Growth. *Journal La Lifesci*, 1(1), 1`2-17. <https://doi.org/10.37899/journallifesci.v1i1.32>

Karbalaei-Heidari, H. R., Partovifar, M., & Memarpour-Yazdi, M. (2020). Evaluation of the Bioactive Potential of Secondary Metabolites Produced by a New Marine *Micrococcus* Species Isolated from the Persian Gulf. *Avicenna journal of medical biotechnology*, 12(1), 61–65.

Kent, D. and Hayward, R., 2007. When Averages Hide Individual Differences in Clinical Trials. *American Scientist*, 95(1), p.60.

Krishnamurthi, V., Niyonshuti, I., Chen, J., & Wang, Y. (2021). A new analysis method for evaluating bacterial growth with microplate readers. *PLOS ONE*, 16(1), e0245205. <https://doi.org/10.1371/journal.pone.0245205>

Lam, T., Verzotto, D., Brahma, P., Ng, A., Hu, P., & Schnell, D. et al. (2018). Understanding the microbial basis of body odor in pre-pubescent children and teenagers. *Microbiome*, 6(1). doi: 10.1186/s40168-018-0588-z

Learn About Clinical Studies - ClinicalTrials.gov. (2021). Retrieved 24 December 2021, from <https://clinicaltrials.gov/ct2/about-studies/learn>

Masse, M., Genay, S., Martin Mena, A., Carta, N., Lannoy, D., & Barthélémy, C. et al. (2020). Evaluation of the stability of vancomycin solutions at concentrations used in clinical services. *European Journal Of Hospital Pharmacy*, 27(e1), e87-e92. <https://doi.org/10.1136/ejhpharm-2019-002076>

Mogilnicka, I., Bogucki, P., & Ufnal, M. (2020). Microbiota and Malodor-Etiology and Management. *International journal of molecular sciences*, 21(8), 2886. <https://doi.org/10.3390/ijms21082886>

Natsch, A. (2015). What Makes Us Smell: The Biochemistry of Body Odour and the Design of New Deodorant Ingredients. *CHIMIA International Journal For Chemistry*, 69(7), 414-420. doi: 10.2533/chimia.2015.414

News Medical. 2019. *Three Problems Faced by Cosmetic Research & Development*. [online] Available at:

<<https://www.news-medical.net/whitepaper/20191008/Three-Problems-Faced-by-Cosmetic-Research-Development.aspx>> [Accessed 24 December 2021].

Pallag, A., Filip, G., Olteanu, D., Clichici, S., Baldea, I., Jurca, T., Micle, O., Vicaș, L., Marian, E., Sorișău, O., Cenariu, M. and Mureșan, M., 2018. Equisetum arvense L. Extract Induces Antibacterial Activity and Modulates Oxidative Stress, Inflammation, and Apoptosis in Endothelial Vascular Cells Exposed to Hyperosmotic Stress. *Oxidative Medicine and Cellular Longevity*, 2018, pp.1-14.

Pereira, E., de Mattos, C., dos Santos, O., Ferreira, D., de Oliveira, T., & Laport, M. et al. (2019). Staphylococcus hominis subspecies can be identified by SDS-PAGE or MALDI-TOF MS profiles. *Scientific Reports*, 9(1). doi: 10.1038/s41598-019-48248-4

O'Mahony, F. C., & Papkovsky, D. B. (2006). Rapid high-throughput assessment of aerobic bacteria in complex samples by fluorescence-based oxygen respirometry. *Applied and environmental microbiology*, 72(2), 1279–1287. <https://doi.org/10.1128/AEM.72.2.1279-1287.2006>

Rudden, M., Herman, R., Rose, M., Bawdon, D., Cox, D., & Dodson, E. et al. (2020). The molecular basis of thioalcohol production in human body odour. *Scientific Reports*, 10(1). doi: 10.1038/s41598-020-68860-z

Sandhu, N. S., Kaur, S., & Chopra, D. (2010). Equisetum arvense: pharmacology and phytochemistry- a review. *Asian Journal of Pharmaceutical Clinical Research*, vol. 3, no. 3, pp. 146–150.

Shahtalebi, M. A., Ghanadian, M., Farzan, A., Shiri, N., Shokri, D., & Fatemi, S. A. (2013). Deodorant effects of a sage extract stick: Antibacterial activity and sensory evaluation of axillary deodorancy. *Journal of research in medical sciences : the official journal of Isfahan University of Medical Sciences*, 18(10), 833–839.

Sorokowska, A., Sorokowski, P., & Havlíček, J. (2016). Body Odor Based Personality Judgments: The Effect of Fragranced Cosmetics. *Frontiers In Psychology*, 7. doi: 10.3389/fpsyg.2016.00530

Spence, C. (2021). The scent of attraction and the smell of success: crossmodal influences on person perception. *Cognitive Research: Principles And Implications*, 6(1). doi: 10.1186/s41235-021-00311-3

Stevenson, K., McVey, A., Clark, I., Swain, P., & Pilizota, T. (2016). General calibration of microbial growth in microplate readers. *Scientific Reports*, 6(1). doi: 10.1038/srep38828

Tamer, Y., & Toprak, E. (2017). On the Race to Starvation: How Do Bacteria Survive High Doses of Antibiotics?. *Molecular Cell*, 68(6), 1019-1021. doi: 10.1016/j.molcel.2017.12.004

Traupe, B., Fölster, H., Max, H. and Schulz, J., 2016. Effective axillary malodour reduction by polyquaternium-16-containing deodorants. *International Journal of Cosmetic Science*, 39(2), pp.141-148.

U.S. Food and Drug Administration. 2018. *Step 3: Clinical Research*. [online] Available at: <<https://www.fda.gov/patients/drug-development-process/step-3-clinical-research>> [Accessed 24 December 2021].

U.S. Food and Drug Administration. 2020. *Product Testing of Cosmetics*. [online] Available at: <<https://www.fda.gov/cosmetics/cosmetics-science-research/product-testing-cosmetics>> [Accessed 24 December 2021].

Wald-Dickler, N., Holtom, P., & Spellberg, B. (2018). Busting the Myth of "Static vs Cidal": A Systemic Literature Review. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*, 66(9), 1470–1474. <https://doi.org/10.1093/cid/cix1127>

Wang, L., Fan, D., Chen, W., & Terentjev, E. (2015). Bacterial growth, detachment and cell size control on polyethylene terephthalate surfaces. *Scientific Reports*, 5(1). doi: 10.1038/srep15159

Wang, J., Woo, M. and Yan, C., 2017. *Spot Plating Assay for the Determination of Survival and Plating Efficiency of Escherichia coli in sub-MIC Levels of Antibiotics*. [online] Ujemi.microbiology.ubc.ca. Available at: <https://ujemi.microbiology.ubc.ca/sites/default/files/Wang%20et%20al%20JEMI-methods%20Vol%201%20pg%2026-29_0.pdf> [Accessed 11 July 2022].

Watanakunakorn C. (1981). The antibacterial action of vancomycin. *Reviews of infectious diseases*, 3 suppl, S210–S215.

Yazgan, H., 2020. Investigation of antimicrobial properties of sage essential oil and its nanoemulsion as antimicrobial agent. *LWT*, 130, p.109669.

Zinn, M.-K., Singer, M., & Bockmühl, D. (2021). Smells Like Teen Spirit—A Model to Generate Laundry-Associated Malodour In Vitro. *Microorganisms*, 9(5), 974. <https://doi.org/10.3390/microorganisms9050974>

Zomorodian, K., Moein, M., Pakshir, K., Karami, F. and Sabahi, Z., 2017. Chemical Composition and Antimicrobial Activities of the Essential Oil From *Salvia mirzayanii* Leaves. *Journal of Evidence-Based Complementary & Alternative Medicine*, 22(4), pp.770-776.

