The Microbial Isolates of the Human Axilla Among Some Students and Employees of the College of Education –Ibn Al-Haitham, University of Baghdad

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Abstract

Body odour is the smell caused by bacteria feeding on sweat on the skin, especially in the armpit and groin area. Fifty-four volunteers from students and employees of college of Education Ibn Al- Haitham, were surveyed. Data were obtained concerning: subject details and microbial examination. The following conclusions were reached: 1) coagulase negative *Staphylococcus* was the most common isolate. 2) The most effective antibiotics were amikacin, ciprofloxacin, vancomycin, cephalothin, tobramycin, gentamycin respectively and were least sensitive to methicillin and penicillin G. 3) Alum zirconium and alum chlorohydrate were the most effective antiperspirants.

Introduction

The average person has 2.6 million sweat glands in his skin (1). Armpits odour, usually begins with puberty. There are two kinds of sweat glands in the human body, the apocrine glands, which secrete a milky fluid from the hair follicles, and the eccrine glands, which are the source of most perspiration (2). Eccrine sweat is composed of water, sodium, potassium, lactate, urea, ammonia, serine, ornithine, citrulline, aspartic acid, heavy metals, organic compounds and proteolytic enzyme (3). Apocrine glands also contain proteins and fatty acids, which make it thicker and give it a milkier or yellowish color (1). Microbes break down the apocrine secretions and release a chemical called 3- methyl – 2- hexenoic acid which produces a strong distinctive odour (4). Sweat can be made in response to nerve stimulation, hot air temperature and low exercise (1).

Sweat as it is secreted by axillary glands is odorless (5).When droplets of apocrine sweat placed on the fore- arm, were inoculated with various bacteria, only diphtheroids generated typical body odour and cocci produced a sweaty odour attributable to iso- valeric acid (6).

The present study was aimed toward the following objective:

1) Determination of the most prevalent bacterial armpit residues.
2) The susceptibility of bacterial isolates to antimicrobial agents.
3) Determination of the commercial deodorant and antiperspirant were mostly used by students and staff members. It was the first study in Iraq about this problem.

Materials and Methods

Subjects:

Fifty-four male and female users of deodorant and antiperspirants from the College of Education Ibn Al- Haitham (student and staff) were included in this investigation. Three or four samples were taken from each user, left and right armpit, inflammation in back and chest and deodorant or antiperspirants container. Volunteers had been instructed to stop using deodorants for 24 hr. before sample collection.

Culture Technique and Microbiology Identification:

Axillary bacteria and deodorant or antiperspirants surface were collected using cotton-swabs. Swabs were streaked over the surface of the blood agar, Mannitol salt agar, MacConky agar and Sabaroud agar. Conventional laboratory procedures for isolation and identification of microorganism were used according to the Baily and Scott´s manual 2002 (7).

Case Histories:

Fifty-four users with deodorant and/or antiperspirants were asked to report their: - name, sex, age, marital status, occupation, type of deodorant and manufacturers, skin inflammation, any medical treatment.

Antimicrobial Susceptibility Testing:

All isolates were subjected for their response to antimicrobial agents according to the Microbiology manual (8).

Antimicrobial discs (Bioanalyse) used were amikacin (30µg), ciprofloxacin (5µg), cephalothin (30µg), gentamycin (10µg), methicillin (5µg), pencillin G (10U), tobramycin (10µg) and vancomycin (30µg).

Results and Discussion

Case Histories:

The initial study showed 86% of the volunteers complain from bad smell odour and 48% volunteers with back and chest skin inflammation. Other subject details are outlined in Table (1). No comparison studies were available.

Bacterial Isolates:

The axillary microflora is composed of four principle groups of bacteria (*Staphylococcus*, aerobic *Coryneforms*, *Micrococcus* and *Propionibacteria*) and the Yeast genus *Malassezia* (9, 10). Coagulase negative *Staphylococcus* was found to be the most prevalent organism isolated, which represented (78%), *Micrococcus* (9%), coagulase positive *Staphylococcus* (7.27%) and *Corynebacterium* spp. (5.95%) but all antiperspirant and deodorant containers were sterile (Table 2). Other study reported the presence of propionic acid in many sweat samples. This acid is a breakdown product of some amino acids by *Propionibacteri*a, which thrive in the ducts of adolescent and adult sebaceous glands (11). Isovaleric acid (3-methyl butanoic acid) is the other source of body odour as a result of actions of the *Staphylococcus epidermidis* (12, 13).

Our study revealed 26% of *Staphylococcus* isolated was *B*-hemolytic. Another research team from Swiss company showed *Staphylococcus haemolyticus* produced the most sulfurous scent (14). *In vitro* and *In vivo* studies by Rennie *et al*. and Natsch *et al*., revealed underarm odour that produced exclusively by aerobic Coryneform bacteria (15, 16).

Antimicrobial Susceptibility Testing:

All armpit bacterial isolates, showed high sensitivity to amikacin, ciprofloxacin, vancomycin, cephalothin, tobramycin, and gentamycin respectively, and low sensitivity to methicillin and penicillin G (Table 3). Other previous report showed that untreated individuals carry a significant pool of single and multiple resistant *Staphylococci* of sufficient size to be readily disseminated by direct contact and desquamation (17). The rapid development of resistance to ciprofloxacin due to excretion of this drug into the sweat might be involved in the development of multiresistant *S. epidermidis* and possibly other skin bacteria in hospitals and in communities with high use of ciprofloxacin or related drugs (18).

