RESEARCH ARTICLE JPAR 2020

Journal of Pharmaceutical Advanced Research

(An International Multidisciplinary Peer Review Open Access monthly Journal)

Available online at: www.jparonline.com

A first round study on the effect of some Marketed Deodorants on Armpit Microflora of Male

Soumya Suchismita Dash*, Somezeet Panda

Gayatri College of Pharmacy, Gayatri Vihar, Jamadarpali, Sambalpur – 768200, Odisha, India.

Received: 26.05.2020 Revised: 14.06.2020 Accepted: 20.06.2020 Published: 30.06.2020

ABSTRACT: Background: Axillary malodour is a major concern among individuals which is caused by bacterial degradation of apocrine secretions. Deodorants play an important role in inhibiting those smell causing bacteria since a long time. **Aim:** In a microbiology point of view, our aim was to evaluate the antimicrobial efficacies of marketed deodorants against the isolates of male armpit. **Method:** For this study, bacteria were isolated from the armpit of two young male persons and identified partially through microscopic observations and biochemical tests. Then five numbers of mostly used deodorants were selected to check their antimicrobial efficacies against those isolates. The antibacterial activity was performed by disc diffusion method. **Results:** All the isolates showed some degree of susceptibility to the deodorants used in this study. However, deodorants like Setwet and Nivea could effectively reduce the bacterial growth up to a greater extent. **Conclusion:** Hence deodorants can be an enhanced selection to overcome from social discomfort created due to the bad smell of armpit.

Corresponding author*
Dr. Soumya Suchimsita Dash
Gayatri College of Pharmacy
Gayatri Vihar, Jamadarpali
Sambalpur, Odisha, India.
Tel: +91-8249598936
Mail ID: soumya.suchismita@gmail.com

Keywords: Human skin, armpit, sweat, malodour, deodorants, antibacterial.

INTRODUCTION:

Microbes are all-pervading and undeniably the indispensable components of biosphere. The external surface of Human body such as skin and mucous membrane is as well colonized by certain microbial species [1], referred to as the normal micro biota [2]. Human skin readily becomes a host to resident bacteria right after the birth [3] adding defence to human body [4]. In the moisture laden regions such as the armpit, groin, and middle of the toes, bacteria are usually more in number [5]. The very frequent armpit micro flora includes *Staphylococcus aureus*, *Corynebacterium*, *Micrococci*, *Propionibacterium* [6-9]. These resident floras degrade the apocrine secretions which include fatty chemicals and sweat leading to production of malodour [10]. The bad

smell of skin brings annoyance, embarrassment and psychological downfall for many individuals [11].

Over the last century people are using deodorant having an antimicrobial agent as active ingredient to inhibit the growth of the microbial populations responsible for sweat degradation and malodour generation [12- 14]. Deodorants are available in the market in various forms like solid stick, gel, roll on, Liquid, Spray etc. All the Deodorants have some common formulation ingredients like anti-sweating agent, antibacterial agent, pH reducing agent, drying agent etc. Most deodorants come with a perfume based agent to give a pleasant effect to the environment. The antimicrobial substance used in deodorants mostly includes Triclosan, Paraben, Alcohol, Sodium hypochlorite [15,16]. Use of such underarm cosmetic product has become practice for most of the people to reduce axillary malodour and to increase self-confidence [17].

From the available literature it was observed that, studies are being performed on deodorants due to its extensive use all over the world against bad odour. However, as the odour is caused by microbes, it is important to study whether the deodorants are having any kind of antimicrobial activity against the concrete isolates of armpit. Hence the present study was carried out to study the antibacterial effect of some common marketed deodorants on arm pit isolates of male persons.

MATERIALS:

Different growth media including biochemical reagents and staining agents used for this study were procured from HI-Media, Mumbai. Different brands of commercially popular deodorants were obtained. Owing to the constraints pertaining to the available time and expenditure, only five mostly used Deodorants for male were selected for the present study *viz.* Park Avenue Icon, Fogg Royal, Set wet, Axe Signature, and Nivea Men.

