

CHAPTER I

INTRODUCTION

1.1 Background

The hand is an important part of the body consisting of tissues, bones, muscles, and nerves that work together to give humans unique abilities in a variety of daily activities with the ability to grasp, hold, pick up, and feel, hands play a vital role in social interaction, and the achievement of physical goals.¹ Based on research by Dessy Triana (2014) shows that the hand is a part of the body that is often infected with bacteria.² The spread of this source of infection can be through various intermediaries known as vectors, namely air, animals, objects, and human.³ Such as Hands that carry pathogens and are one of the causes of direct or indirect transmission of pathogens.⁴ One of the common pathogens found on hands is *Staphylococcus aureus*⁵.

Staphylococcus aureus is a Gram-positive aerobic bacterium commonly found on the skin and mucous membranes of humans and part of the normal bacterial flora of the skin⁶. However, when the number increases, it can cause infections in human tissues or organs leading to diseases such as acute respiratory infections, diarrhea, measles, and malaria.⁷ Thus, extra protection for the skin is

¹ Eka Apriyanti et al., *Teori Anatomi Tubuh Manusia* (Yayasan Penerbit Muhammad Zaini, 2021).

² Dessy Triana, "Frekuensi β -Lactamase Hasil *Staphylococcus aureus* Secara Iodometri Di Laboratorium Mikrobiologi Fakultas Kedokteran Universitas Andalas" 10, no. 2 (2014).

³ Dessy Triana, "Frekuensi β -Lactamase Hasil *Staphylococcus aureus* Secara Iodometri Di Laboratorium Mikrobiologi Fakultas Kedokteran Universitas Andalas," *Jurnal Gradien*, No. 2 Vol. 10, 2014: 992–95.

⁴ Uswatun Hasanah and Dwi Rizki Mahardika, "Edukasi Prilaku Cuci Tangan Pakai Sabun Pada Anak Usia Dini Untuk Pencegahan Transmisi Penyakit," *Seminar Nasional Pengabdian Masyarakat LPPM UMJ*, Oktober 2020, 150.

⁵ Mukti Nur Hamidah, Laras Rianingsih, And Romadhon Romadhon, "Aktivitas Antibakteri Isolat Bakteri Asam Laktat Dari Peda Dengan Jenis Ikan Berbeda Terhadap E. Coli Dan S. Aureus," *Jurnal Ilmu Dan Teknologi Perikanan* 1, No. 2 (December 14, 2019): 11–21, <https://doi.org/10.14710/Jitpi.2019.6742>.

⁶ Solikah Ana Estikomah et al., "Antimicrobial Activity of Natural Solid Soap with a Combination of Liquid Cheese Waste, Turmeric (*Curcuma Longa*), and Dragon Fruit (*Hylocereus Polyrrhizus*) Peel," *Molekul* 18, no. 3 (November 20, 2023): 434, <https://doi.org/10.20884/1.jm.2023.18.3.8039>.

⁷ Anak Agung Bintang Astridwiyanti, Agung Nova Mahendra, and Ni Wayan Sucindra Dewi, "Uji efektivitas ekstrak etanol kulit buah naga merah (*Hylocereus polyrrhizus*) terhadap *Staphylococcus aureus* ATCC 25923 secara in vitro," *Intisari Sains Medis* 10, no. 3 (September 2, 2019), <https://doi.org/10.15562/ism.v10i3.425>.

needed, such as the use of antibacterial soap. Likewise, Islam has always taught and emphasized cleanliness.

The Prophet Muhammad (peace and blessings be upon him) said:

الطهور شرط الإيمان

Meaning: Purity is part of faith (Muslim narration 223).⁸.

WHO has recommended efforts to prevent germs or viruses, one way is to wash hands with running water soap which has the potential to kill germs by as much as 80%.⁹ Based on research by Ima Sukmawati and Mulkiya Yuliawati (2024) shows that hand washing can reduce the mortality rate by one million per year.¹⁰ In addition, the number of germs on the palm can be reduced by 58%.¹¹. According to BPOM RI, soap is classified as a cosmetic with a cleaning purpose. The dosage forms of antiseptic soaps on the market are solid, liquid, and transparent. In addition, it is also available with an innovation, namely soap in the form of paper sheets.¹²

Developments in the hand soap industry in the form of sheets, namely paper soap which is varied using (water-soluble paper) water-soluble paper.¹³ This paper soap has advantages such as a different shape and has the characteristics of light,

⁸ Sayyid Sabiq, *Fikih Sunnah - Jilid 1* (Cakrawala Publishing, 2021).

