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Identification and Characterization of Bacteria Air Pathogens from Homes in Zaria Metropolis

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ABSTRACT

This research title, identification and characterization of bacteria air pathogens was carried out in some strategic houses cutting across five zones in Zaria metropolis with the view to isolate and identify bacteria pathogens present in the air that could constitutes health risk to the inhabitants of these houses. A total of thirty five samples were collected during the cause of this study out of which seven samples were collected from each of the five zones (Hanwa, Samaru, Zango, Zaria City and Kwangila). A total of six bacterial pathogens comprising of *Salmonella spp, Shigella spp, Escherichia coli, Klebsiella spp, Pseudomonas aeruginosa and Bacillus subtilis* was isolated. *Escherichia coli* had the highest percentage of occurrences of 29.2% followed by *Salmonella spp* (20.8%). *Shigella spp* had 16.7% while *Klebsiella spp and Pseudomonas aeruginosa* had 12.5% each and the least was *Bacillus subtilis* (8.3%). Considering the fact that some of the isolated pathogenic bacteria are associated with gastrointestinal tract infection (*Salmonella spp, Shigella spp, Escherichia coli, and Bacillus subtilis)* which could be through ingestion of food or water contaminated by these pathogens and also respiratory tract infection (*Klebsiella spp and Pseudomonas aeruginosa*) constitute a great concern to health practitioners in developing countries because these are bacteria pathogens that are mostly resistant to the commonly available antibiotics used in the treatment of infection associated with these pathogens.

Keywords: *Air pathogens, resistant, respiratory tract, inhabitants, metropolis*.

1. INTRODUCTION

Microorganisms are ubiquitous, and mixtures of microbes are often transferred to everyday objects from the environment and infected individuals. Pathogenic microbes are transmissible via air, skin, food, water and other interpersonal contacts, and in most cases, they cause diseases and infections. Exposure to bio-aerosols, containing airborne microorganisms and their by-products, can result in respiratory disorders and other adverse health effects such as infections, hypersensitivity pneumonitis and toxic reactions [8,9]. Transmission of these infectious agents typically involves their escape from the host and entry into a new host [3,12]. The importance of bio-aerosols has been emphasized in recent decades due to their effect on human health. They have been implicated in conditions ranging from allergies to disseminated infections in susceptible patients [11]. Different authors have reported the importance of these particles as transmitters of hospital infections,[1,6] especially those caused by fungal isolates, as they act as epidemiologic markers of microbial contamination [2]. Fungal infections of hospital origin have been gaining importance in recent years due to their progressive increase and their high rates of morbidity and mortality [4,5,14]. Despite the need to monitor bio-aerosol levels in evaluating health risks, differences between automatic techniques and passive sedimentation techniques hamper results comparison [10]. Microbial damage in indoor/outdoor areas, is caused most frequently by molds and bacteria. These micro-organisms have a very important role in the biogeochemical cycle, as their task consists of disintegrating organic mass to reusable metabolites. In the environment spores of molds and bacteria may become airborne and are therefore ubiquitous. They can enter indoor areas either by means of passive ventilation or by means of ventilation systems. Many genera are also emitted by indoor sources like animals, flowerpots and wastebaskets. In most cases, normal flora is not harmful. However, growth conditions like excessive humidity and/or a high water content of building materials are encountered on a more frequent basis, which in most cases can be described as the limiting factor for microbial growth [17]. This is caused by shortcomings of the buildings such as the lack of thermal insulation, as well as the incorrect behavior of users of rooms. The relative humidity and/ or the moisture content of the materials determines that to what extent different micro-organisms are able to grow on indoor or outdoor materials [7].Automated techniques, although they are efficient in quantitative analysis, are of limited use because they require heavy and noisy equipment and need a constant power supply [16]The passive sedimentation technique is also limited because it does not permit an adequate quantitative analysis, but

it is still widely recommended in the literature for use as a microbiological alert [5]. To access and manage environmental health risks, such as air pathogens, the need to continuously carrying out research into the effects and impacts of air pathogens on health remains critical which is often overlooked most especially the health impacts of indoor air pathogens sources. Looking at the high population in Zaria, the present study is aim at isolating air bacteria pathogens in Zaria metropolis residence.

