Isolation of Bacteria from Constantly used Face Masks of Some Novena University Students

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ABSTRACT

Bacteria entail an extremely diverse and wide group of organisms, capable of living in ubiquitous environmental niches. Since the onset of the covid 19 pandemic, face masks are being used by people to prevent the spread of the disease. However, once these face masks are constantly used without discarding, they serve as means for the spread of bacteria. The aim of the study was to isolate and characterize bacteria from constantly used face masks of some Novena University students. Thirty samples were collected using sterile swab sticks randomly from (15 males and 15 females) students and standard microbiological methods were employed for the analysis. The swabs were cultured on a different media in order to determine the bacteria on the constantly used face masks. Out of the 30 samples 16 (55.82%) were contaminated with bacteria. The bacteria isolated were: Staphyl- ococcus specie 8 (23.56%), Escherichia coli 4 (17.3%), Peptococcus specie 3 (9.44%) and Pseudomonas aeruginosa 1 (1.3%). Subjecting these isolates to natural and synthetic antibiotics reveals that Manihot esculenta and Helianthus plant extract were highly sensitive to the isolates compared to Gentamycin, Rocephin, Cipro- floxacin and Erythromycin. It is recommended that good hygiene should be observed by students to avoid the spread of the pathogen from constantly using face masks.

Keywords: face mask, _escherichia coli_, _staphylococcus_ specie and _peptococcus_ specie.

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Bacteria entail an extremely diverse and wide group of organisms, capable of living in ubiquitous environmental niches. Since the onset of the covid 19 pandemic, face masks are being used by people to prevent the spread of the disease. However, once these face masks are constantly used without discarding, they serve as means for the spread of bacteria. The aim of the study was to isolate and characterize bacteria from constantly used face masks of some Novena University students. Thirty samples were collected using sterile swab sticks randomly from (15 males and 15 females) students and standard microbiological methods were employed for the analysis. The swabs were cultured on a different media in order to determine the bacteria on the constantly used face masks. Out of the 30 samples 16 (55.82%) were contaminated with bacteria. The bacteria isolated were: Staphylococcus specie 8 (23.56%), Escherichia coli 4 (17.3%), Peptococcus specie 3 (9.44%) and Pseudomonas aeruginosa 1 (1.3%). Subjecting these isolates to natural and synthetic antibiotics reveals that Manihot esculenta and Helianthus plant extract were highly sensitive to the isolates compared to Gentamycin, Rocephin, Ciprofloxacin and Erythromycin. It is recommended that good hygiene should be observed by students to avoid the spread of the pathogen from constantly using face masks.

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I. INTRODUCTION

Bacteria entail an extraordinarily diverse and broad group of organisms, capable of living in a ubiquitous environmental niches (Theodor and William, 1999). Due to their simple cellular structure, they have the tendency to grow rapidly in their environment and withstand unfavorable environmental conditions, thereby increasing their survival rate. Bacteria can be pathogenic, symbiotic, parasitic or saprophytic, depending on their effect and interaction with their host. Another class of bacteria is the group that we refer to as normal flora. This group inhabits the normal flora of individual system without causing any harm or damage to the individual. Due to the immune- compromised system, these bacteria may become opportunistic parasites (David and Fleet, 2001).

Constantly used face masks have been an indirect means of spreading these bacteria, due to the fact that face masks used continuously may become means through which these bacteria can be contracted (Fleet et al., 1998). Good hygiene has been a common way to control and monitor the spread of these bacteria. Though the health benefits of constantly used face masks cannot be overemphasized, when these face masks are used continuously without disposing, they eventually turn to be a vehicle through which these bacteria can be harbored and spread (William, 1999). Since this covid 19 period, face masks are being used by students to prevent the spread of infection, but once these face masks are constantly used without disposing, they now serve as a means for the spread of bacteria (William, 2001). The study aimed at isolate and characterize bacteria from constantly used face masks of some Novena University students.

II   MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Novena University Ogume, Ukwuani Local Government Area, Delta State, Nigeria.

2.2 Population of study

Thirty (30) students of Novena University were randomly selected for the study,   fifteen (15) males and (15) females.

2.3 Sample collection

The sample collected was constantly used face masks from the selected 30 students of Novena University Ogume. Using a sterile swab sticks, the swab was moistened in sterile saline and rotated over the front and back of the constantly used face mask (Micheal and Verrian, 2001).

Some plants leaves were collected, sundried and grinded. The plants collected were *Manihot esculenta* (cassava)*, Helianthus* species (Sunflower), *Chromolena odorata (*bitter bush*)* and *Gorgronema latifolum (*bush back*)*.