⁹ Dewi Marlina Et AL., "Formula Dan Uji Antibakteri Sabun Kertas Ekstrak Etanol Dari Daun Lidah Mertua (*Sansevieria Trifasciata* P.) Dan Daun Lidah Buaya (*Aloe Vera* L.)," *Jpp (Jurnal Kesehatan Poltekkes Palembang)*, No. 1, Vol 17 June 30, 2022: 23–29, <https://doi.org/10.36086/Jpp.V17i1.1129>.

¹⁰ Ima Sukmawati And Kiki Mulkiya Yuliawati, "Pengujian Aktivitas Antibakteri Ekstrak Kulit Buah Naga Merah (*Hylocereus Polyrhizus*) Terhadap *Staphylococcus Aureus*," *Bandung Conference Series: Pharmacy*, No. 1, Vol. 4 February 11, 2024: 105–11.

¹¹ Adlina Salsabila Et AL., "Formulasi Dan Uji Aktivitas Sediaan Sabun Kertas Ekstrak Etanol Daun Pandan (*Pandanus Amaryllifolius*) Sebagai Antibakteri," *Pharmacoscript*, No. 1, Vol. 6 February 23, 2023: 22–30, <https://doi.org/10.36423/Pharmacoscript.V6i1.1126>.

¹² Dewi Marlina And Fadly Fadly, "Edukasi Dan Demonstrasi Pembuatan Sabun Pencuci Tangan Antiseptik Berbahan Kertas Pada Kelompok Wanita Tani Di Kota Palembang," *Jurnal Pengabdian Kepada Masyarakat (Abdikemas)*, No. 1, Vol. 5 June 30, 2023: 58–63, <https://doi.org/10.36086/J.Abdikemas.V5i1.1735>.

¹³ Universitas Khairun, Ermalyanti Fiskia, And Cindhany Darmaria Faridhah Utami Mala, "Formulasi Dan Evaluasi Sediaan Sabun Kertas Ekstrak Etanol Fuli Buah Pala (*Myrtica Fragrans* Houtt)," *Kieraha Medical Journal*, No. 2, Vol. 3 December 31, 2021: 120–27, <https://doi.org/10.33387/Kmj.V3i2.3958>.

practical and easy to carry anywhere such as traveling far.¹⁴ This paper soap when applied to the palm and rubbed under running water will produce foam on the hands so it can only be used once.¹⁵ Everyone desires clean, healthy skin free of germs. Various methods are used to achieve healthy skin. healthy skin starting with traditional methods and modern methods, such as the use of cosmetics with chemicals, botox injections or plastic surgery.¹⁶ Therefore, researchers want to use the traditional method utilizing whey yogurt and natural coloring from the skin of red dragon fruit (*Hylocereus polyrhizus*).

Whey is a by-product of the cheese-making process that has nutrients such as protein.¹⁷ *Whey contains lactoferrin which can be utilized as an antibacterial agent*¹⁸. The largest component of whey is lactose (4.5-5%) which is utilized as a source of nutrients for Lactic Acid Bacteria (LAB) to produce various metabolite compounds such as lactic acid and antimicrobials through fermentation.¹⁹ Lactic Acid Bacteria (LAB) fermentation process can produce acids in fermented foods that have the potential to inhibit the growth of pathogenic bacteria and food spoilage bacteria.²⁰ Further treatment is carried out so that the whey is not wasted as waste. This whey processing is done by fermentation using Lactic Acid Bacteria (LAB)

¹⁴ Universitas Khairun, Ermalyanti Fiskia, And Cindhany Darmaria Faridhah Utami Mala, "Formulasi Dan Evaluasi Sediaan Sabun Kertas Ekstrak Etanol Fuli Buah Pala (*Myrictica Fragrans* Houtt)," *Kieraha Medical Journal*, No. 2, Vol. 3 December 31, 2021: 120–27, <https://doi.org/10.33387/Kmj.V3i2.3958>.