APPENDICES

Appendix 1. Normal distribution test and One-way ANOVA test summary of Staphylococcus hominis

Test for normal distribution					
Shapiro-Wilk test					
W	0.9081	1.000	1.000	0.9643	Invalid input data
P value	0.4117	>0.9999	>0.9999	0.6369	
Passed normality test (alpha=0.05)	Yes	Yes	Yes	Yes	
P value summary	ns	ns	ns	ns	

ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Treatment (between columns)	355.1	4	88.79	F (4, 10) = 65.73	P<0.0001
Residual (within columns)	13.51	10	1.351		
Total	368.6	14			

Appendix 2. Normal distribution test and One-way ANOVA test summary of Micrococcus luteus

Shapiro-Wilk test					
W	0.7894	1.000	0.9231	0.9938	Invalid input data
P value	0.0893	>0.9999	0.4633	0.8499	
Passed normality test (alpha=0.05)	Yes	Yes	Yes	Yes	
P value summary	ns	ns	ns	ns	

ANOVA table	SS	DF	MS	F (DFn, DFd)	P value
Treatment (between columns)	575.6	4	143.9	F (4, 10) = 118.6	P<0.0001
Residual (within columns)	12.13	10	1.213		
Total	587.7	14			

Appendix 3. Raw data of Staphylococcus hominis' Growth Curve

T0				T1			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	0.1037	0.0465	0.0471	A	0.1302	0.0707	0.0716
B	0.1039	0.0467		B	0.131	0.0715	
C	0.1052	0.0480		C	0.132	0.0725	
Blank 1	0.053			Blank 1	0.0601		
Blank 2	0.0558			Blank 2	0.0564		
Blank 3	0.0628			Blank 3	0.062		
Blank Ave.	0.0572			Blank Ave.	0.0595		

T2				T3			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	0.1914	0.1319	0.1340	A	0.2658	0.2062	0.2177
B	0.197	0.1375		B	0.2923	0.2327	
C	0.192	0.1325		C	0.2737	0.2141	
Blank 1	0.0602			Blank 1	0.0602		
Blank 2	0.0563			Blank 2	0.0565		
Blank 3	0.0619			Blank 3	0.0621		
Blank Ave.	0.0595			Blank Ave.	0.0596		

T4				T5			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	0.3651	0.3057	0.3111	A	0.4678	0.4073	0.3989
B	0.3788	0.3194		B	0.4577	0.3972	
C	0.3676	0.3082		C	0.4527	0.3922	
Blank 1	0.06			Blank 1	0.0597		
Blank 2	0.0562			Blank 2	0.0593		
Blank 3	0.062			Blank 3	0.0624		
Blank Ave.	0.0594			Blank Ave.	0.0605		

T6				T7			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	0.5479	0.4886	0.4790	A	0.6158	0.5558	0.5241
B	0.5341	0.4748		B	0.5589	0.4989	
C	0.5329	0.4736		C	0.5775	0.5175	
Blank 1	0.0597			Blank 1	0.0607		
Blank 2	0.0562			Blank 2	0.0568		
Blank 3	0.0621			Blank 3	0.0625		
Blank Ave.	0.0593			Blank Ave.	0.0600		

T8				T9			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	0.6124	0.5460	0.5580	A	0.7174	0.6348	0.6169
B	0.6127	0.5463		B	0.6789	0.5963	
C	0.6419	0.5755		C	0.7021	0.6195	
Blank 1	0.0667			Blank 1	0.0792	0.6510	0.6331
Blank 2	0.064			Blank 2	0.0828	0.6125	
Blank 3	0.0684			Blank 3	0.0857	0.6357	
Blank Ave.	0.0664			Blank Ave.	0.0826		

T10				T11			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	0.7612	0.6301	0.6135	A	1.1765	0.9561	0.9524
B	0.7298	0.5987		B	1.1805	0.9601	
C	0.743	0.6119		C	1.1615	0.9411	
Blank 1	0.1216	0.6786	0.6621	Blank 1	0.2067	1.1101	1.1064
Blank 2	0.1345	0.6472		Blank 2	0.1876	1.1141	
Blank 3	0.1373	0.6604		Blank 3	0.2669	1.0951	
Blank Ave.	0.1311			Blank Ave.	0.2204		

T12				T13			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	1.1091	0.8000	0.8143	A	1.1141	0.7730	0.7378
B	1.1504	0.8413		B	0.9861	0.6450	
C	1.1106	0.8015		C	1.1367	0.7956	
Blank 1	0.2715	1.0427	1.0570	Blank 1	0.2921	1.0477	1.0126
Blank 2	0.2567	1.084		Blank 2	0.2961	0.9197	
Blank 3	0.3991	1.0442		Blank 3	0.4352	1.0703	
Blank Ave.	0.3091			Blank Ave.	0.3411		

T14				T15			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	1.1934	0.7729	0.6960	A	1.1986	0.6514	0.5693
B	0.9874	0.5669		B	0.9833	0.4361	
C	1.1686	0.7481		C	1.1678	0.6206	
Blank 1	0.4708	1.127	1.0501	Blank 1	0.6009	1.1322	1.0502
Blank 2	0.337	0.921		Blank 2	0.4121	0.9169	
Blank 3	0.4536	1.1022		Blank 3	0.6287	1.1014	
Blank Ave.	0.4205			Blank Ave.	0.5472		

T16				T17			
SH	OD	OD - Blank Ave.	OD Ave.	SH	OD	OD - Blank Ave.	OD Ave.
A	1.1902	0.6168	0.5408	A	1.2142	0.6367	0.5443
B	0.9854	0.4120		B	0.9864	0.4089	
C	1.1671	0.5937		C	1.1648	0.5873	
Blank 1	0.5929	1.1238	1.0478	Blank 1	0.5813	1.1478	1.0554
Blank 2	0.4122	0.919		Blank 2	0.4165	0.92	
Blank 3	0.7152	1.1007		Blank 3	0.7546	1.0984	
Blank Ave.	0.5734			Blank Ave.	0.5775		

T18			
SH	OD	OD - Blank Ave.	OD Ave.
A	1.0926	0.6216	0.5787
B	0.9723	0.5013	
C	1.0843	0.6133	
Blank 1	0.431	1.0262	0.9833
Blank 2	0.3983	0.9059	
Blank 3	0.5837	1.0179	
Blank Ave.	0.4710		

Appendix 4. Raw data of Micrococcus luteus' Growth Curve

T0				T1			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	0.119	0.0618	0.0642	A	0.1688	0.1093	0.1123
B	0.1248	0.0676		B	0.1715	0.1120	
C	0.1203	0.0631		C	0.175	0.1155	
Blank 1	0.053			Blank 1	0.0601		
Blank 2	0.0558			Blank 2	0.0564		
Blank 3	0.0628			Blank 3	0.062		
Blank Ave.	0.0572			Blank Ave.	0.0595		

T2				T3			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	0.2374	0.1779	0.1856	A	0.3368	0.2772	0.2889
B	0.2441	0.1846		B	0.3505	0.2909	
C	0.2537	0.1942		C	0.3583	0.2987	
Blank 1	0.0602			Blank 1	0.0602		
Blank 2	0.0563			Blank 2	0.0565		
Blank 3	0.0619			Blank 3	0.0621		
Blank Ave.	0.0595			Blank Ave.	0.0596		

T4				T5			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	0.4506	0.3912	0.3814	A	0.5588	0.4983	0.4933
B	0.4306	0.3712		B	0.5426	0.4821	
C	0.4412	0.3818		C	0.56	0.4995	
Blank 1	0.06			Blank 1	0.0597		
Blank 2	0.0562			Blank 2	0.0593		
Blank 3	0.062			Blank 3	0.0624		
Blank Ave.	0.0594			Blank Ave.	0.0605		

T6				T7			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	0.6909	0.6316	0.6203	A	0.7881	0.7281	0.7063
B	0.6533	0.5940		B	0.7588	0.6988	
C	0.6946	0.6353		C	0.7519	0.6919	
Blank 1	0.0597			Blank 1	0.0607		
Blank 2	0.0562			Blank 2	0.0568		
Blank 3	0.0621			Blank 3	0.0625		
Blank Ave.	0.0593			Blank Ave.	0.0600		

T8				T9			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	0.8637	0.7973	0.7728	A	0.9306	0.8480	0.8261
B	0.8402	0.7738		B	0.9158	0.8332	
C	0.8137	0.7473		C	0.8795	0.7969	
Blank 1	0.0667			Blank 1	0.0792	0.8642	0.8423
Blank 2	0.064			Blank 2	0.0828	0.8494	
Blank 3	0.0684			Blank 3	0.0857	0.8131	
Blank Ave.	0.0664			Blank Ave.	0.0826		

T10				T11			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	0.982	0.8509	0.8306	A	0.9901	0.7697	0.7976
B	0.9637	0.8326		B	1.0157	0.7953	
C	0.9396	0.8085		C	1.0483	0.8279	
Blank 1	0.1216	0.8994	0.8792	Blank 1	0.2067	0.9237	0.9516
Blank 2	0.1345	0.8811		Blank 2	0.1876	0.9493	
Blank 3	0.1373	0.8570		Blank 3	0.2669	0.9819	
Blank Ave.	0.1311			Blank Ave.	0.2204		

T12				T13			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	1.0121	0.7030	0.7391	A	1.0503	0.7092	0.7086
B	1.0522	0.7431		B	0.9729	0.6318	
C	1.0802	0.7711		C	1.126	0.7849	
Blank 1	0.2715	0.9457	0.9818	Blank 1	0.2921	0.9839	0.9833
Blank 2	0.2567	0.9858		Blank 2	0.2961	0.9065	
Blank 3	0.3991	1.0138		Blank 3	0.4352	1.0596	
Blank Ave.	0.3091			Blank Ave.	0.3411		

T14				T15			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	1.0601	0.6396	0.6428	A	1.063	0.5158	0.5164
B	0.9864	0.5659		B	0.9849	0.4377	
C	1.1432	0.7227		C	1.1431	0.5959	
Blank 1	0.4708	0.9937	0.9968	Blank 1	0.6009	0.9966	0.9973
Blank 2	0.337	0.92		Blank 2	0.4121	0.9185	
Blank 3	0.4536	1.0768		Blank 3	0.6287	1.0767	
Blank Ave.	0.4205			Blank Ave.	0.5472		