2. METHODOLOGY

Sample Areas

Five sample areas namely, Hanwa, Samaru, Zango, Zaria City, Kwangila were strategically mapped out in Zaria metropolis in other to have an even representation of the city the research is aim at studying

Preparation of Media

Four media namely, Nutrient agar, Salmonella/Shigella agar, MacConkey agar and Eosin Methylene Blue (EMB) agar were prepared based on manufacturer instruction. In other to test for sterility of the prepared media, the Petri dishes containing the different sterilized agar media were further incubated without any inoculation in the incubator for 24 hours. Petri dishes having no growth of microorganisms (contamination) were used for sample collection.

Sample Collection

Sample collection was performed using the passive sedimentation method in 150 mm diameter Petri dishes containing Nutrient agar, Salmonella/Shigella agar, MacConkay agar, and Eosin Methylene Blue (EMB) agar media. The plates were exposed in each of the environments for two hours in each period, positioned 2 m high – roughly human respiration height [13] close to an open window.

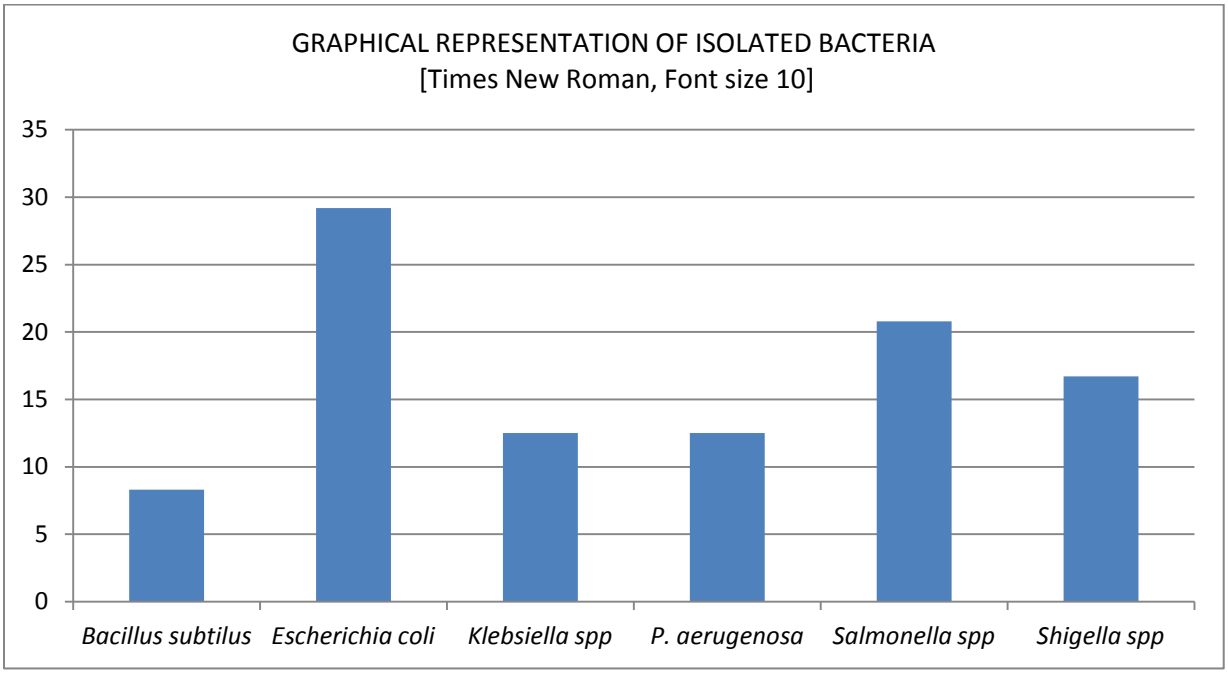
3. RESULTS

Table 1: Isolated Bacteria in Different Homes in Zaria Metropolis

SAMPLE AREAS	ISOLATED BACTERIA. (FIRST SAMPLE)	ISOLATED BACTERIA. (SECOND SAMPLE)	ISOLATED BACTERIA. (THIRD SAMPLE)	ISOLATED BACTERIA. (FOURTH SAMPLE)	ISOLATED BACTERIA. (FIFTH SAMPLE)	ISOLATED BACTERIA. (SIXTH SAMPLE)	ISOLATED BACTERIA. (SEVENTH SAMPLE)
HANWA	Shigella spp	Escherichia coli	Escherichia coli	NO GROWTH	NO GROWTH	NO GROWTH	Salmonella spp
SAMARU	Salmonella spp	Escherichia coli	Salmonella spp	Klebsiella spp	Klebsiella spp	NO GROWTH	NO GROWTH
ZANGO	Escherichia coli	Shigella spp	NO GROWTH	NO GROWTH	Escherichia coli	Escherichia coli	Pseudomonas aeruginosa
ZARIA CITY	Bacillus subtilis	Escherichia coli	NO GROWTH	NO GROWTH	Klebsiella spp	Salmonella spp	Shigella spp
KWANGILA	Salmonella spp	NO GROWTH	Shigella spp	NO GROWTH	Shigella spp	Bacillus subtilis	Pseudomonas aeruginosa

Table 2: Percentage of Isolated Bacteria

ISOLAED ORGANISMS	FREQUENCY OF OCCURENCE	PERCENTAGE
Bacillus subtillus	2	8.3%
Escherichia coli	7	29.2%
Klebseilla spp	3	12.5%
Pseudomonas aeregenosa	3	12.5%
Salmonella spp	5	20.8%
Shigella spp	4	16.7%
TOTAL	24	100%



4. DISCUSSION

From the result represented above, a total of twenty four bacteria pathogens were isolated comprising of *Salmonella spp, Shigella spp, Escherichia coli, Klebsiella spp, Pseudomonas aeruginosa and Bacillus subtilis. Escherichia coli* has the highest percentage occurrences of 29.2% followed by *Salmonella spp* 20.8%, *Shigella spp* recorded a percentage of 16.7% while *Klebsiella spp* and *Pseudomonas aeruginosa* recorded 12.5% each.