¹⁵ Adlina Salsabila Et Al., "Formulasi Dan Uji Aktivitas Sediaan Sabun Kertas Ekstrak Etanol Daun Pandan (*Pandanus Amaryllifolius*) Sebagai Antibakteri," *Pharmacoscript*, No. 1, Vol. 6 February 23, 2023: 22–30, <https://doi.org/10.36423/Pharmacoscript.V6i1.1126>.

¹⁶ Qurrata Ayun, "Formulasi Sabun Mandi Padat Dari Ekstrak Limbah Kulit Buah Naga Merah (*Hylocereus Costaricensis*)," *Jurnal Biosense*, No. 01, Vol. 2 July 9, 2019: 18–27, <https://doi.org/10.36526/Biosense.V2i01.357>.

¹⁷ Kamelia Oktafiyanti Et Al., "Efektivitas Whey Sebagai Feed Additive Pada Broiler," *Jurnal Triton*, No. 1, Vol. 15 January 31, 2024: 1–9, <https://doi.org/10.47687/Jt.V15i1.399>.

¹⁸ Solikah Ana Estikomah Et Al., "Antimicrobial Activity Of Natural Solid Soap With A Combination Of Liquid Cheese Waste, Turmeric (*Curcuma Longa*), And Dragon Fruit (*Hylocereus Polyrrhizus*) Peel," *Molekul*, No. 3, Vol. 18 November 20, 2023: 434, <https://doi.org/10.20884/1.Jm.2023.18.3.8039>.

¹⁹ Meliana Puti Fatimah, Imam Megantara, And Trianing Tyas Kusuma Anggaeni, "Kajian Pustaka: Pemanfaatan Bakteriosin Dari Produk Fermentasi Sebagai Antibakteri Terhadap *Staphylococcus Aureus*," *Indonesia Medicus Veterinus*, No. 5, Vol. 9 September 30, 2020: 835–48, <https://doi.org/10.19087/Imv.2020.9.5.835>.

²⁰ Adde Lolita Putri And Endang Kusdiyantini, "Isolasi Dan Identifikasi Bakteri Asam Laktat Dari Pangan Fermentasi Berbasis Ikan (Inasua) Yang Diperjualbelikan Di Maluku-Indonesia," *Jurnal Biologi Tropika*, No. 2, Vol. 1, November 30, 2018: 6, <https://doi.org/10.14710/Jbt.1.2.6-12>.

which is usually called yogurt. Yogurt making is one of the efforts so that whey is not wasted as waste but is even useful as a product that has high value, rich in nutrition.²¹

Yogurt is the result of fermentation mixed with Lactic Acid Bacteria (LAB) starter, namely *Lactobacillus bulgaricus* and *Streptococcus thermophiles bacteria* which are rich in nutrients because they contain protein, vitamins, minerals and low fat.²² The study of the utilization of whey as a fermentation material for Lactic Acid Bacteria (LAB) *Streptococcus thermophilus* (St-RRM01) and *Lactobacillus bulgaricus* (Lb-RRM01) known as Yogurt Whey to observe its potential as a growth inhibitor of acne, namely *Staphylococcus aureus* bacteria.²³ Therefore, researchers want to utilize yogurt whey as an antibacterial ingredient in making paper soap and combine it with red dragon fruit skin (*Hylocereus polyrhizus*) as a natural colorant.

Some studies show the side effects of synthetic dyes in the above exposure on human health, so it is urgent to make us aware that these synthetic dyes are very dangerous for health. For this reason, researchers want to utilize natural dyes of red dragon fruit skin (*Hylocereus polyrhizus*). Based on research conducted by Anindyah Febriyani Santoso and Kiki Fibrianto, red dragon fruit peel extract (*Hylocereus polyrhizus*) has antioxidant content such as vitamin C, flavonoid compounds, and polyphenols.²⁴ Other research shows that dragon fruit skin (*Hylocereus polyrhizus*) contains 30 out of 300 kinds of anthocyanins that give red color. Red dragon fruit skin (*Hylocereus polyrhizus*) contains anthocyanins as a coloring agent that can provide a natural red color that can be used as a substitute

²¹ Edhi Nurhartadi Et Al., "Pengaruh Waktu Inkubasi Dan Konsentrasi Sukrosa Terhadap Karakteristik Minuman Probiotik Dari Whey Hasil Samping Keju," *Jurnal Teknologi Hasil Pertanian*, No. 2, Vol. 11, August 31, 2018: 73, <https://doi.org/10.20961/jthp.v11i2.29056>.