T16				T17			
ML	OD	OD - Blank Ave.	OD Ave.	ML	OD	OD - Blank Ave.	OD Ave.
A	1.0739	0.5005	0.4949	A	1.0799	0.5024	0.4902
B	0.986	0.4126		B	0.9837	0.4062	
C	1.145	0.5716		C	1.1395	0.5620	
Blank 1	0.5929	1.0075	1.0019	Blank 1	0.5813	1.0135	1.0013
Blank 2	0.4122	0.9196		Blank 2	0.4165	0.9173	
Blank 3	0.7152	1.0786		Blank 3	0.7546	1.0731	
Blank Ave.	0.5734			Blank Ave.	0.5775		

T18			
ML	OD	OD - Blank Ave.	OD Ave.
A	1.0356	0.5646	0.5612
B	0.9274	0.4564	
C	1.1337	0.6627	
Blank 1	0.431	0.9692	0.9658
Blank 2	0.3983	0.861	
Blank 3	0.5837	1.0673	
Blank Ave.	0.4710		

Appendix 5. Average OD data of Growth Curve used in the graph

SH			ML			Notes
HOUR	OD	OD with T8 Ave. Control	HOUR	OD	OD with T8 Ave. Control	
0	0.0471	0.0471	0	0.0642	0.0642	
1	0.0716	0.0716	1	0.1123	0.1123	
2	0.134	0.134	2	0.1856	0.1856	
3	0.2177	0.2177	3	0.2889	0.2889	
4	0.3111	0.3111	4	0.3814	0.3814	
5	0.3989	0.3989	5	0.4933	0.4933	
6	0.479	0.479	6	0.6203	0.6203	
7	0.5241	0.5241	7	0.7063	0.7063	
8	0.556	0.556	8	0.7728	0.7728	
9	0.6169	0.6331	9	0.8261	0.8423	Significant growth in control
10	0.6135	0.6621	10	0.8306	0.8792	
11	0.9524	1.1064	11	0.7976	0.9516	
12	0.8143	1.057	12	0.7391	0.9818	
13	0.7378	1.0126	13	0.7086	0.9833	
14	0.696	1.0501	14	0.6428	0.9968	
15	0.5693	1.0502	15	0.5164	0.9973	
16	0.5408	1.0478	16	0.4949	1.0019	
17	0.5443	1.0554	17	0.4902	1.0013	
18	0.5787	0.9833	18	0.5612	0.9658	

Appendix 6. Raw Data of *Micrococcus luteus* on Spot Plating Assay

Treatment	Bacteria	OD	Sample	ZOI (mm)	Diameter of treatment	ZOI - diameter
Positive control	ML	0.2		22.3	8.2	14.1
Negative control	ML	0.2		0	0	0
Rexona	ML	0.2	A	6.5	5.5	1
			B	6	5	1
			C	5.4	4.5	0.9
TBB	ML	0.2	A	7.8	6.7	1.1
			B	7	6	1
			C	8.8	7.4	1.4
Erha	ML	0.2	A	17	6.3	10.7
			B	18.7	6.1	12.6
			C	13.6	5.4	8.2

Appendix 7. Raw Data of *Staphylococcus hominis* on Spot Plating Assay

Bacteria	OD	Treatment	Sample	ZOI (mm)	Diameter of treatment	ZOI - Diameter of Treatment
SH	0.2	Positive control		20.8	10.4	10.4
		Negative control		0	0	0
		Rexona	A	6.5	5.5	1
			B	6.4	5.4	1
			C	6.7	5.9	0.8
		TBB	A	10.7	7.8	2.9
			B	11.7	8.6	3.1
			C	10.4	7.7	2.7
		Erha	A	17.6	10.8	6.8
			B	16.5	9.9	6.6
			C	17.8	10.6	7.2

Appendix 8. Raw Data of Rexona on Time Kill Assay (all bacteria)

Rexona	0	CT	0	0	0	0	0	0
		SH	0	0	0	1	4	1
		SE	1	0	0	0	0	0
		ML	1	0	0	0	0	0
	1	CT	0	0	0	0	0	0
		SH	0	0	0	0	0	2
		SE	0	0	0	0	0	0
		ML	0	0	0	0	0	0
	5	CT	0	0	0	1	0	0
		SH	0	0	18 TMTC		44	46
		SE	0	0	0	1	0	1
		ML	0	0	0	0	0	0
	9	CT	0	0	0	1	0	0
		SH	0	0	0	0	0	TMTC
		SE	0	0	0	0	2	1
		ML	0	0	0	0	0	0

Appendix 9. Raw Data of The Bath Box on Time Kill Assay (all bacteria)

TBB	0	CT	TMTC	TMTC	TMTC	0	0	0
		SH	0	0	0	0	0	0
		SE	45	0	0	0	0	0
		ML	0	0	0	0	0	0
	1	CT	TMTC	TMTC	0	0	0	0
		SH	0	0	2	2	4	0
		SE	15	0	0	0	0	0
		ML	0	1	1	0	1	0
	5	CT	TMTC	4	0	0	0	0
		SH	0	0	1	1	48	33
		SE	TMTC	17	0	1	2	0
		ML	0	0	0	0	0	0
	9	CT	28	7	2	0	1	0
		SH	0	0	0	0	TMTC	TMTC
		SE	0	1	0	3	0	4
		ML	TMTC	3	4	0	0	0

Appendix 10. Raw Data of Product E on Time Kill Assay (all bacteria)

Erha	0	CT	TMTC	TMTC	TMTC	0	0	0
		SH	0	0	0	0	1	1
		SE	0	0	0	0	0	0
		ML	TMTC	22	7	1	0	0
	1	CT	0	1	0	0	0	1
		SH	0	0	0	10	1	3
		SE	0	0	0	0	1	0
		ML	TMTC	19	6	0	0	0
	5	CT	TMTC	TMTC	23	1	0	1
		SH	0	0	13	60	57	87
		SE	0	0	0	0	0	2
		ML	TMTC	21	1	0	0	0
	9	CT	TMTC	TMTC	28	0	2	2
		SH	0	0	0	0	TMTC	TMTC
		SE	0	0	0	0	0	1
		ML	0	0	0	0	0	1

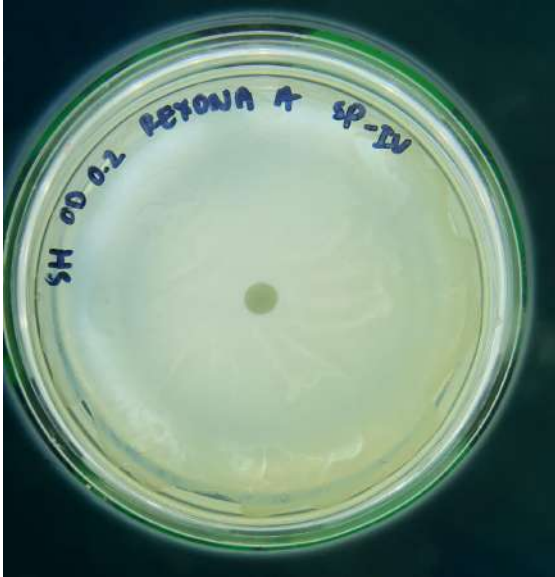
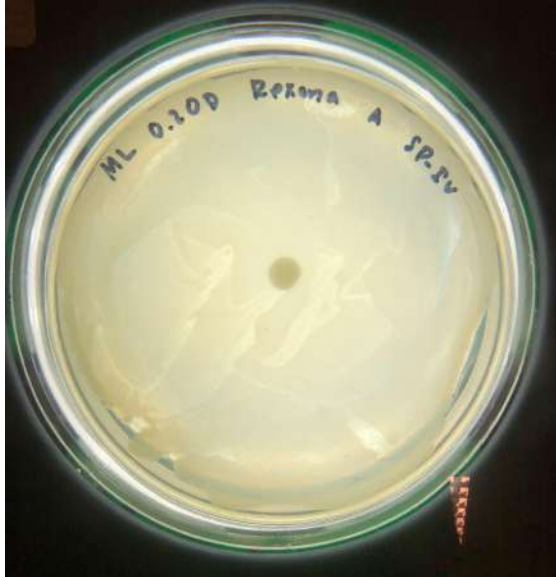
Appendix 11. Raw Data of Negative Control on Time Kill Assay (all bacteria)

