



## Bacterial and Fungal Contamination of Personal Care Product in Northern Thailand

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ARTICLE INFO	ABSTRACT
Article history	The aim of this present study was focused on detection of several pathogens from cosmetic and spa products in northern Thailand. Eighty and seven samples including body cream, facial cream, hand cream, cleansing lotion, bath form, shampoo, and liquid soap were collected from eight provinces in northern Thailand. The total plate count of pathogenic bacteria was determined by using plate count agar. The results showed that 3.44% (3/87 samples) of total samples had the bacterial count of more than maximum limitation of $5.0 \times 10^5$ cfu/g include facial cream, and hair cram and dressing. Additionally, 8 of 87 personal care samples or 9.19% had total yeast and molds count of more than $5.0 \times 10^3$ cfu/g. These samples were facial cream, hand cream and body lotion, hair cram and dressing, and shampoo and hair colorant. All samples did not show pathogen contamination in personal care product. Our data indicated that herbal cosmetic products from OTOP require process improvement to provide better quality for consumer healthcare and get an opportunity to complete in international worldwide market for healthcare business development.
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## INTRODUCTION

One Tambon One Product (OTOP) is a project to promote socio-economic development through business integration, hand-made goods and folk handicraft of each district in Thailand [1]. These products are divided into six categories which are food, beverage, textile and garments, household and decoration, handicraft and souvenirs and herbal products. The important idea is to involve the entire community to come together and develop a product based on their creativity with Thai wisdom and improve the product on aspects such as quality, capital, and folk knowledge as well as technology. Moreover, the policies assure Thai and ASEAN citizens that they will be offered safe and high-quality products, especially herb and other personal care product.

The contamination of microorganisms in personal care product may cause spoilage because it contains a lot of ingredients such as water, lipids, polysaccharides, alcohol, proteins, amino acids, glycosides, peptides and vitamin [2], which support for microbial growth. Moreover, the production area of cosmetics is not good process especially storage temperature nearly optimal for microbial growth, especially the warm and rather humid climatic condition that prevail in most tropical countries as Thailand and South East Asia area would to support the survival and growth of bacteria and fungi. The presence of

microorganisms in cosmetics products lead to a health risk for consumer. At this present, the implement of Good Manufacturing Practices (GMP) has been improved the industrial quality control analyses but some case studied have reported the contamination in cosmetic products such as *Pseudomonas aeruginosa*, *Psuedomonas putida*, *Klebsiella oxytoca*, *Burkholderia cepacia*, *Staphylococcus aureus*, *Escherichia coli*, *Candida albicans*, *Enterobacter gergoviae*, *Enterococcus faecium*, *Serratia marcescens* [2, 3], *Acinetobacter calcoaceticus*, *Citrobacter diversus*, *Citrobacter freundii*, *Clostridium* spp., *Enterobacter aerogenes*, *Enterobacter agglomerans*, *Enterobacter cloacae*, *Enterobacter gergovia*, *Providencia rettgeri*, *Providencia stuartii*, *Pseudomonas cepacia*, *Pseudomonas fluorescens* *Serratia liquefaciens* and *Stapylococcus epidermidis* [4] as well as yeast and mold. Therefore, it is important to study and improve the preservative system in order to inhibit the growth of contaminating microorganisms during manufacturing, storage and use by consumers [3]. The objective of our study was to evaluate the possible microbial contamination of several cosmetic and spa products in the northern of Thailand.

## Research methodology

### *Collection of personal care products*

The total of 87 personal care products were randomly sampled from distributors in 8

provinces in the northern region of Thailand. These samples were in various formulations such as facial cream (6 samples), hand cream and body lotion (21 samples), hair cream and dressing (11 samples), foot cream (1 sample), bath oil and detergent (1sample), shampoo and hair colorant (20 samples), soaps, and oil massage (3 samples).

#### *Microbial limit test*

The examination of microbial contamination in this study was performed according to Microbial limit test in the Thai Pharmacopoeia with some modifications [5]. The presence of specific pathogens was confirmed by Gram-staining.