²² R Y Trisnaningtyas, "Pengaruh Penambahan Susu Skim Pada Pembuatan Frozen Yogurt Dengan Bahan Dasar Whey Terhadap Total Bahan Padat, Waktu Pelelehan Dan Tekstur," *Animal Agriculture Journal* 2, No. 1, Vol. 2, 2018: 217–24.

²³ E Taufik, S Purwantiningasih, And B P Purwanto, "Kajian Potensi Whey Yogurt Sebagai Bahan Alami Pencegah Jerawat," *Jurnal Ilmu Produksi Dan Teknologi Hasil Peternakan, Fakultas Peternakan, Institut Pertanian Bogor, Bogor*, No. 01, Vol. 02, 2014: 238–42.

²⁴ Anindyah Febriyani Santoso And Kiki Fibrianto, "Pengaruh Ekstrak Kulit Buah Naga Merah (*Hylocereus Polyrhizus*) Terhadap Kualitas Sosis Ayam: Tinjauan Pustaka," *Jurnal Pangan Dan Agroindustri, Universitas Brawijaya Malang*, No. 01, Vol. 5, 2017: 92–96.

for synthetic dyes that are safer for health.²⁵ According to Hermansyah Amir et al.s research, the red dragon fruit peel extract (*Hylocereus polyrhizus*) was proven to inhibit the growth of *Staphylococcus aureus* bacteria.²⁶

1.2 Problem Formulation

The formulation of the problem in this study is:

- 1) What is the quality of paper soap preparation from yogurt whey with the natural coloring of dragon fruit peel (*Hylocereus polyrhizus*)?
- 2) What is the effectiveness of paper soap inhibition against *Staphylococcus aureus* bacteria?

1.3 Research Objectives

The research objectives of this study are:

1. Knowing the quality of paper soap preparations from yogurt whey with natural coloring of red dragon fruit skin (*Hylocereus polyrhizus*) is determined by Organoleptik Test, ph Test, Moisture Content Test, Foam Content Test, Free Alkali Test, and Antibacterial Test.
2. To determine the effectiveness of Paper soap inhibition against *Staphylococcus aureus* bacteria with a microbiological well diffusion test.

1.4 Research Benefits

1. Theoretical Benefits

The results of this study can be a basis for further research. The results of this study can be the basis for further research on the development of paper soap from yogurt whey with natural coloring dragon fruit peel (*Hylocereus polyrhizus*) as an alternative to conventional soap and increase knowledge about how to make and know the method of measuring the inhibitory power of paper soap.

²⁵ Lidya Simanjuntak, Chairina Sinaga, And Fatimah, "Ekstraksi Pigmen Antosianin Dari Kulit Buah Naga Merah (*Hylocereus Polyrrhizus*)," *Jurnal Teknik Kimia Usu*, No. 2, Vol. 3 July 2, 2014: 25–29, <https://doi.org/10.32734/jtk.V3i2.1502>.

²⁶ Hermansyah Amir Et Al., "Bimbingan Teknis Pembuatan Sabun Kulit Buah Naga Sebagai Pengembangan Jiwa Kewirausahaan Di Sman 4 Kota Bengkulu," *Jurnal Karya Abdi Masyarakat*, No. 3, Vo. 4, January 1, 2021: 681–86, <https://doi.org/10.22437/jkam.V4i3.11626>.

2. Practical Benefits

The results of this study are expected to increase the economic value of whey waste fermented into yogurt and red dragon skin waste (*Hylocereus polyrhizus*) as a natural dye by utilizing it as an ingredient in making Paper soap with potential as an antibacterial *Staphylococcus aureus*, and provide an alternative to using soap that is more environmentally friendly and ergonomic because it is practical and easy to carry everywhere.