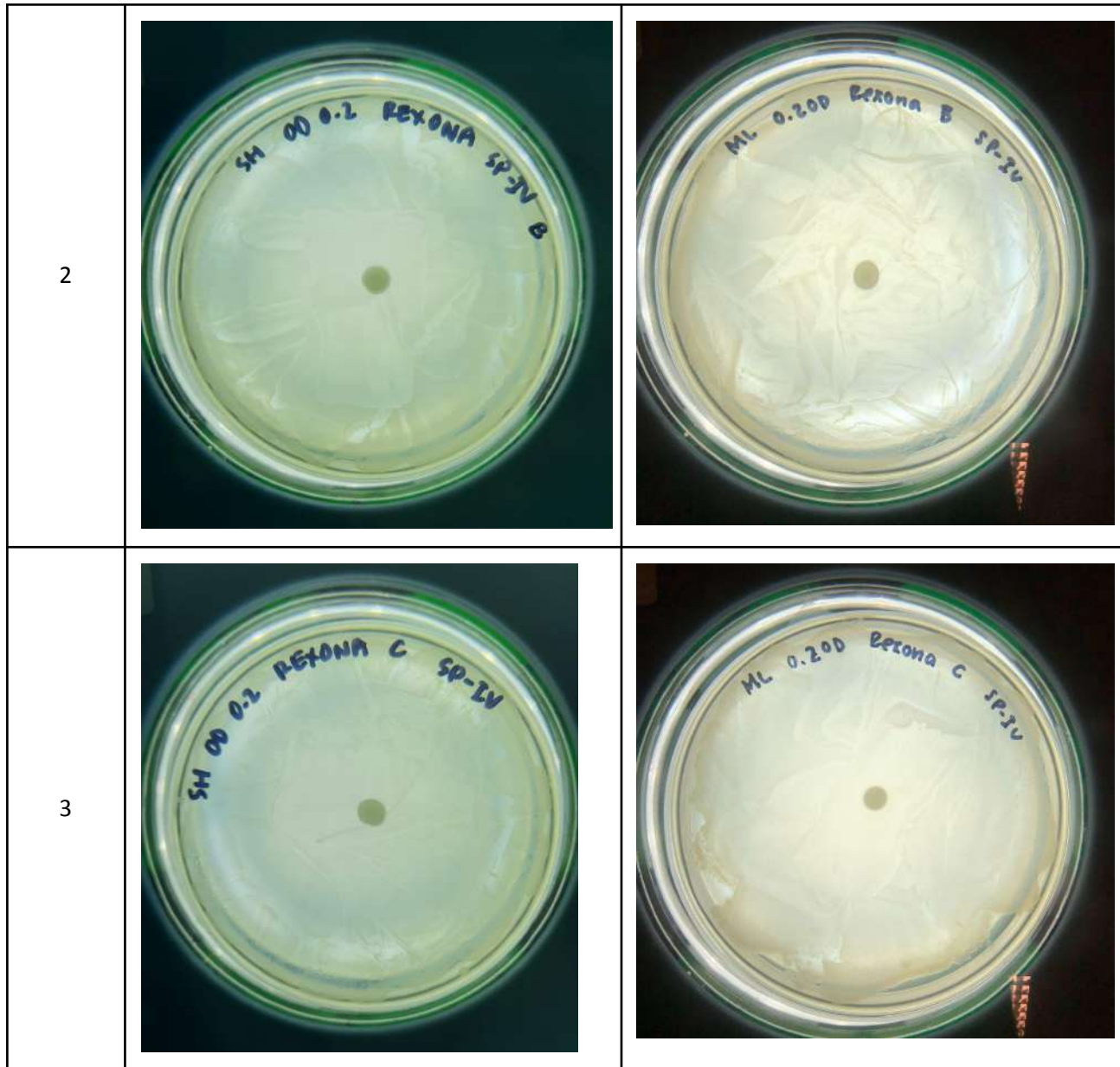
Negative control	0	CT	TMTC	40	13	12	8	6
		SH	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC
		SE	64	5	0	0	0	0
		ML	50	2	2	0	1	0
	1	CT	TMTC	76	22	5	3	3
		SH	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC
		SE	TMTC	14	5	1	2	2
		ML	TMTC	47	14	23	9	11
	5	CT	TMTC	TMTC	32	11	4	3
		SH	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC
		SE	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC
		ML	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC
	9	CT	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC
		SH	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC
		SE	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC
		ML	TMTC	TMTC	TMTC	TMTC	TMTC	TMTC

Appendix 12. Raw Data of Positive Control on Time Kill Assay (all bacteria)



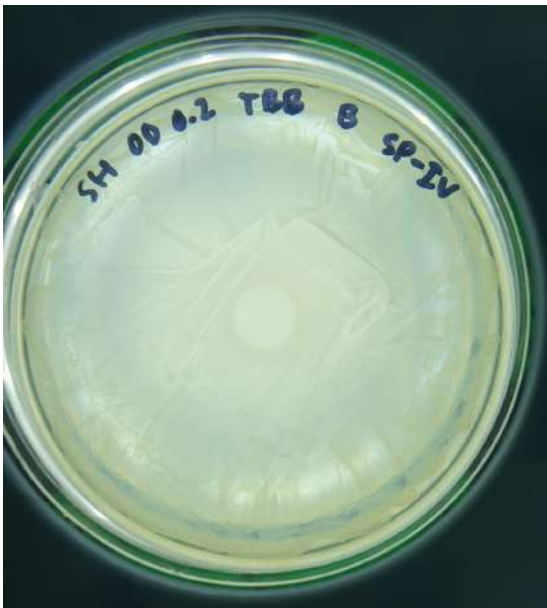
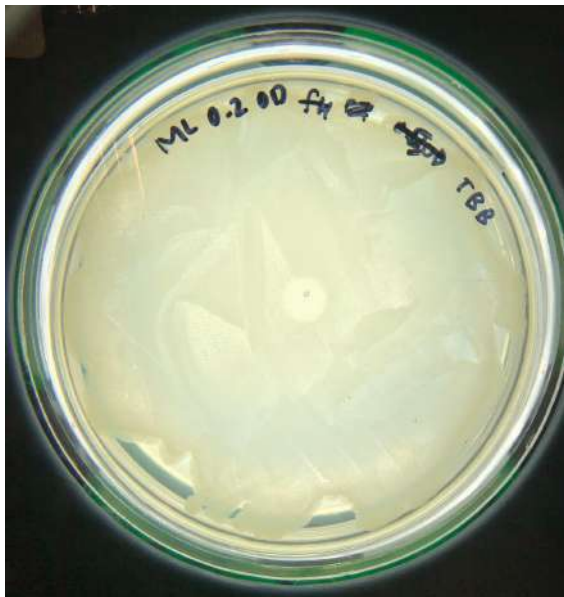
Positive control	0	CT	TMTC	TMTC	6	0	0	0
		SH	0	0	0	0	0	0
		SE	0	0	0	0	0	0
		ML	26	3	0	0	0	0
	1	CT	TMTC	TMTC	12	0	0	0
		SH	0	0	0	2	0	4
		SE	0	0	0	0	0	0
		ML	76	8	0	0	0	0
	5	CT	TMTC	TMTC	0	0	0	0
		SH	0	0	0	0	0	0
		SE	0	0	0	0	0	0
		ML	67	0	0	0	0	0
	9	CT	0	0	0	2	0	1
		SH	0	0	0	0	0	0
		SE	0	3	0	0	0	4
		ML	79	9	0	0	3	0

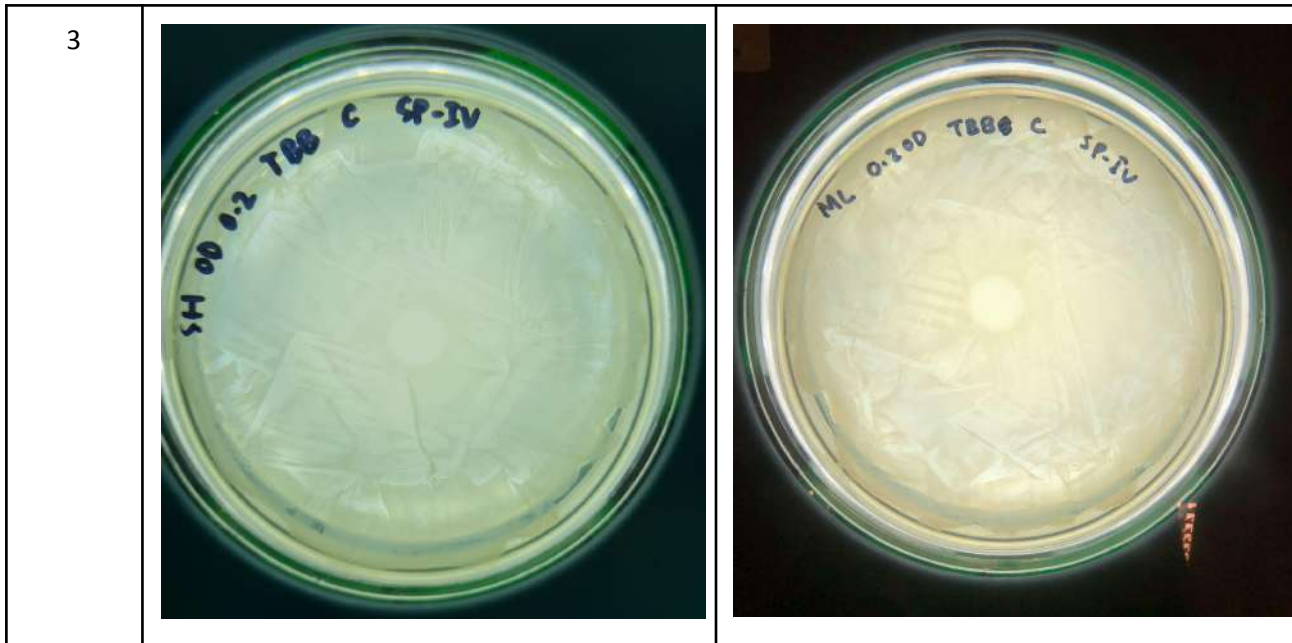
Appendix 13. Agar plate observation for Rexona's results of Spot Plating Assay