#### *Total aerobic bacterial count*

For total aerobic plate count, the collected samples of cosmetics and spa products were analyzed for the determination of total bacterial count. Each sample were used serially ten-fold diluted from  $10^{-1}$  to  $10^{-5}$  cell/ml in physiological buffer and homogenized, Subsequently, one ml of each dilution was added to sterile Petri-dishes. Plate count agar (PCA, Oxoid) was promptly added into each sterile dish and mixed slowly. The plates were then incubated at 37 °C for 24 h. The number of colony-forming units (CFU/ml.) was determined. Each assay was performed in triplicate [6].

#### *Total fungal count*

For fungal determination, one ml. of sample was taken from each appropriate dilution and mixed with Sabouraud's agar in sterile triplicate plates. Each plate was incubated at 30°C and examined daily up to 5 days. The suitable dilutions were then counted as CFU [7].

#### *Pathogen determination*

For *Staphylococcus aureus* determination, 10 mg of the samples was added into TSB and incubated at 37 °C for 24 h. The samples was then streaked on mannitol salt agar and incubated at 37 °C for 24 h. After incubation time, the colonial morphology was observed [5].

For enterobacteria, the diluted sample was streaked onto McConkey agar plate, after incubation time, the colonial morphology was observed. The colonies were sub-cultured into Triple sugar iron medium, Eosin-methylene blue agar, and Brilliant green agar for further characterization. Growth of bacteria was determined for enterobacteria including *Escherichia coli* and *Salmonella* spp. [5].

For *Clostridium* spp., the diluted sample was streaked onto Cooked-Meat agar plate and incubated anaerobically at 37 °C for 3 days. The bacterial growth was examined regularly during the incubation time. The presence of pathogen was confirmed by colonial morphology and hemolytic reaction on blood agar plate.

For *Pseudomonas aeruginosa* detection, the diluted sample was streaked onto Thioglycolate medium agar plate. After the incubation at °C for 24 h, the green colonies was appear and tested for oxidase reaction and sub-cultured into triple sugar iron medium. Microbial growth and the reaction results were then observed [5].

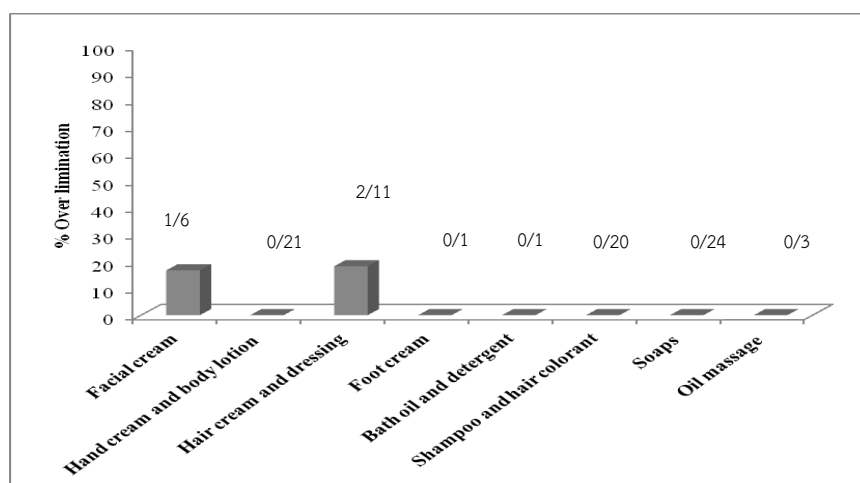
## RESULTS AND DISCUSSIONS

### *Determination of total bacteria and fungi*

In the present, many studies have been carried out to evaluate microbial contamination in cosmetic including spa products. The results showed that 3.44% (3/87) of total samples had the bacterial count of more than maximum limitation of  $5.0 \times 10^5$ cfu/g (Fig 1). These samples were facial cream and hair cream and dressing. In addition, it was found that 8 of 87 personal

care OTOP samples or 9.19% had total yeast and molds count of more than  $5.0 \times 10^3$ cfu/g. These samples were facial cream, hand cream and body lotion, hair cram and dressing, and shampoo and hair colorant, respectively (Fig 2).