METHODS:

Samples were collected by taking sterile moist cotton swabs and swabbing the arm pit of two different male persons (Sample D1 and Sample D2) free from any deodorant application. Then the samples were swabbed on solid nutrient medium for the growth of bacterial isolates. The nutrient plates were incubated at 37 °C for a period of 18 h in a bacteriological incubator (Labgo Laboratory Incubator, LABGO128, Labgo). The appearances of growth in the form of colonies were taken for further studies. The colonies were observed and grouped according to their distinguishing characteristics shown on the nutrient plate. A single isolated colony from each group was selected and streaked onto fresh NA plates using Streaking technique to develop into pure culture. After this, the cultures were identified on the basis of their morphological parameters like colony appearance, shape, margin, elevation, texture, optical density, coloration and odor. The isolates were further subjected to microscopic observation using Gram's staining techniques. In addition to this, biochemical characterization was performed which includes Indole, Methyl Red, Voges-Proskauer and Citrate utilization test. The isolates were further taken to test the efficacies of different deodorants on them.

The antibacterial efficacies of the five selected deodorants were determined qualitatively by disc diffusion method [18]. Overnight broth culture of test bacterium (10^5 cells/ml) was taken and swabbed onto nutrient agar plates maintaining 1:100 dilutions by lawn culture method [19]. Sterile paper discs containing deodorants (1 µl/disc) were placed on the agar surface. The plates were then incubated for 18 h at 37 °C. Following incubation, the inhibition was detected by a zone of clearing around the sample discs and bacteria were categorized accordingly as Resistant and Sensitive.

RESULTS AND DISCUSSION:

Isolation and identification of bacterial strains:

Different types of bacterial colonies were obtained from the two armpit samples (Fig 1).

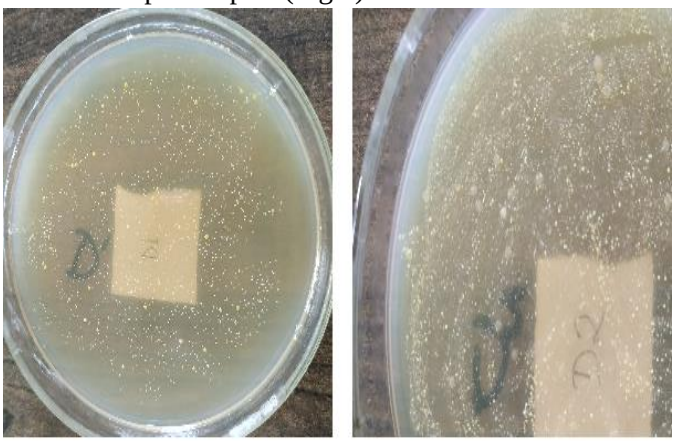

Fig 1. Isolation plate showing mixed bacterial isolates from the arm pit.

From the mixed culture of both D1 and D2 samples, five types of colonies were selected over the agar plate for further study basing upon the distinguished morphology *viz.* D1b, D1c, D2a, D2b, and D2c. These strains were subjected to identification by following diagnostic microbiology based on the standard physical parameters

that are Colony appearance, shape, margin, elevation, texture, optical density, coloration and odour. The results regarding the colony characteristics obtained from the streaking of the five armpit isolates are displayed in Table 1 and Fig 2.

Table 1. Cultural characteristics of the five arm pit isolates.

Isolate	Morphology
D1b	Smooth, shiny, small size, circular, convex, entire margin, Bright white colour, opaque
D1c	Smooth, medium size, circular, raised, entire margin, Yellow colour, opaque
D2a	Smooth, pin point, circular, raised, entire margin, Pinkish orange colour, opaque
D2b	Smooth, shiny, medium size, circular, convex, entire margin, Orange colour, opaque
D2c	Smooth, shiny, large size, circular, flat, undulated margin, off white colour, opaque