Rexona		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
1		

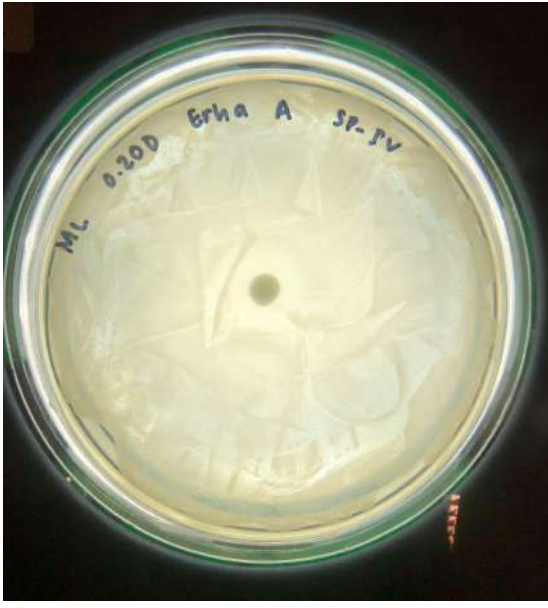


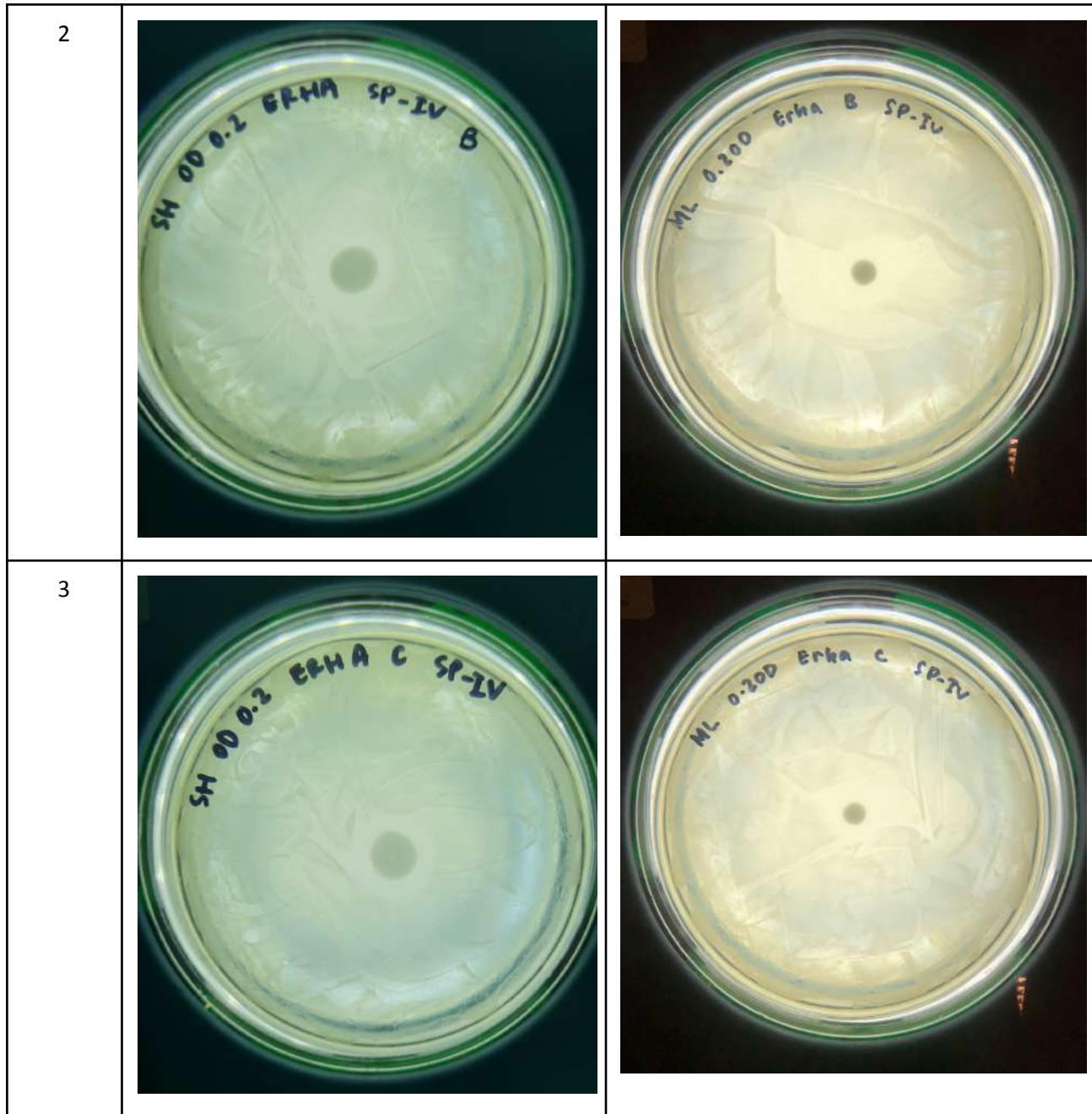
Appendix 14. Agar plate observation for The Bath Box's results of Spot Plating Assay

The Bath Box		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
1		
2		


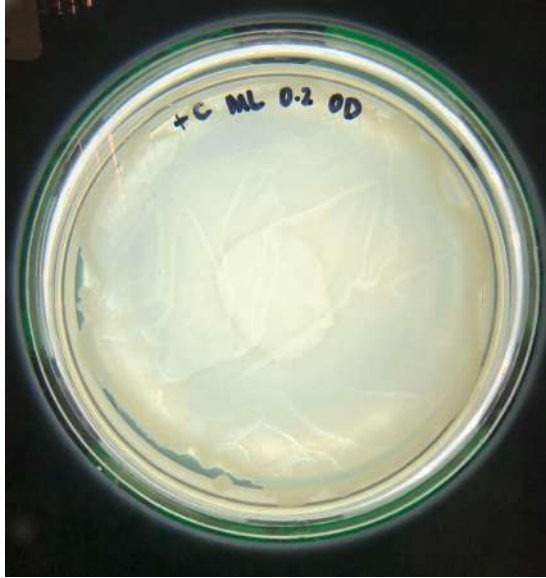

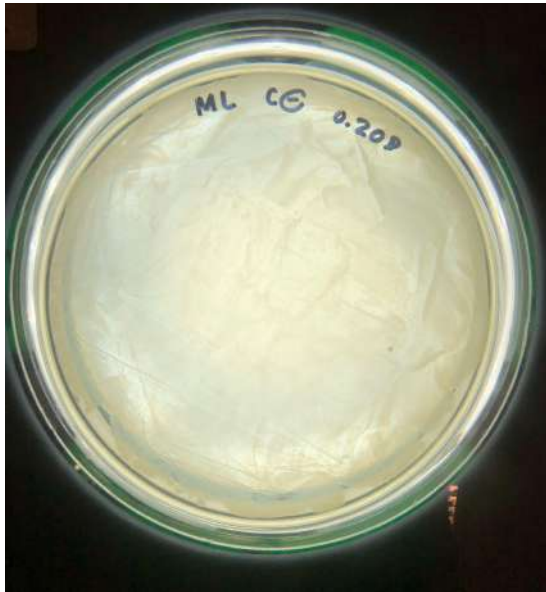


Appendix 15. Agar plate observation for Product E's results of Spot Plating Assay