The microbial contamination of cosmetic and spa products is a great importance to the consumers and industry which become a major problem of both products and economic losses. Because, it lead to hygienic equipment of the products is grown concomitantly with the consumption [6]. The increasing of microbial depends on water level of cosmetic and spa products [7]. It could be concluded that the percentages of moisture contents play important role in increasing or decreasing the bacterial and fungal counts in cosmetics products. These results in the present study agree with those found by Egypt researcher [8].



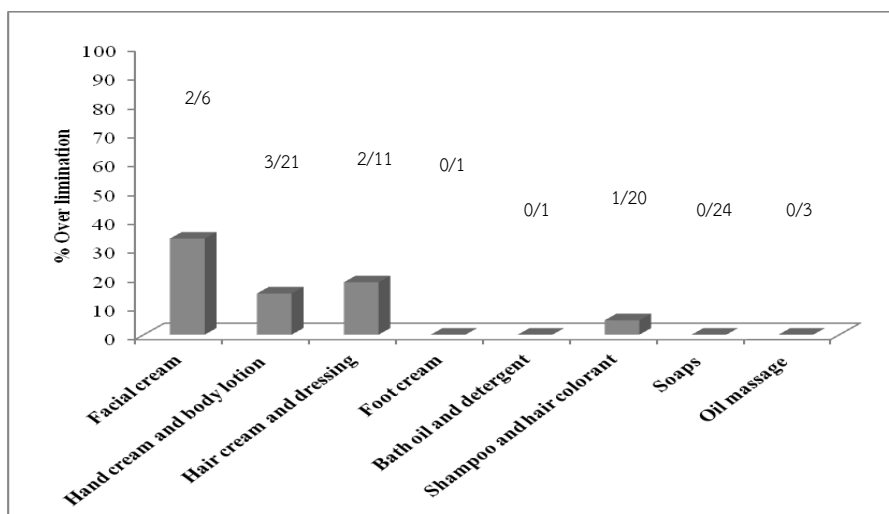
**Figure 1.** Total aerobic bacteria count of personal care OTOP samples. Each bar demonstrates the percentage of samples containing total microbial count more than the maximum limitation of Thai Pharmacopoeia.

## Pathogenic bacteria

The results in Table 1 demonstrated that none of the 87 sample of personal care product contained pathogenic pathogen. It was under the regulation the Thai Pharmacopoeia. As result, indicating that natural compound in cosmetic shows preservative activities as antimicrobial activity or preservatives may be added to some product during the manufacturing process or the product itself may retain the inhibitory effect on microorganisms [9,10]. However, the herbal cosmetic manufactures can prevent contamination by controlling raw materials, validating processes and sanitizing procedures. Many authors have reported the isolation of pathogenic bacteria from different types of cosmetic, *S. aureus*, *E. coli* and *P. aeruginosa* [11,12]

## CONCLUSION

From the present research it can be concluded that the production of personal care and cosmetic product is still in critical situation in terms of quality and safety. The quality depends on raw material, manufacturing procedure, transportation, and storage. Our data indicated that herbal cosmetic products from OTOP require process improvement to provide better quality for consumer health and get an opportunity to complete in international worldwide market. Furthermore, the Thai government and ministry of public health should be concern about critical problems in health care and personal care products especially OTOP product as well as issue a suitable policy to control of One Tumbon One Product (OTOP).



**Figure 2.** Total aerobic yeast and mold count of personal care OTOP samples. Each bar demonstrates the percentage of samples containing total microbial count more than the maximum limitation of Thai Pharmacopoeia.

**Table 1** Detection of pathogenic bacteria in the selected cosmetic and SPA product

Product	Number	Pathogenic bacteria/ g (cfu)			
		SA	CO	PA	CA
Creams and lotion					
Facial cream	6	nd	nd	nd	nd
Hand cream and body lotion	21	nd	nd	nd	nd
hair cream and dressing	11	nd	nd	nd	nd
Foot cream	1	nd	nd	nd	nd
Soaps and detergents					
Bath oil and detergent	1	nd	nd	nd	nd
Shampoo and hair colorant	20	nd	nd	nd	nd
Soaps	24	nd	nd	nd	nd
Miscellaneous					
Oil massage	3	nd	nd	nd	nd

**Note:** SA: *Staphylococcus aureus*, CO: *Clostridium* sp., PA: *Pseudomonas aeruginosa*, CA: *Candida albicans*, nd: non detected

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