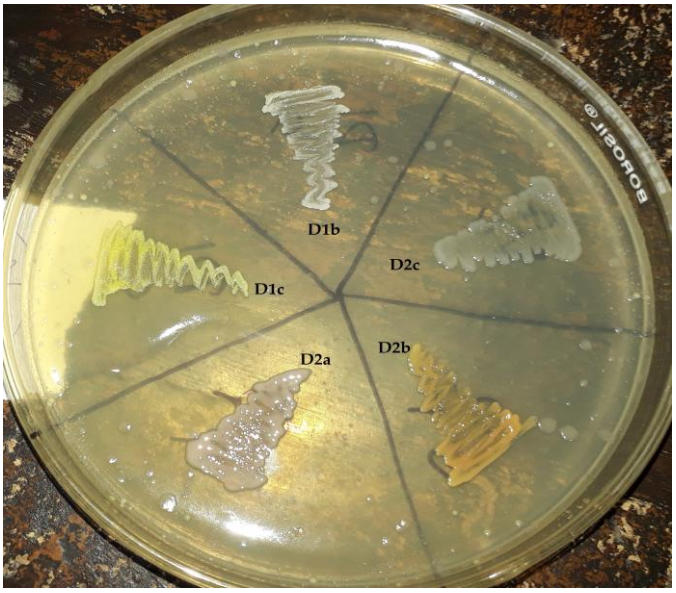

Fig 2. Five armpits isolates on culture media.

From the Gram staining and microscopic observation (Table 2) D2a was observed to be a Gram negative rod. The rest D1b, D2b and D2c were found to be Gram positive coccus. D1c is Gram positive rod. Regarding the Biochemical characterization (Table 2 and Fig 3), D2a was the only positive strain for Indole test as evidenced from the formation of Rose-Indole ring while others were negative showing no colour change. The isolates were unable to convert glucose to acid and result was negative for Methyl red test. All the armpit isolates were found to be positive for Voges-Proskauer test indicating production of neutral end products in metabolism of Glucose. The test isolates also could utilize Citrate as the carbon source which was observed from the colour change of the medium from forest green to blue.

From the microscopic and biochemical result the Gram positive coccus may belong to *Staphyloccus group* [20] and the Gram positive rod may belong to *Propionibacterium* as they constitutes the normal flora of the armpit [21]. Though Gram negative bacteria are normally not found as skin commensals, but the Gram negative rod found in the study may belong to *Pseudomonas* [22,23].

Table 2. Microscopic and Biochemical observation of the isolates.

Isolate	Gram's Response	I	MR	VP	CU
D1	+ Coccus	-	-	+	+
D1	+ Bacillus	-	-	+	+
D2	- Bacillus	+	-	+	+
D2	+ Coccus	-	-	+	+
D2	+ Coccus	-	-	+	+

MR – Methyl red, VP - Voges Proskauer, I – Indole, CU - Citrate Utilization. + (Positive Test) and – (Negative Test).

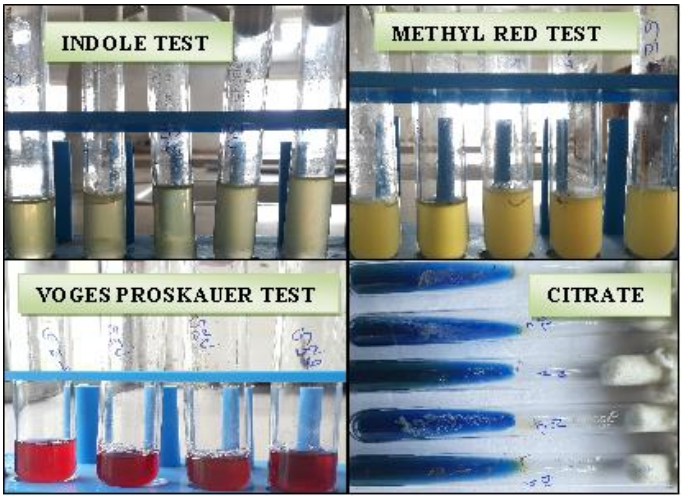

Fig 3. Biochemical Reactions of the isolates.

Assessment of antibacterial efficacy of deodorants against the arm pit isolates:

From the antibacterial assessment a mixed result was obtained regarding the antimicrobial activities of deodorants against the armpit bacteria as depicted in Fig 4. The result interpreted from the respective zones of inhibitions (in mm) around each disc was noted down in Table 3, where it was apparent that all the isolates showed some sorts of susceptibility to the test deodorants.