Product E		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
1		

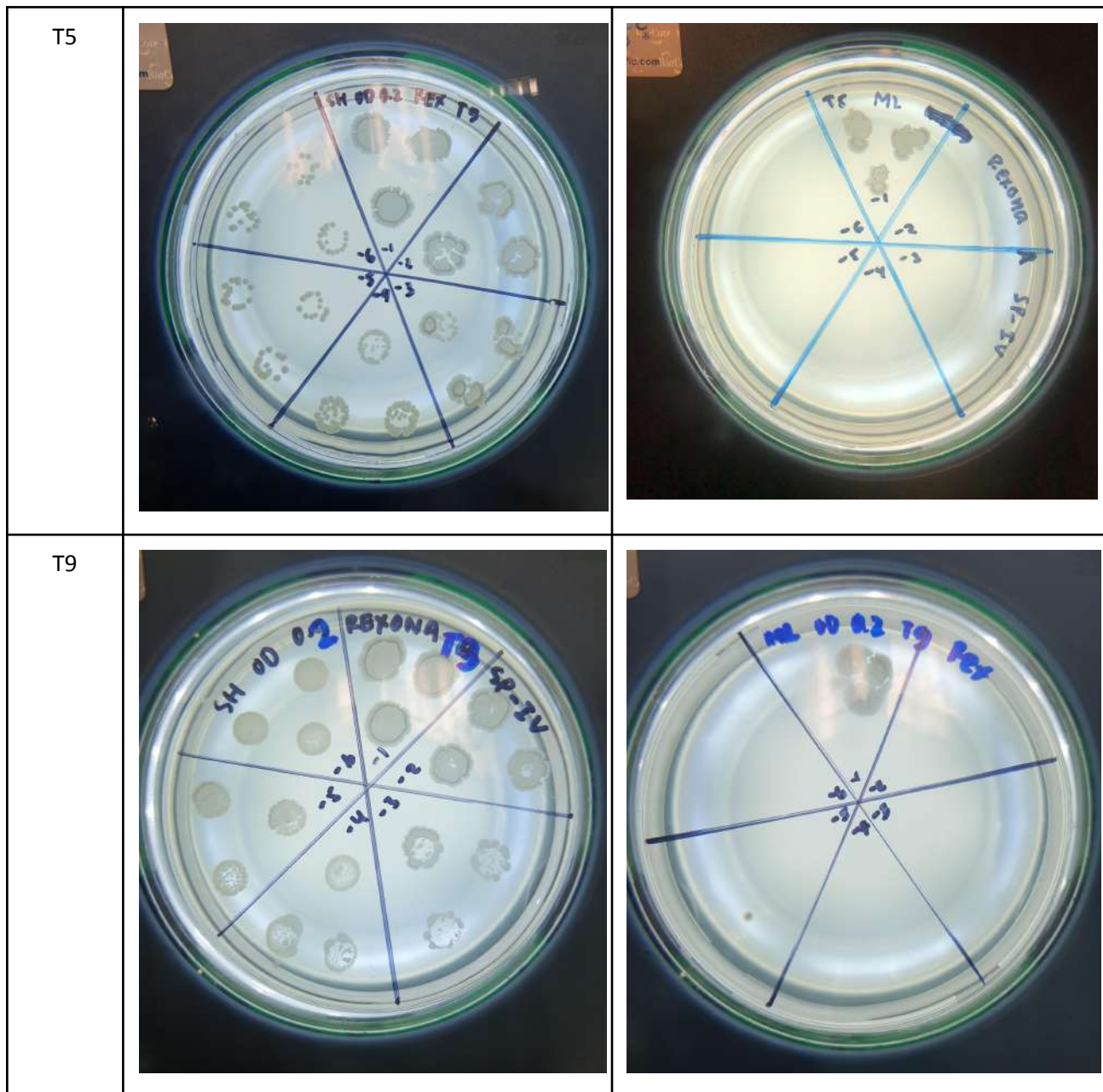


Appendix 16. Agar plate observation for the controls result of Spot Plating Assay

Controls		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
Positive Control		
Negative Control		

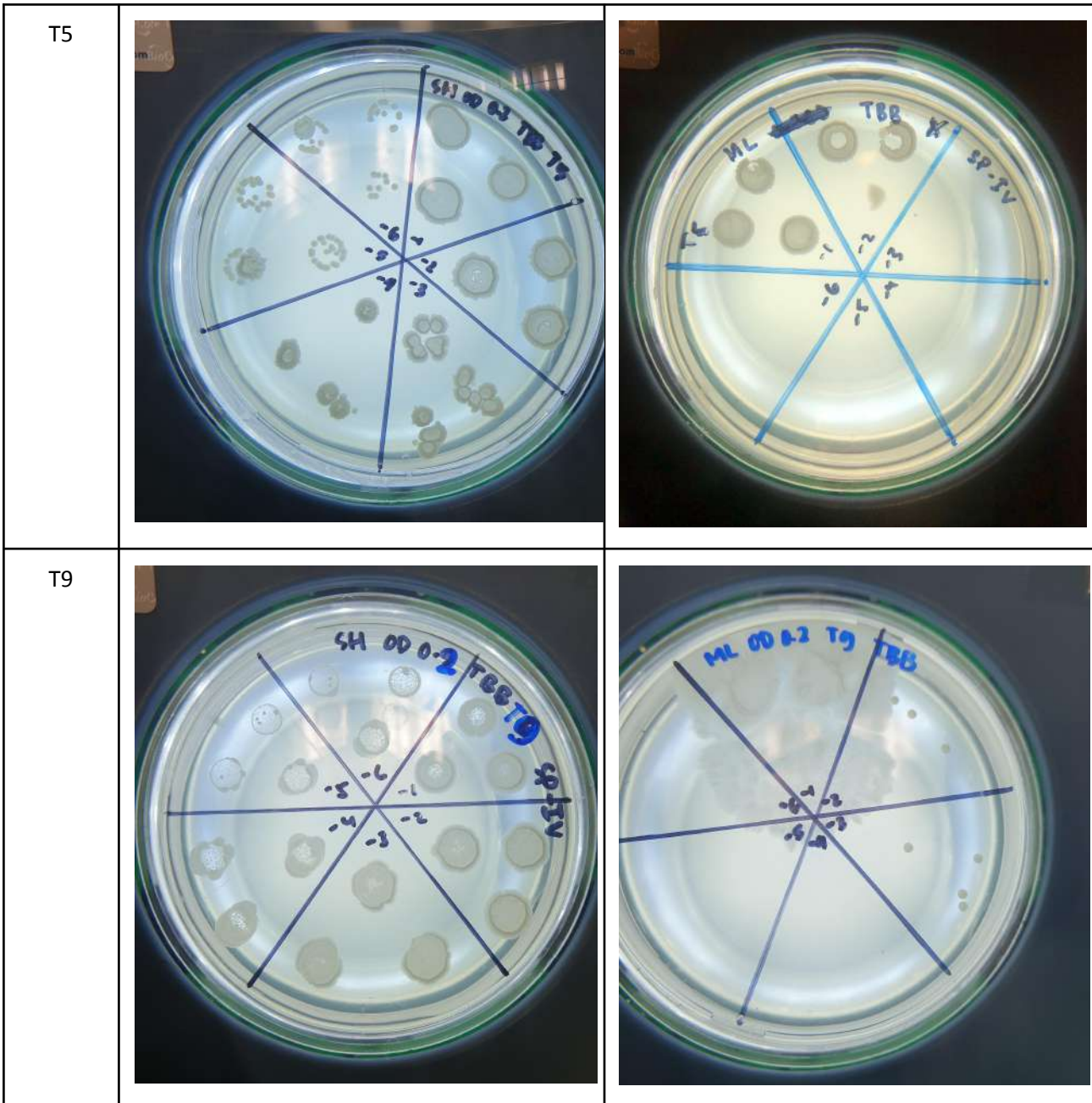
Appendix 17. Agar plate observation for Rexona's result of Time Kill Assay

Rexona		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
T0		
T1		


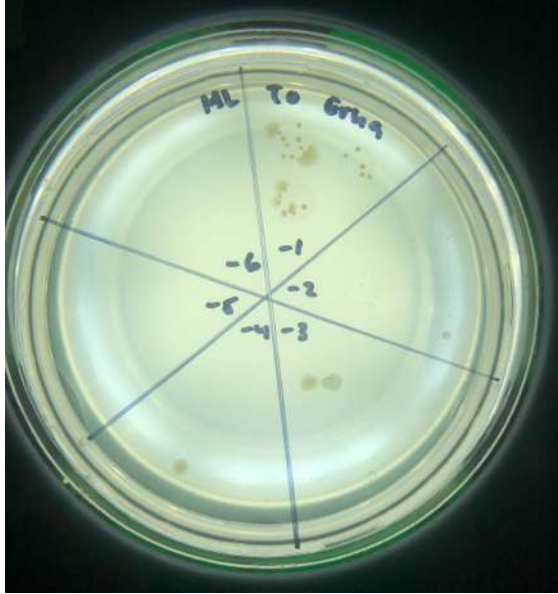
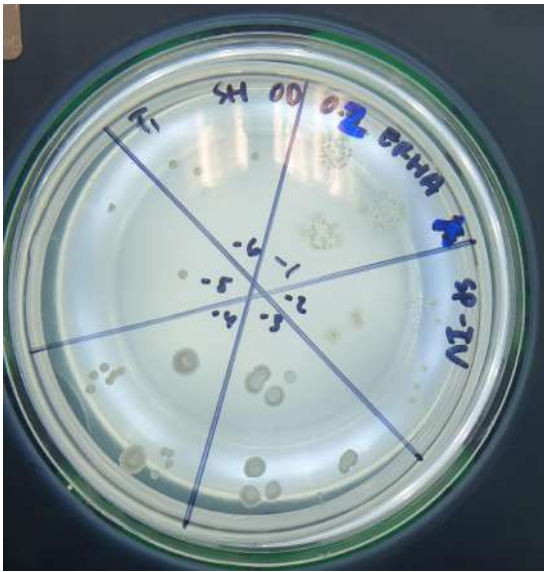
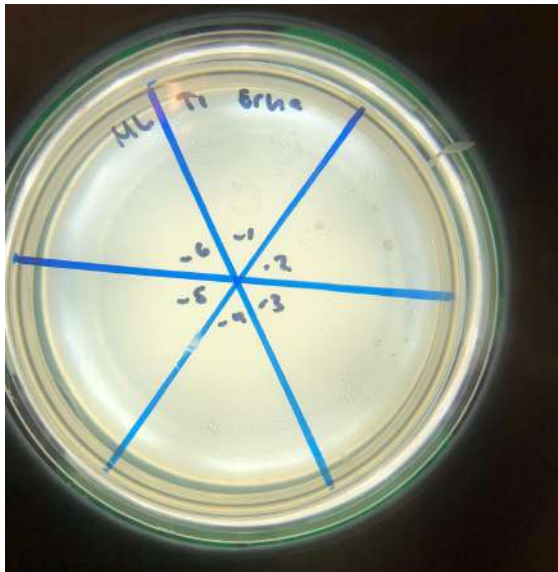




