

Identification and characterization of air bacteria from some school of Baghdad city

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To cite this article:

Badri,R.M.;Alani,R.R.;Hassan,S.S.Identification and characterization of air bacteria from some school of Baghdad city.
Mesop. environ. j., 2016, Vol. 2, No.4, pp. 9-13.

Received Date: 5/ 4/2016, **Accepted Date:**2 / 5 /2016, **Publishing Date:** 15/8/2016

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Abstract

This study record the existence of bacteria in indoor of school (in 5 randomly selected primary school in Baghdad), accurate locating of various groups of microorganisms indoors is needful for both to inform the health hazard and to form standards for indoor air quality control.

If air contains microorganisms especially pathogenic microorganisms, it's the reasons to serious health impacts to human beings especially children who are more expanded to respiratory defect. So, the overall counts of Gram positive microorganisms were found to be higher than Gram negative microorganisms. From this, *Staphylococci* and *Micrococcus* were prevalent Gram positive bacteria, while *Pseudomonas sp.* and *Enterobacter sp.* were prevalent probably pathogenic Gram negative bacteria isolated from the air samples.

Keywords: indoor bacteria, pathogenic microorganisms, environment of school, Gram positive bacteria, Gram negative bacteria.

Introduction

Indoor air quality (IAQ) is becoming more and more significant matter for occupational and public health [1]. Air in the indoor environment can be polluted by a number of pollutants among which airborne microorganisms(bacteria and fungi) are one of the most important [2]. It has been evaluated that one-third of indoor air quality(IAQ)

grievance may be due to microbial contamination [3]. Exposure to these may cause allergies, respiratory and immunotoxic diseases [4]. One can live for several days without food, a few days without water, but only a few minutes without air [5]. Microorganisms and/or their reproductive structures are almost always found in outdoor air. Their types and populations will vary respect to local environmental conditions. Doors, windows, and fresh air intakes provide easy access for microorganisms to enter the interiors of buildings.

It is common to find some quantity of microorganisms in indoor air in normal indoor environment, their numbers should be safely lower than outdoor levels. [6]. These contaminants may be culturable and non-culturable [7]. Estimate of microbial contaminants in the form of bacteria from indoor environment is always a refining and worthwhile subject of great concern [8]. School is the second most remarkable indoor environment in estimating the quality of indoor air and health components of occupants [9]. Schools are public places populated by thousands of students every day and tend to have high levels of activity that typically result in higher levels of airborne bacteria. The amount of the microbial content of indoor air of school is an important parameter because it has a direct impact on the mental health, physical development and performance of the students [10]. The objective and quantitative determination of airborne microorganisms at a school classroom.

Materials and Methods

Samples were taken in a school room by natural sedimentation method. Nutrient agar (NA) (Himedia laboratories Limited, Mumbai, India) was used for the sampling and cultivation of bacteria. Plates of fix the smears human breathing zone, that is, 1.5m above floor level. Nutrient agar plates were incubated at 37°C for 48 hrs to allow the growth of aerobic bacteria. The average of colony forming units (CFU) of bacteria was calculated and reverse to organisms per cubic meter of air (CFU/m³). Bacterial colonies were initially characterized by morphology and microscopic appearance, and identified further by biochemical tests according to Bergey's manual of systematic bacteriology [11].

Gram Staining for Bacteria

Take thin smears of cultured bacteria on separate glass slides and let the smear air dry. Heat fix the smears. Hold the smear using slide rack or cloth pin. Cover each smear with crystal violet for 30 sec. wash each slide with distilled water for few seconds using wash bottle. Cover each smear with gram's iodine solution for 60 sec. wash of the iodine solution with 95% ethyl alcohol. Add ethyl alcohol drop by drop until no more color flows from the smear. Wash the slides with distilled water and drain. Apply safranin to smear for 30 sec. wash with distilled water and blot dry with absorbent paper. Let the stained slides air dry. Identify for gram negative or gram positive bacteria.

Results and Discussion

This part deals with the results and interpretation of data obtained from the present work. The results of microbial load concentration found in indoor of schools are shown in tables below. (1,2,3,4).

Table (1): School number 1:

Class room 1	165.06 cfu/m ³
Class room 2	168.26 cfu/m ³
Class room 3	150.66 cfu/m ³
Class room 4	138.93 cfu/m ³
Teachers room	97.46 cfu/m ³

Biology lab.	188.66 cfu/m ³
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Table (2): School number 2:

director room	97.46 cfu/m ³
Class room 1	113.86 cfu/m ³
Class room 2	94.4 cfu/m ³
Class room 3	137.33 cfu/m ³
Class room 4	217.06 cfu/m ³
Class room5	138.4 cfu/m ³

Table (3): School number 3:

Class room 1	136.8 cfu/m ³
Class room 2	222.4 cfu/m ³
Class room 3	219.73 cfu/m ³
Teachers room	95.86 cfu/m ³

Table (4): School number 4:

Class room 1	110.13 cfu/m ³
Class room 2	93.73 cfu/m ³
Class room 3	94.26 cfu/m ³
Class room 4	96.4cfu/m ³
Class room 5	110.66cfu/m ³
Class room 6	96.933cfu/m ³
Teachers room	111.73cfu/m ³

Table (1) show the concentration of airborne bacteria in school number 1 it ranged from 97.46 cfu/m³ -188.66 cfu/m³ in all school rooms. Table (2) show the concentration of airborne bacteria in school 2 it ranged from 94.4 cfu/m³ - 217.06 cfu/m³ and school 3 show the concentration ranged from 95.86 cfu/m³ -222.4 cfu/m³ and school 4 the concentration ranged from 93.73 cfu/m³ -111.73 cfu/m³. The most common bacteria isolated were gram positive cocci. Prevailing isolates were the *Staphylococcus aureas*. While the remaining part of this group belonged to *Staphylococcus epidermidis* and *Micrococcus sp*.

Also Gram negative bacteria were *Pseudomonas sp.* was commonly isolated. The other isolates were identified as *E. coli* and endospore forming Gram positive bacilli (*Bacillus sp.*). Microbiological indoor air quality of a school is an important factor for children's health, as school serves a daily environment for them. Microbial concentration of indoor air of the school is affected by many factors, including human activity, the age of school building, ventilation conditions, outdoor air, season (primarily temp. and humidity), etc. [12]

In the present study the prevalent bacteria isolated were Gram positive cocci belonging to saprophytic micro flora generally correlating to human skin and mucosa which can be dispersed through droplets or skin peeling and maintained in air. Researchers observed a significant increased concentration of bacteria in afternoon (during the lessons) as compared to morning in various rooms of a university [13], and found the same result, concluding that bacterial contamination into indoor air derives from human presence [14].

The association of airborne microbes and human activity has also been reported by many studies. Reported highest level of bacteriological contamination in corridor and rooms during lessons in a school [15]. As there are no generally accepted threshold limit values concerning concentration of bacteria in the air of indoor, the obtained results could be compared only with the values recommended by various authors or institutions. According to indoor air quality standards suggested by environmental protection administration (EPA) indoor air of schools and other educational settings should have less than 500 cfu/m³ of total bacterial count. In our research, however the levels of bacteria mentioned above were not exceeded but showed considerable number in the air of school. According to some molecular findings the level of total bacteria may be even up to 5- times higher than the number of cultural bacteria determined as cfu/m³ (16), so the present results may be an under estimate of real indoor air microbial concentration. Therefore, it is necessary to control microbial air pollution in such educational settings and also to develop the standards related to it.

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