D1b was found to be resistant to Park Avenue and Axe but sensitive to Fogg, Nivea and Setwet. D1c was found resistant to Park Avenue and Fogg but sensitive to the rest three test deodorants. D2a was sensitive to Park Avenue and Nivea, however it was resistant to the rest. D2b showed remarkable sensitivity towards all the test deodorants whereas though D2c was resistant only to Axe but sensitive towards the rest four samples. Hence, Park Avenue, Fogg Royal and Axe Signature had a less satisfactory effect on the armpit isolates. However, the result showed by Nivea and Set wet proved them to be better in activity for the test isolates. The variations in antibacterial activity may be due to the different ingredients of the deodorants. Moreover the biodiversity of armpit may differ from person to person and time to time.

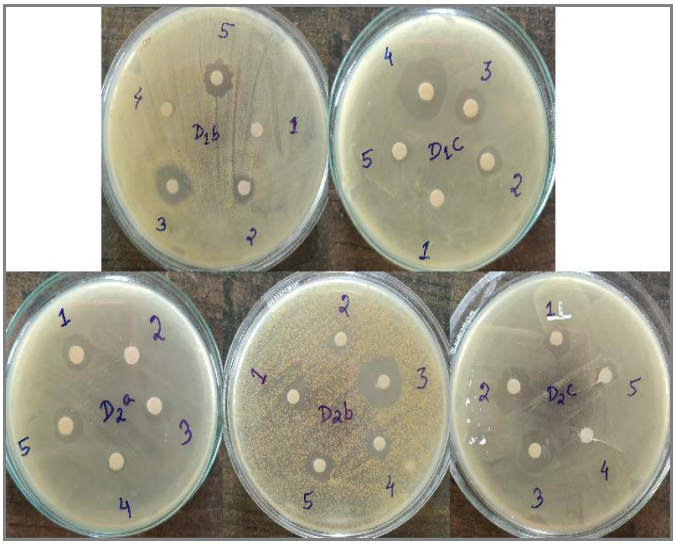

Fig 4. Antibacterial efficacies by disc diffusion method.

Table 3. Antibacterial Efficacies of deodorants against armpit isolates.

Isolate	Deodorants				
D1b	**PA**	**FR**	**SW**	**AS**	**NM**
D1c	R	S	S	R	S
D2a	R	R	S	S	S
D2b	S	R	R	R	S
D2c	S	S	S	S	S
D1b	S	S	S	R	S

R – Resistant and S – Sensitive. PA – Parkavenue, FR – Fogg Royal, SW – Set Wet, AS – Axe Signature and NM – Nivea Men.

As it is an *in vitro* assessment directly against the armpit isolates, so we may state that the antimicrobial ingredients present in the Deodorant formulation are active in inhibiting those odour producing organisms. This was a preliminary attempt to study about the antimicrobial effects of some Deodorants against the real organisms it has to counter after application. In the above study the amount of deodorant taken was too less. So the activity may get enhanced if taken in larger concentrations. As such products are applied directly on body the activity may vary according to the amount used. Hence deodorants can be employed to maintain personal hygiene up to some extent.

CONCLUSION:

Human sweat plays a tremendous role in thermoregulation of body to prevent temperature fluctuation. Malodour is the characteristic of every person which depends on factors like skin structures, food habit, age, sex, genetic makeup and environmental condition. A simple bathing cannot efficiently prevent body odours all over the day. Hence, deodorants are being used mostly on armpit in order to prevent this body odour and to significantly reduce the growth of microorganisms. However, people are less concern about these cosmetic products and their possible effects of regular use. Therefore, this study has provided evidence to show the efficacy of deodorants to prevent body odour by considerably reducing microbial population of the armpit. However, more studies should be conducted to test each ingredient of the formulation. Moreover those organisms should be identified in molecular level to reach up to a definitive conclusion.

ACKNOWLEDGEMENT:

The authors are thankful to the Management of Gayatri College of Pharmacy, Sambalpur, for providing the necessary tools and platform required for the study.

REFERENCES:

1. Grice EA, Segre JA. The skin microbiome. Nat Rev Microbiol, 2011; 9 (4): 244-253.
2. Marples MJ. The normal flora of the human skin. Brit J Dermatol, 1969; 81(1): 2-13.
3. Aly R. Cutaneous microbiology. In: Orkin M, Maibach HI, Dahl MV, editors. Dermatology. Los Altos: Appleton & Lange; 1991. pp. 22-25.
4. Fedtke I, Gotz F, Peschel A. Bacterial evasion of innate host defences- the *Staphylococcus aureus* lesson. Int J Med Microbiol, 2004; 294:189–194.
5. Ibe SN, Wariso BA. Carriage of *Staphylococcus aureus* on armpits of secondary school and university students in Port- Harcourt, Nigeria. Afr J Appl Zool Env Biol, 2005; 7: 125-130.