Antiperspirants and Deodorant Testing:

Different types of commercially available antiperspirants and deodorants were tested. According to the container instruction, it shows the most effective were aluminum

chlorohydrate, aluminum zirconium, triclosan and ethanol (Table 4). The results of table (4) were derived from a questionnaire that was conducted during the research. According to cosmetic researchers information there are top five ingredients to avoid, Parabens (these preservatives come in several forms {methyl, ethyl, propyl & butyl} which had been found in breast cancer tumors), aluminum compound (It has been connected to alzheimer disease), triclosan (It's a chemical that is classified as a pesticide by FDA),propelyn glycol and Talc (19).

Deodorants mainly work on controlling the growth of bacteria on the skin and antiperspirants on the other hand, actually prevent the sweat coming out in the first place (3). The Food and Drug Administration (FDA) controls the active ingredients used in antiperspirant be legally classified as drugs. The ingredients are limited to aluminum chlorohydrat chloride, aluminum sulfate, and aluminum zirconium complexes. Most of these materials are supplied as powder typically used at levels of 8-25% based on the weight of the finished product (20).

Today, sticks are the single most popular antiperspirant form (20). Our data show 40.6%of users prefer stick form Table(1)

In conclusion, coagulase negative *Staphylococcus* was found to be the most predominant isolate among other armpit bacteria. Such isolates may be the main responsible of malodors.

All antiperspirants & deodorants product available locally are not subjected to quality control. According to our research data, users need to be educated about the proper antiperspirant and deodorant and their use.

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Table (1): Subject Details

	Sex %		Age (yr)^{m}	Status %		Occupation %		Smell odour %	Change the type of deodorant %
	♂	♀		M.	S.	S.	Stud.		
Users (54)	37	63	24.1±5.7	35	65	33.3	66.7	86	44.4
	Clinical symptom %		Type of deodorant%				More than one person use the same deodorant %	Do not use deodorant %	
			solid (sticks)	liquid	spray	alum			
	48		40.6	26	26	7.4	37	22.2	

M. Mean ± standard deviation; St. student; S. staff; Si. Single; M. Married

Table (2): Type and Number of Isolates

Bacterial isolates	Staphylococcus Coagulase – ve	Staphylococcus Coagulase +ve	Micrococcus spp.	Corynebacterium spp.
Subjects number	86	8	10	6
*Total	110			

*The no. of isolates refers to left and right armpit, chest and back inflammation and deodorant surface

Table (3): Percentage of Bacterial Sensitivity to Antibiotics

Antimicrobial Agents	Staphylococcus Coagulase – ve	Staphylococcus Coagulase +ve	Micrococcus spp.	Corynebacterium spp.
Amikacin	100	100	100	100
Ciprofloxacin	80	100	66.6	100
Cephalothin	93.3	33.3	100	100
Gentamycin	93.3	100	33.3	66.6
Methicillin	20	33.3	0	0
Pencillin G	10	0	33.3	0
Tobramycin	73.3	100	33.3	100
Vancomycin	93.2	33.3	100	100

Table(4): Commercial Antiperspirants and Deodorants Available

Product	Type	Manufacturer	Active Ingrediant
Rexona	liquid	Canada	Aluminum Chlorohydrante
Teen spirit (Mennen)	solid(sticks)	Jordan	Aluminum Chlorohydrante
Dove	solid (sticks)	USA	Aluminum Zirconium
Gillette	spry	UK	Triclosan
AXE	spry	India	Ethanol
Gravity	solid(sticks)	USA	Triclosan
Alum	solid(sticks)	Local product	Aluminum sulfate

دراسة المحتوى المايكروبي لمنطقة الابط لعدد من طلبة ومنتسبي كلية التربية- ابن الهيثم

اسراء عبد الجبار ابراهيم ، سندس عبد المهيمن محمد الحضرية

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الخلاصة

من المتعارف عليه ان رائحة الجسم ناتجة عن تواجد البكتريا على سطح الجلد والمتغذية على نواتج مادة العرق ولاسيما في منطقة الابط والاربية . شملت الدراسة 54 متطوعا" من طلبة وموظفين كلية التربية –ابن الهيثم ، وبعد الحصول على المعلومات الخاصة بالمتطوع واستنادا الى نتائج الفحص المايكروبي تبين الاتي:

1- البكتريا الموجبة لصبغ كرام هي الاكثر شيوعا ولاسيما بكتريا العنقوديات ذي تفاعل التجلطي السالب (coagulase-negative) .

2- اثبتت نتائج اختبار الحساسية للمضادات الحيوية ان amikacin, ciprofloxacin, vancomycin, gentamycin cephalothin, tobramycin, هي الاكفأ في التأثير ضد البكتريا المعزولة من منطقة الابط وأظهر الـ methicillin, penicillin الاقل تاثيرا".

3- تبين من خلال الدراسة ان كلا من ملح الالومنيوم زركونيوم، والالومنيوم كلوروهايدريت هما المادتان الاكثر فعالية في منع التعرق.