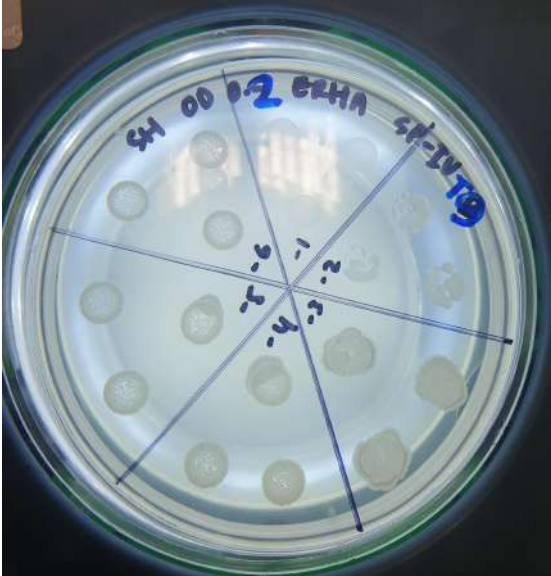
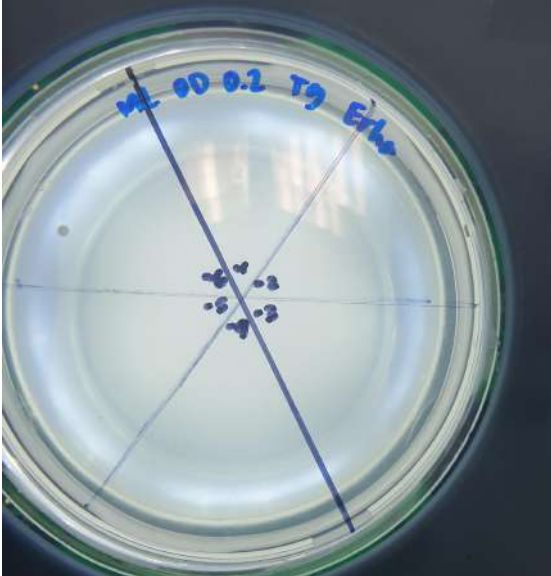
Appendix 18. Agar plate observation for The Bath Box's result of Time Kill Assay

The Bath Box		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
T0		
T1		




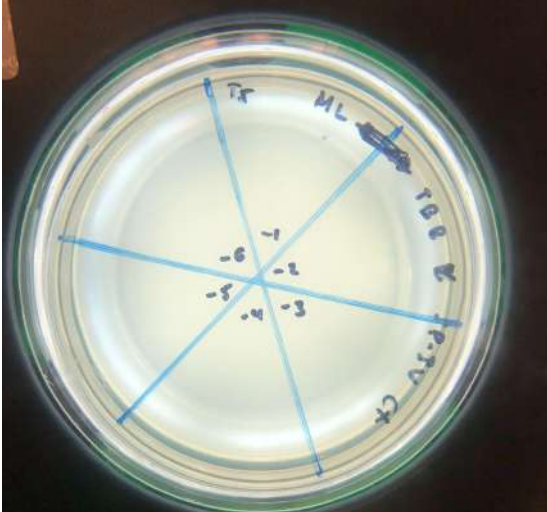
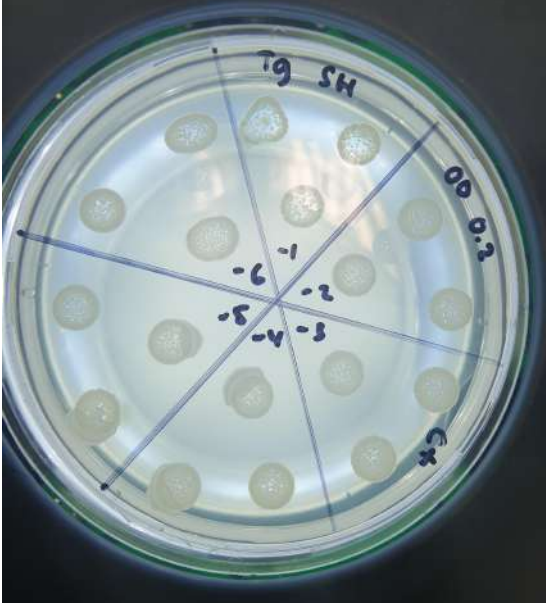

Appendix 19. Agar plate observation for Product E's result of Time Kill Assay

Product E		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
T0	 <p>Agar plate for <i>Staphylococcus hominis</i> at T0. The plate is divided into six sectors by black lines. The sectors are labeled with handwritten numbers: -6, -1, -2, -3, -4, and -5. The plate shows numerous yellowish colonies, particularly in the sectors labeled -6, -1, and -2.</p>	 <p>Agar plate for <i>Micrococcus luteus</i> at T0. The plate is divided into six sectors by black lines. The sectors are labeled with handwritten numbers: -6, -1, -2, -3, -4, and -5. The plate shows numerous yellowish colonies, particularly in the sectors labeled -6, -1, and -2.</p>
T1	 <p>Agar plate for <i>Staphylococcus hominis</i> at T1. The plate is divided into six sectors by black lines. The sectors are labeled with handwritten numbers: -6, -1, -2, -3, -4, and -5. The plate shows a significant reduction in colonies compared to T0, with only a few small colonies remaining, particularly in the sectors labeled -6, -1, and -2.</p>	 <p>Agar plate for <i>Micrococcus luteus</i> at T1. The plate is divided into six sectors by black lines. The sectors are labeled with handwritten numbers: -6, -1, -2, -3, -4, and -5. The plate shows a significant reduction in colonies compared to T0, with only a few small colonies remaining, particularly in the sectors labeled -6, -1, and -2.</p>