2.4 Isolation and identification of bacteria

After the samples were collected, it was transported immediately to the laboratory. The samples were serially diluted in 5 folds and 0.1 aliquots was inoculated into a freshly prepared different media which includes; macConkey, nutrient agar, blood agar and chocolate agar.The plates were incubated for 24hours at 37°c in an incubator. The isolates were subcultured after 24hours to get pure isolates.

The identification of bacteria was made based on gram staining, colony characterization and other reaction tests such as biochemical test (Simmerman *et al.*, 2011). The isolates were counted using a colony counter and expressed as colony -forming units per mil.

2.5 Sensitivity test

Each antibiotics discs was impregnated into the pure cultured plate and incubated for 24 hours to test for sensitivity.

The plant extracts were impregnated into the plates containing the isolates and incubated for 24 hours to test for sensitivity.

III.   RESULTS

Table I : Isolated bacteria from the face masks

Organism	catalase test	gram staining	oxidase test	%
Staphylococcus	+	+	_	8(23.56)
Peptococcus	_	_	+	4(17.4)
E. coli	_	_	+	3(9.30)
P. aeruginosa	_	_	+	1(1.03)
Total				16 (55.82)

Key: +: presence of isolate , −: absence of isolate

From the various plate viewed under light microscope made from the smear of the colony growth from macConkey, nutrient, blood and chocolate agar, based on their shape, morphological characteristics and biochemical carried out, the following organisms were observed in table 1: *Staphylococcus aureus, Pseudomonas aeruginosa, Peptococcus species, Escherichia coli.* (Fleet, 2001).

Table 2: Synthetic Antibiotics used against the Isolates

	Staphylococcus sp.	*Peptococcus sp.*	*E. Coli*	*Pseudomonas sp.*
Pefloxacin	S	R	R	R
Gentamycin	R	R	R	R
Ampiclox	S	R	R	S
Zinnacef	S	S	R	S
Amoxicillin	S	R	R	S
Rocephin	S	S	R	S
Ciprofloxacin	R	R	R	R
Streptomycin	R	R	R	R
Septrin	R	R	R	R
Erythromycin	R	R	R	R

Table 2 shows the four bacteria that were isolated from the analyzed face masks samples. The probable identification of the organisms showed Staphylococcus sp , Peptococcus sp and Pseudomonas were sensitive to Rocephin while E .coli were resistant to all the antibiotics used

Table 3: Natural plants extracts used against the Isolates

	Staphylococcus sp.	*Peptococcus sp.*	*E. Coli*	*Pseudomonas sp.*
Manihot esculenta	S	S	S	S
Helianthus species	S	S	S	S
Chromolena odorata	S	R	R	S
Gorgronema latifolum	R	R	R	R

R= RESISTANCE   S= SENSITIVE

The plant extracts that were highly sensitive to the isolated four bacteria include: Manihot esculenta (cassava) and Helianthus species (Sunflower)

IV. DISCUSSION

The prevalence rate with bacteria was high about (54.54%). *Staphylococcus sp* had a high prevalence rate of 8 (26.52%). It is good to note that *Staphylococcus* sp are usually on the nasal passage and skin on 15-40% of healthy humans. *Staphylococcus aureus* is one of the most common causes of nosocomial infections which is caused by patients own endogenous microbial flora (David and Fleet, 2001*). E.coli* 4(17.43%) , *Peptococcus specie* 3 (9.44%) and *Pseudomonas aeruginosa 1(1.3%)* regularly reside in human intestine and as well as the skin. Constantly used face masks contaminated by microbes are usually exposed to places such as hospitals, hands and pocket and as such it will serve as a source of transmission (Allegal, 1999). These constantly used face masks serve as a very good vehicle for infection transmission. This research was compared with other studies, where it was noted that microbes like *Pseudomonas aeruginosa, Salmonella, Staphylococcus* and *E. coli* were isolated from constantly used face masks (Abbas,

1999). While a number of studies have focused on the importance of face masks in the transmissions of respiratory infections, accumulation of bacteria on the masks due to human saliva and exhaled breath represents a possible underestimated biosafety concern (Cowling *et al.,* 2010). Microorganisms present on the skin and in the upper respiratory tract could be transferred to the face mask while wearing it. For optimal growth, bacterial cells need a surface to grow on, warmth, moisture, and nutrients, which is the environment created on the face mask due to exhaled air and water vapor (Liang *et al .,* 2020). The results in this research is in line with the previous findings of Jacobs *et al.,* (2009) who concluded that growth of these microorganisms will also increase the amount of bacteria that are inhaled or could be transferred to the skin. This could theoretically cause some disturbance in the skin and nasal microbiome due to the overgrowth of certain pathobionts, which are associated with an increased risk of inflammation and infections (WHO, 2020). Davies *et al.,* in (2019) from his research found that *S. aureus* is part of a healthy skin microbiome, but can cause skin infections when the abundance of this species increases . In several studies, the use of face masks has been associated with acne linked to an accumulation of *S. aureus.* The study also evaluated the effect of the isolates using synthetic and natural plant extracts such as *Manihot esculenta* (cassava)*, Helianthus* species (sunflower), *Chromolena odorata (*bitter bush*)* and *Gorgronema latifolum (*bush back*).*

Manihot esculenta and *Heliantus* plant extract were highly sensitive to the isolates compared to Gentamycin, Rocephin, Ciprofloxacin and Erythromycin. The results in this research conform with the previous results of Doung *et al.,* (2020) from Thailand metropolis who used medicinal plants extract to kill infections caused by bacteria.