1.5 Authenticity of Research

Several researchers have carried out research on the inhibitory power of paper soap, as shown in Table 1 below:

Table 1. Authenticity of Research

Research Title	Research Methods	Variable	Result	Research Differences
Antimicrobial activity of natural solid soap with a combination of liquid cheese waste, turmeric (curcuma longa), and dragon fruit ²⁷ .	Ekperimental Laboratoriu m	Dependen: Antimicrobial activity of natural solid soap Independen: liquid cheese waste, turmeric (curcuma longa), and dragon fruit.	The results indicate that the solid soap formula with 100% whey yogurt variant and added curcumin was found to be the best formula because it has good physicochemical characteristics and better antibacterial activity than other formulas.	Dependen : <i>Paper soap</i> Independen : <i>Yogurt whey</i>

²⁷ Estikomah et al., "Antimicrobial Activity of Natural Solid Soap with a Combination of Liquid Cheese Waste, Turmeric (Curcuma Longa), and Dragon Fruit (*Hylocereus Polyrhizus*) Peel," November 20, 2023.

Research Title	Research Methods	Variable	Result	Research Differences
Formulation and effectiveness test of hand washing soap from pandan leaf extract (pandanus amaryllifolius roxb.) against salmonella sp. bacteria ²⁸ .	Eksperiment al laboratorium	Dependen : Formulation and effectiveness test of hand washing soap and antibacterial Salmonella sp. Independen : Ekstrak daun pandan (pandanus amaryllifolius roxb.)	The results of testing the antibacterial effectiveness of Salmonella sp on the diameter of the most effective inhibition zone were obtained at a concentration of 15% with a diameter of 22.70 mm. The results of the study can be concluded that the formulation of hand soap preparations with pandan leaf extract has antibacterial effectiveness against Salmonella sp.	Dependen : Inhibition test of paper soap on S.aureus bacteria Independen : Yogurt whey and dragon fruit peel (Hylocereus polyrhizus)
Physicochemical test and irritation test of aloe vera (L) Burm.f. leaf bark antiseptic soap ²⁹ .	Ekperimental laboratorium	Dependen : Physicochemical test and irritation test of antiseptic soap Independen : leaf bark of aloe vera (L) Burm.f.	The results showed that aloe vera liquid soap had no irritating effect on the skin of healthy participants.	Dependen : Inhibition activity test of Staphylacoccus aureus bacteria Independen : Dragon fruit peel extract (Hylocereus polyrhizus)
Biochemistry Mechanism And Optimization Lactobacillus Bulgaricus And Streptococcus Thermophilus In Processing Quality Yoghurt ³⁰	Ekperimental laboratorium	Dependen : Biochemistry Mechanism And Optimization Lactobacillus Bulgaricus And Streptococcus Thermophilus Independen : yoghurt	The biochemical mechanism of lactic acid formation is the process of glucose formation into lactic acid under anaerobic conditions. Optimization of L. bulgaricus and S. thermophilus	Dependen : Inhibition activity test of Staphylacoccus aureus bacteria Independen : whey

²⁸ Vera Estefania Kaban et al., "Formulasi dan Uji Efektivitas Sabun Pencuci Tangan dari Ekstrak Daun Pandan (Pandanus amaryllifolius Roxb.) Terhadap Bakteri Salmonella sp.," *Herbal Medicine Journal*, no. 1, Vol. 5, February 22, 2022: 8–12, <https://doi.org/10.58996/hmj.v5i1.38>.

²⁹ Eka Kartika Untari and Robiyanto Robiyanto, "Uji Fisikokimia dan Uji Iritasi Sabun Antiseptik Kulit Daun Aloe vera (L.) Burm. f.," *Jurnal Jamu Indonesia*, No. 2, Vol. 3, August 31, 2018: 55–61, <https://doi.org/10.29244/jji.v3i2.54>.

³⁰ David Richard Hendarto Et Al., "Mekanisme Biokimiawi Dan Optimalisasi Lactobacillus Bulgaricus Dan Streptococcus Thermophilus Dalam Pengolahan Yoghurt Yang Berkualitas," *Jurnal Sains Dasar*, No. 1, Vol. 8 February 10, 2021: 13–19, <https://doi.org/10.21831/Jsd.V8i1.24261>.