

ANTI-MICROBIAL PROPERTIES OF HUMAN WAX

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ABSTRACT

Background: Human wax is a mixture of desquamated keratinocytes secreted in outer third of the wall of external auditory canal. The wax produced forms a physiological barrier between the external environment and deep external auditory canal. The antibacterial and antifungal properties of human wax due to its chemical composition have raised considerable debate. Different authors have different views regarding the antimicrobial property of human wax.

Aims & Objective: Present study was undertaken to study the antimicrobial property of human wax and to assess its preventive actions against some common flora.

Material and Methods: A prospective study of healthy individuals, both males and females, of all age groups, without any pathology in the external and middle auditory canal who presented at outpatient department of a tertiary care hospital in this region and few other private hospitals. Samples were collected from patients and studied for their antimicrobial effect. Results were recorded and analysed.

Results: A total of 100 cases were included in the study, of which 52 sterile samples were tested with some common microbial flora. Data obtained was analysed.

Conclusion: Variable results have been observed by different authors regarding antimicrobial properties of human wax. Our study highlights the antimicrobial property of human wax and signifies the role of further studies for antibacterial and antifungal role of human wax in diseased auditory canals.

Key-Words: Human Wax; Cerumen; Anti-Microbial Properties

Introduction

Human wax is a mixture of desquamated keratinocytes secreted in outer third of the wall of external auditory canal, and sebaceous gland secretions, along with apocrine sweat glands. This forms a grey-brown to greyish-black coloured thick substance, which gets deposited over and along the wall of superficial and deep external auditory canal. Glandular secretions from the hair in the canal also mix and forms sticky substance known as cerumen.^[1,2] The wax produced forms a physiological barrier between the external environment and deep external auditory canal. Chemical composition of wax has also been believed to have antibacterial and antifungal properties, though this is under controversy, as some authors suggest that wax has rich level of nutrients which aid in microbial growth rather than inhibit it. Others hold a view that wax contains antimicrobial property which prevents external ear from infections.^[3]

Present study was undertaken to study the antimicrobial property of human wax and to assess its preventive actions against some common flora.

Materials and Methods

Present study was done at a tertiary care hospital in

western UP and few other private hospitals in this region.

Unit of Study: Healthy individuals, both males and females, of all age groups, without any pathology in the external and middle auditory canal, who presented at Outpatient department of ENT of a tertiary care centre and few other private hospitals in this region of north India, were included in the study.

Nature of Study: This is a prospective study conducted at department of ENT and department pathology and microbiology. Follow-up cases or those who had undergone treatment anytime earlier or those having any middle or external ear pathology were excluded from the study.

Methodology: After taking informed consent and clearance from Institutional Ethics Committee (IEC), wax samples were collected from 100 healthy individuals using a sterile spatula. Samples were emulsified in a solution of 30% glycerol and 5% sodium bicarbonate, forming a suspension. Solution was gently mixed and subjected to further examination. The obtained suspensions were cultured on nutrient agar and incubated at 37°C for 24 hours. Microbial growth was observed in the culture plates and results were recorded. The cultures which did not show any growth were considered as sterile and were

subjected to further examination. A fungal and three bacterial strains (*Candida albicans*, *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*) were cultured on Sabroud's dextrose agar and nutrient agar respectively and incubated at 37°C for 24 hours as fresh cultures. Isolated colonies were transferred to 10 ml nutrient broth and incubated for 10 hours at 37°C. Tubes containing 1 in 10 dilution of wax suspensions were prepared by adding 0.1ml of prepared inoculum into 0.9ml of wax suspension. These tubes were incubated for 18-20hrs at 37°C. After this time period, 0.01ml of suspension from each tube was transferred to blood agar culture plate, streaking was done and plates were kept for incubation at 37°C for 24 hrs to observe growth. Results were recorded in a tabular format. Parallel controls were taken at all the steps to avoid any false negative/positive results.

Sample Size: Total no. of cases were 100.

Study Schedule: An elaborate schedule was prepared before undertaking the study. Detailed history and clinical examination was done. A prior consent was taken from Institution's Ethical Committee (IEC). Data was analysed and correlated with that of other previous similar studies.

Results

In our present study, a total of 100 cases were studied. Out of these, 52 (52.0%) samples were observed as sterile and showed no growth. These were further taken up for their antimicrobial property study. The rest 48 (48.0%) samples showed growth and were therefore considered as un-sterile. Results of these cases were recorded and were not taken up for further study. The positive and negative control cases showed relevant results, which provided validity of results in our study. Inhibitory effects on growth of the bacterial and fungal strains used were seen by inoculation of human wax suspension as seen in table 2.

Table-1: Result of initial growth on culture media

Case Results	No.	%
Sterile	52	52.0
Un-sterile	48	48.0
Total	100	100.0

Table-2: Samples showing inhibition of growth (n = 52 sterile)

Agent	No.	%
<i>Candida albicans</i>	35	67.31
<i>Staphylococcus aureus</i>	38	73.08
<i>Escherichia coli</i>	52	100
<i>Pseudomonas aeruginosa</i>	49	94.23

Discussion

Efficacy of antimicrobial property of human wax has been a subject of debate for different authors since many years.

Some authors believe that absence of wax mediates an alkaline environment which promotes growth of different microbes.^[4,7] Role of wax in creating a physical barrier between external and internal environment has also been given. When wax is removed, this barrier is lost, and this aids in bacterial growth, leading to infections.^[4,5,7] However, there is no concrete evidence to support this view. The role of common resident flora in the region might also play a role which again questions the overall ability of human wax as antimicrobial. In other studies, cerumen has been shown to have significant antibacterial and anti-fungal properties.

Sumit G et al showed 58.3% antibacterial effect on *Staphylococcus aureus* colonies in 1 in 10 dilution and 75% antibacterial effect in 1 in 100 dilution.^[3] Similarly, Sololov et al showed that cerumen from few mammals show anti-micrococcal, anti-staphylococcal properties.^[6] In our study we observed antimicrobial effect on *Staphylococcus aureus* in 73.08% cases, which was concurrent with that other studies^[3,6], Burtenshaw et al observed a variable bactericidal properties of human cerumen against *S.aureus*^[4], while Fulghum et al. showed significant antibacterial property as in our study.^[5]

On comparing the results of antibacterial effects on *P.aeruginosa*, we observed 94.23% antimicrobial activity, which was similar to that observed by Sumit G et al (96.6%)^[3] and Lum et al. ^[2] Other studies showed insignificant effect which might be due to their different clinical settings and environment^[7,8].

Conclusion

Variable results have been observed by different authors regarding antimicrobial properties of human wax. Most authors however strongly believe that human wax along with its barrier host defence mechanism, also carry some amount of antimicrobial effect, which does inhibit growth of microbes.^[3,5,6] Our study also highlights the antibacterial and antifungal property of human wax. Biochemical changes and pathological role of wax in diseased conditions of middle and external ear has yet to be studied.

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