IV. CONCLUSION

Contaminated face mask has been a source of infection, and it has been noted that it varies from person to person due to the hygiene state of that particular individual.It is recommended that increase in awareness to decontaminate the face mask by effective disinfection and to dispose after use is necessary.The plant extracts, *Manihot esculenta* and *Helianthus* species that were highly sensitive to the isolated bacteria are recommended to be subjected to further research work to harness their potential in the treatment of bacterial infections.

REFERENCES

1. Cowling BJ, Zhou Y, Ip DKM, Leung GM, Aiello AE (2010). Face masks to prevent transmission of influenza virus: a systematic review. *Epidemiology Infection.*138:449–56.

2. Liang M, Gao L, Cheng C, Zhou Q, Uy JP, Heiner K, (2020). Efficacy of face mask in preventing respiratory virus transmission: a systematic review and meta-analysis. *Travel Medicinal Infectious Distribution.* 38: 123-137

3. Cowling BJ, Leung GM. (2020) .Epidemiological research priorities for public health control of the ongoing global novel coronavirus (2019-nCoV) outbreak. *Eurosur- veillance.* (2020) 25:20-27.

4. Leung NHL, Chu DKW, Shiu EYC, Chan KH, McDevitt JJ, Hau BJP(2020). Respiratory virus shedding in exhaled breath and efficacy of face masks. *National Medicine.* (2020) 26:67–80.

5. World Health Organization .(2020) .*Advice on the Use of Masks in the Context of COVID-19: Interim Guidance-2.*

6. Davies A, Thompson KA, Giri K, Kafatos G, Walker J, Bennett A.(2013). Testing the efficacy of homemade masks: would they protect in an influenza pandemic? *Disaster Medicine of Public Health Preparation.* 7:4–8.

7. Loeb M, Dafoe N, Mahony J, John M, Sarabia A, Glavin V, (2009). Surgical mask vs N95 respirator for preventing influenza among health care workers. *JAMA.* 30:18-65.

8. Ng TC, Lee N, Hui S-CD, Lai R, Ip M.(2009). Preventing healthcare workers from acquiring influenza. *Infectious Control Hospital of Epidemiology.* 30:2–5.

9. MacIntyre CR, Seale H, Dung TC, Hien NT, Nga PT, Chughtai AA, (2015). A cluster randomised trial of cloth masks compared with

medical masks in healthcare workers. *BMJ Open.* (2015) 5:4-13.

10. Doung-Ngern P, Suphanchaimat R, Panjangam Patthana A, Janekrongtham C, Ruampoom D, Daochaeng N. (2015). Case-control study of use of personal protective measures and risk for SARS-CoV 2 infection, Thailand. *Emerg Infect Dis.* 26:7–16.

11. Howard J, Huang A, Li Z, Tufekci Z, Zdimal V, van der Westhuizen HM,(2020). An evidence review of face masks against COVID-19. *Proc Natl Acad Sci. USA.* 118: 20-30.

12. Cowling BJ, Chan K-H, Fang VJ, Cheng CKY, Fung ROP, Wai W. (2009). Facemasks and hand hygiene to prevent influenza transmission in households. *Ann Intern Med.* (2009) 151:14-37.

13. Jacobs JL, Ohde S, Takahashi O, Tokuda Y, Omata F, Fukui T.(2009). Use of surgical face masks to reduce the incidence of the common cold among health care workers in Japan: a randomized controlled trial. *Am J Infect Control.* 37:4–9.

14. MacIntyre CR, Wang Q, Cauchemez S, Seale H, Dwyer DE, Yang P.(2011). A cluster randomized clinical trial comparing fit-tested and non-fit-tested N95 respirators to medical masks to prevent respiratory virus infection in health care workers. *Influenza Other Respi Viruses.*5:1–9.

15. Simmerman JM, Suntarattiwong P, Levy J, Jarman RG, Kaewchana S, Gibbons RV.(2011). Findings from a household randomized controlled trial of hand washing and face masks to reduce influenza transmission in Bangkok, Thailand. *Influenza Other Respi Viruses.* (2011) 5:56–67.

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