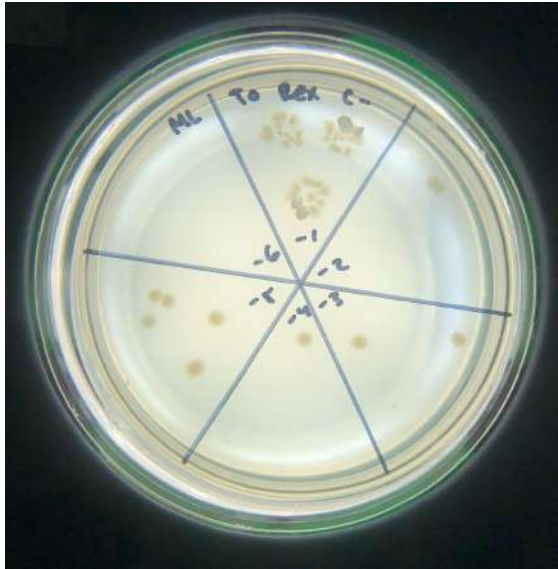

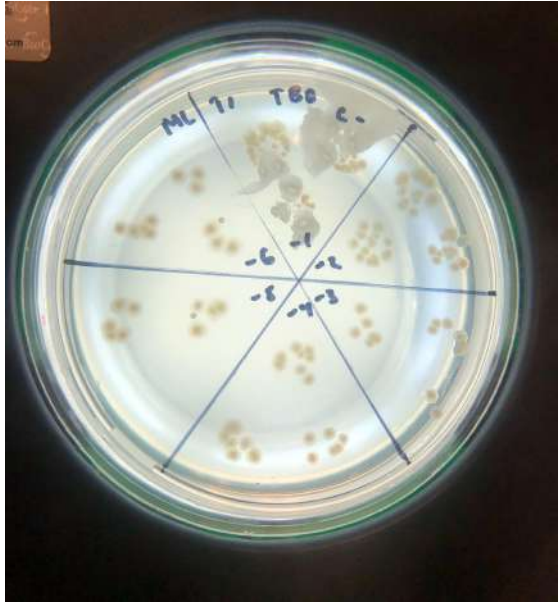
T5	 <p>A petri dish with a white agar surface. The lid is marked with '9H 00 0.2 Erha T5' in black ink. The agar is divided into six sectors by three intersecting lines. Each sector contains a circular bacterial culture. The sectors are numbered 1 through 6 in the center of the dish.</p>	 <p>A petri dish with a white agar surface. The lid is marked with 'Erha T5' and 'ML' in blue ink. The agar is divided into six sectors by three intersecting lines. Each sector contains a circular bacterial culture. The sectors are numbered 1 through 6 in the center of the dish.</p>
T9	 <p>A petri dish with a white agar surface. The lid is marked with '9H 00 0.2 ERHA' and 'SI-IV T9' in blue ink. The agar is divided into six sectors by three intersecting lines. Each sector contains a circular bacterial culture. The sectors are numbered 1 through 6 in the center of the dish.</p>	 <p>A petri dish with a white agar surface. The lid is marked with 'ML 00 0.2 T9 Erha' in blue ink. The agar is divided into six sectors by three intersecting lines. Each sector contains a circular bacterial culture. The sectors are numbered 1 through 6 in the center of the dish.</p>

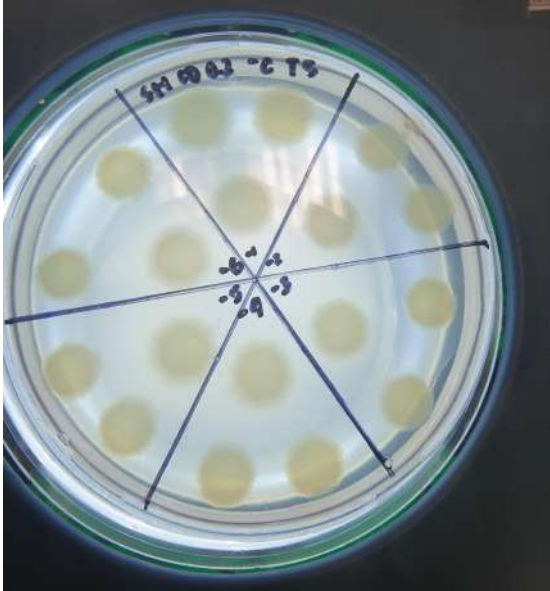
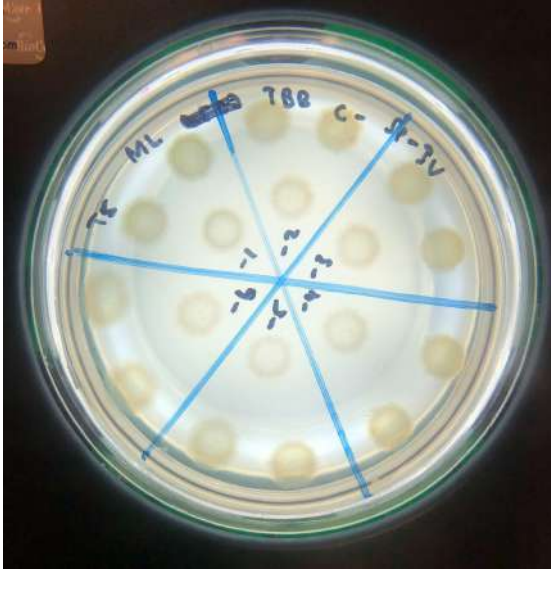
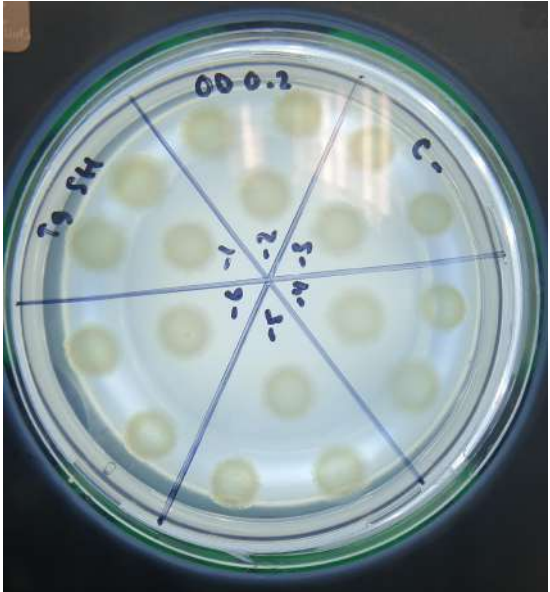
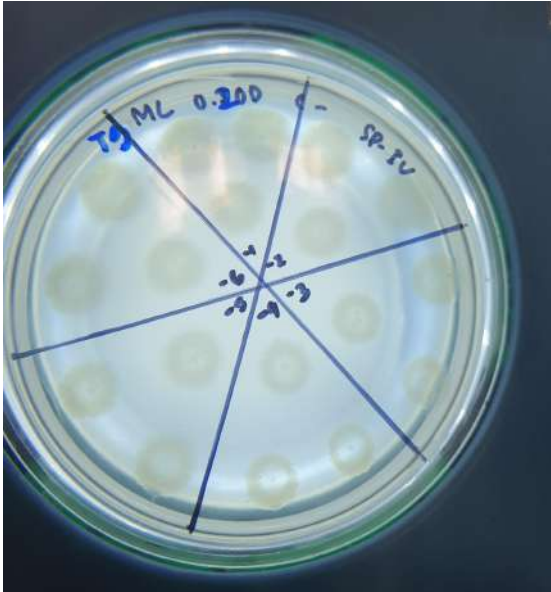
Appendix 20. Agar plate observation of positive control results of Time Kill Assay

Positive Controls		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
T0		
T1		

<p>T5</p>	 <p>A petri dish with a white agar surface, divided into six sectors by blue lines. The sectors are labeled with handwritten numbers: 1, 2, 3, 4, 5, and 6. The top edge of the dish has handwritten text: "SH 00 0.2 FC T5". There are several small, circular, light-colored colonies visible on the agar surface.</p>	 <p>A petri dish with a white agar surface, divided into six sectors by blue lines. The sectors are labeled with handwritten numbers: 1, 2, 3, 4, 5, and 6. The top edge of the dish has handwritten text: "TX ML T50 2 P3V CX". There are several small, circular, light-colored colonies visible on the agar surface.</p>
<p>T9</p>	 <p>A petri dish with a white agar surface, divided into six sectors by blue lines. The sectors are labeled with handwritten numbers: 1, 2, 3, 4, 5, and 6. The top edge of the dish has handwritten text: "T9 SH 00 0.2 CX". There are several small, circular, light-colored colonies visible on the agar surface.</p>	 <p>A petri dish with a white agar surface, divided into six sectors by blue lines. The sectors are labeled with handwritten numbers: 1, 2, 3, 4, 5, and 6. The top edge of the dish has handwritten text: "T9 ML 0.200 CX". There are several small, circular, light-colored colonies visible on the agar surface.</p>

Appendix 21. Agar plate observation of negative control results of Time Kill Assay

Negative Controls		
Bacteria	<i>Staphylococcus hominis</i>	<i>Micrococcus luteus</i>
T0		
T1		

<p>T5</p>	 <p>A petri dish with a white agar surface and 12 yellow circular spots arranged in a 3x4 grid. The dish is divided into six sectors by three intersecting lines. Handwritten labels include '54 00 02' at the top, '78' on the left, and 'C-' on the right. In the center, there are handwritten numbers: '1', '2', '3', '4', '5', '6'.</p>	 <p>A petri dish with a white agar surface and 12 yellow circular spots arranged in a 3x4 grid. The dish is divided into six sectors by three intersecting lines. Handwritten labels include '788' at the top, 'ML' on the left, and 'C- 5-3V' on the right. In the center, there are handwritten numbers: '1', '2', '3', '4', '5', '6'.</p>
<p>T9</p>	 <p>A petri dish with a white agar surface and 12 yellow circular spots arranged in a 3x4 grid. The dish is divided into six sectors by three intersecting lines. Handwritten labels include '00 0.2' at the top, '79 54' on the left, and 'C-' on the right. In the center, there are handwritten numbers: '1', '2', '3', '4', '5', '6'.</p>	 <p>A petri dish with a white agar surface and 12 yellow circular spots arranged in a 3x4 grid. The dish is divided into six sectors by three intersecting lines. Handwritten labels include '79 ML 0.200' at the top, 'C-' on the left, and 'SP-3V' on the right. In the center, there are handwritten numbers: '1', '2', '3', '4', '5', '6'.</p>