ANTIBACTERIAL AND ANTIFUNGAL ACTIVITY OF ANTIPERSPIRANT COSMETIC PRODUCTS

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ABSTRACT

In most deodorant products, antibacterial agents such as aluminum salts, alcohol and aromatic odor-masking agents, are used.

Aim: The aim of the study is to evaluate the antimicrobial activity of antiperspirant cosmetic products consist of Aluminum Chlorohydrate and Alcohol to normal skin microflora and conditionally pathogenic bacteria, which can cause skin infections.

Material and Methods: Antimicrobial activity was tested with strains *S. epidermidis*, *S. aureus*, *C. albicans*, *S. pneumoniae* and *E. coli*. The left half of media with microbial seeds was sprayed with antiperspirant cosmetic product at a distance of 15 cm for 3-4 seconds (Figures 1-5), and the other half was covered with wrapping paper.

Results and Conclusion: Cosmetic products containing Aluminum Chlorohydrate demonstrate almost total inhibition of microbial growth. Complete suppression of the normal microbiota of the skin can lead to skin vulnerability in the armpit area. Antiperspirant cosmetic product containing Alcohol has antibacterial no inhibiting effects against *S. epidermidis* and demonstrated efficacy against *S. pneumoniae* and *C. albicans*.

Keywords: antibacterial activity, antifungal activity, cosmetic products, antiperspirants

INTRODUCTION

The skin is colonized by a diverse milieu of microorganisms, most of which are harmless and even beneficial to their host. The human skin microbial habitat is person-specific [1, 2], usually predominate Gram-positive bacteria (staphylococci, micrococci, diphtheroids) [3, 4], commensal fungi [5] and others. In some cases, the normal flora can be associated with different types of infections, presented in Table 1.

Table 1. Normal skin flora and some infection disease caused by resident skin bacteria.

<i>Staphylococcus epidermidis</i>	Sepsis, endocarditis, wound infection
<i>Staphylococcus aureus</i>	Impetigo
	Erythrasma
<i>Corynebacterium minutissimum</i>	Acne vulgaris
<i>Propionibacterium</i>	Intertrigo

Sweat glands secretion is by itself odorless, and armpit malodor is caused by the microbial biotransformation of the odorless secretion into volatile odorous molecules [6, 7]. Nowadays, in most deodorant products, antibacterial agents such as triclosan, aluminum salts, alcohol and aromatic odor-masking agents, are used.

AIM

The aim of the study is to evaluate the antibacterial and antifungal activity of three antiperspirant cosmetic products consist of Aluminum Chlorohydrate and Alcohol to normal skin microflora and conditionally pathogenic bacteria, which can cause skin infections.

MATERIALS AND METHODS

The study was conducted in Medical Collage – Varna, Bulgaria. We use three market products antiperspirant deodorant sprays with ingredients presented in Table 2.

Table 2. Main ingredients with antimicrobial efficacy in antiperspirant cosmetic products using in the study.

Market Product	Ingredients	Action
Deo Spray 1	Alcohol	inhibit bacterial and fungal growth
	Phenoxyethanol	antiseptic, solvent and preservative
Deo Spray 2 Deo Spray 3	Aluminum Chlorohydrate	antiperspirant (reduces the secretion of sweat) and deodorant (reduces bad odor by inhibiting bacterial growth)
	Benzyl alcohol	solvent and preservative with antibacterial and antifungal properties
	Geraniol	improve the aroma and showed a large bactericidal activity

Antimicrobial activity of antiperspirant cosmetic products was tested with strains *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Candida albicans*, *Streptococcus pneumoniae* and *Escherichia coli*.

The used method includes a dense seed with standardized bacterial and fungal culture on an appropriate nutrient medium. The media were left at room temperature for 30 minutes. The half of each agar was sprayed with the antiperspirant cosmetic product at a distance of 15 cm for 3-4 seconds. The other half was covered with wrapping paper. Each sample was made in triplicate. The results were

reported after 24 hours of aerobic incubation at 37°C.

RESULTS AND DISCUSSION

Cosmetic products containing Aluminum Chlorohydrate demonstrate almost total inhibition of microbial growth (one sample with growth – strain *Escherichia coli*). Antiperspirant cosmetic product containing Alcohol demonstrates antimicrobial activity against *S. pneumoniae* and *C. albicans*, but not against *S. epidermidis*, *S. aureus*, *E. coli*. The results are shown in Table 3 and Figure 1 – Figure 5.

Table 3. Antibacterial and antifungal activity of three antiperspirant cosmetic products consist of Aluminum Chlorohydrate and Alcohol to normal skin microflora and conditionally pathogenic bacteria, which can cause skin infections.

Product (Active Ingredient)	<i>S. epidermidis</i>	<i>S. aureus</i>	<i>S. pneumoniae</i>	<i>E. coli</i>	<i>C. albicans</i>
Deo Spray 1 (Alcohol)	+	+	-	+	-
Deo Spray 2 (Aluminum Chlorohydrate)	-	-	-	-/+	-
Deo Spray 3 (Aluminum Chlorohydrate)	-	-	-	-	-

+ Visible microbial growth
- No microbial growth

Fig. 1 – Fig. 5. Antimicrobial activity of antiperspirant cosmetic products:

The left half was sprayed with the antiperspirant cosmetic product at a distance of 15 cm for 3-4 seconds

(1 - Deo Spray 1 (Alcohol); 2 – Deo Spray 2 (Aluminum Chlorohydrate); 3 – Deo Spray 3 (Aluminum Chlorohydrate)). The right half was covered with wrapping paper. Each sample was made in triplicate.

Fig. 1. *Staphylococcus epidermidis* on Blood agar.

Fig. 2. *Staphylococcus aureus* on Blood agar.

Fig. 3. *Streptococcus pneumoniae* on Blood agar.

Fig. 4. *Escherichia coli* on MacConkey agar.

Fig. 5. *Candida albicans* on Sabouraud agar.

CONCLUSION

Cosmetic products containing Aluminum Chlorohydrate with high cosmetic efficiency, however, lead to complete suppression of the normal microbiota of the skin such as *S. epidermidis*. This systemic effect can lead to skin vulnerability in the armpit area and subsequent pathological effects.

Antiperspirant cosmetic product containing Alcohol has no inhibiting effects against *S. epidermidis*. If these Alcohol-deodorant sprays lead to a satisfactory cosmetic effect (reducing the sweat and odor), we recommend their use as a more supportive product to the resident skin bacteria, part of the human natural resistance.

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Please cite this article as: Ermenlieva N, Georgieva E, Milev M. Antibacterial and antifungal activity of antiperspirant cosmetic products. *J of IMAB.* 2020 Oct-Dec;26(4):3374-3377. DOI: <https://doi.org/10.5272/jimab.2020264.3374>

Received: 04/11/2019; Published online: 07/10/2020

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