6. Christy IC, Ideselu AM, Edem UE. Effect of Deodorant on Microflora of the Armpit of Female Students of A University in Nigeria. Int J Scient Res, 2016; 5 (6): 641-645.
7. Davis CP, Baron S, editors. Medical Microbiology. 4th Ed. Galveston (TX): University of Texas Medical Branch; 1996.
8. Callewaert C, Kerckhof FM, Granitsiotis MS, van Gele M, van de Wiele T, Boon N. Characterization of *Staphylococcu*s and *Corynebacterium* clusters in the human axillary region. PLoS ONE, 2013; e50538.
9. Mak TN, Schmid M, Brzuszkiewicz E, Zeng G, Meyer R, Sfanos KS, *et al*. Comparative genomics reveals distinct host-interacting traits of three major human-associated propionibacteria. BMC Genomics, 2013; 14: 640-653.
10. Troccaz M, Gaia N, Beccucci S, Schrenzel J, Cayeux I, Starkenmann C. Mapping axillary microbiota responsible for body odours using a culture-independent approach. Microbiome, 2015; 3: 3-17.
11. Callewaert C, Lambert J, Van de Wiele T. Towards a bacterial treatment for armpit malodour. Exp Dermatol, 2017; 26: 388-391.
12. Ashley RC. Efficacy of the antimicrobial agent triclosan in topical deodorant products: recent developments *in vivo*. J Soc Cosmet Chem, 1987; 38: 223-231.
13. Philip K, Jack W. Antiperspirants and deodorants. In: Butler H, Editor. Poucher's Perfumes, Cosmetics and Soaps. 10th ed. London: Kluwer Academic Publishers; 2000. pp. 69-100.
14. Arthiha T. Determination of the aluminium content in different brands of deodorant using the EDTA back-titration method. Int Baccalaureate, 2004; 1-19.
15. Benohanian A. Antiperspirants and deodorants. Clin Dermatol, 2001; 19(4): 398-405.
16. Shahtalebi MA, Ghanadian M, Farzan A, Shiri N, Shokri D, Fatemi SA. Deodorant effects of a sage extract stick: Antibacterial activity and sensory evaluation of axillary deodorancy. J Res Med Sci, 2013; 18(10): 833-839.
17. Traupe B, Folster H, Max H, Schulz J. Effective axillary malodour reduction by polyquaternium16-containing deodorants. Int J Cosmet Sci, 2017: 39: 141-148.
18. Bauer WA, Kirby MW, Sherris JC, Truck M. Antibiotic susceptibility testing by standardized single disc method. Am J Clin Pathol, 1996; 45(4): 493-496.
19. Tripathy B, Satyanarayan S, Khan KA, Raja K, Tripathy S. Phytochemical screening and evaluation of antibacterial activity of *Croton bonplandianum* leaves. J Pharm Adv Res, 2018; 1(1): 38-42.
20. Holt JG, Krieg NR, Sneath PH, Safety JT, Williams ST. In: Hensyl WR, editor. Bergey's Manual of Determinative Bacteriology. 9th ed. Baltimore, USA: Lippincott Williams & Wilkins; 1994.
21. Taylor D, Dauldy A, Grimshaw S. Characterization of the microflora of the human axilla. Int J Cosmet Sci, 2003; 25: 137-145.
22. Myles IA, Reckhow JD, Williams KW, *et al*. A method for culturing Gram-negative skin microbiota. BMC Microbiol, 2016; 16: 60-65.
23. Sadahiko V, Kunihide H, Masatoshi K. Odor Associated with aging. Anti-Aging Med, 2010; 7(6): 60-65.

Conflict of Interest: None
Source of Funding: Nil
Paper Citation: Dash SS*, Panda S. A first round study on the effect of some Marketed Deodorants on Armpit Microflora of Male. J Pharm Adv Res, 2020; 3(6): 893-897.