From the result of this research conducted, it is observed that *Escherichia coli and Salmonella spp* had the highest occurrences in each of the sampling zones. This is true, looking at the fact that these bacterial pathogens are commonly associated with gastrointestinal infections as a result of eating food contaminated by these pathogens. Also another gastrointestinal pathogens *Shigella spp* (16.7%) isolated is of concern because these bacteria pathogens is the causative agent of bacillary dysentery in most developing countries today, which could be fatal in children if not diagnose and treated on time. Also the isolation of *Klebsiella spp* and *Pseudomonas aeruginosa* in four out of five zones (Samaru, Zango, Zaria city and Kwangila) is of great concern too, looking at the fact that these bacterial pathogens are associated with respiratory tract infection that if left untreated could be life threatening both in children and adult as reported by [9,8,17]

5. CONCLUSSION AND RECOMMENDATION

In conclusion, the isolation of gastrointestinal pathogens(*Salmonella spp, Shigella spp, Escherichia coli*), and respiratory tract pathogens (*Klebsiella spp, Pseudomonas aeruginosa*) from houses of Zaria metropolis constitute a great concern to the health of the inhabitants residing in Zaria because these bacterial pathogens could be life threatening both in children and adult if not diagnose on time and appropriate antibiotic administered to treat these infections associated with these pathogens. Also considering the fact that these pathogens were isolated from areas close to the windows, this further suggest that proper ventilation system should be provided when constructing houses to permit the in-flow and out-flow of air in our homes in other to minimized not only the concentration of pathogenic bacteria in our homes but also chemical substances such as carbondioxide which could also have an adverse effect on the inhabitants of these homes if the concentration is high if there is poor outflow of air. Finally, this research focus on the isolation of bacterial pathogens alone, but there is the need to carried out further research with the view to find out the possibilities of isolating fungal pathogens which could be a good source of air pathogens and also to evaluate these microbes (bacteria and fungi) against some of the commonly used antimicrobial agents used in the treatment of infections associated with these pathogens.

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